

# Town of Bristol, Vermont



## Single Jurisdiction All-Hazards Mitigation Plan Update

Final Plan Adoption Date:     /    /    

FEMA Approval Date: 11/13/2018

# **Bristol, Vermont Single Jurisdiction All-Hazards Mitigation Plan Update**

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## **Bristol, Vermont All-Hazards Mitigation Plan Update**

### **1. Planning Process**

#### **1.1. Plan History**

The Town of Bristol was among the original communities in the Addison region who expressed an interest in creation of what was known as a “Pre-Disaster Hazard Mitigation Plan” borne out of DMA2K. In that plan, the Addison region collectively adopted an umbrella plan then each community was tasked with creating an annex which would call out hazards and mitigation projects specific to that community.

In 2010, interpretations of FEMA mitigation plan time frame requirements resulted in a reformat of the original multijurisdictional plan and appropriate local annex into a single jurisdiction plan. This final iteration of a mitigation plan was accepted by FEMA and adopted in 2012.

Following DR 4022 in 2011, Hazard Mitigation Grant Program funds became available for planning and ACRPC queried its member municipalities for interest in either developing an All Hazards Mitigation Plan or updating an existing one. The Town of Bristol, responded and was one of 13 who indicated an interest. Based on that interest, ACRPC applied for and was granted funds to conduct an update of Bristol’s plan in 2017-18

#### **1.2. Current Plan Update Process**

The Bristol, Vermont All-Hazards Mitigation Plan, adopted in August of 2012, gives the following direction for a plan update process which was followed in the development of this updated plan:

1. The Bristol Selectboard assembles a Review/Update Committee.
2. The Committee will discuss the process to determine if any modifications or additions are needed due to changing conditions since the last update occurred. Data needs will be reviewed, data sources identified and responsibility for collecting/updating information will be assigned to members.
3. Other Town plans (Emergency Operations Plan, Town Plan, Road Plan, etc.) will be reviewed to ensure a common mitigation thread still exists throughout.
4. A draft update will be prepared based on these evaluation criteria:
  - Changes in community and government processes, which are hazard-related and have occurred since the last review.
  - Progress in implementation of plan initiatives and projects.
  - Effectiveness of previously implemented initiatives and projects.
  - Evaluation of unanticipated challenges or opportunities that may have occurred between the date of adoption and the date of the report.
  - Evaluation of hazard-related public policies, initiatives and projects.
  - Review and discussion of the effectiveness of public and private sector coordination and cooperation.
5. Selectboard members will have an opportunity to review the draft update. Consensus will be reached on any changes to the draft.
6. The Selectboard will notify and schedule a public meeting to ensure adequate public input.
7. The Selectboard will recommend incorporation of community comments into the draft update.

### 1.3. Opportunities for public comment

As indicated in 1.1.2, multiple opportunities for public comment were made available during the planning process:

- The Town Selectboard at a publicly warned meeting on 11/13/2017, discussed the update process and appointed an update/review committee consisting of:

Joel Bouvier	Selectboard Representative
Peter Bouvier	Road Foreman
Valerie Capels	Town Administrator
Brett LaRose	Bristol Fire Chief
Jill Marsano	VT Utility Management Systems (representing water department)
Kris Perlee	Planning and Zoning administrator
Katie Raycroft-Meyer	Planning Commission Chair
Kristen Underwood	Conservation Commission

- Subsequent open meetings of the Town Selectboard invited the public to review and provide comment on the draft plan updates as they were available. No comments made.
- The initial plan update meeting was held on 12/5/2017 and largely consisted of updating the Hazard Identification and Risk Assessment last conducted for the 2010 plan. The meeting was warned, open to the public and the public was encouraged to provide input. No members of the public attended or provided comment.
- The second plan update committee meeting was held on 3/13/2018. This meeting concentrated on project brainstorming and hazard mapping. It was open to the public and the public was encouraged to provide input. No comments were received.
- Ongoing drafts were made available for review and comment at meetings of the Bristol Planning Commission (3/20/2018) and Bristol Conservation Commission (postponed until 5/10/2018). Comments from these meetings were directed to Tim Bouton at ACRPC. No comments received.
- The plan was made available on the Town website [www.bristolvt.org](http://www.bristolvt.org) for public comment while in draft form and was also made available in paper form at the town offices. The public was encouraged to provide comment to Tim Bouton at ACRPC. No comments were received.
- The Selectboard held a public hearing (3/19/2018) on the draft plan update as indicated in 1.1.2 (6) and input was incorporated into the plan.
- A draft plan was submitted along with a completed plan review tool to the State of Vermont SHMO on 3/20/2018 for review and comments. Following receipt of those comments, the draft was further edited and forwarded to FEMA Region I on 3/27/2018 for comments and preliminary approval.
- Comments were received back from FEMA reviewers on 7/19/2018.
- Changes were made to the draft plan based on FEMA recommendations and an updated draft was completed on 10/2/2018. This draft was submitted to the State reviewers for a second time, who found it to meet their standards and then forwarded to FEMA reviewers.
- Following review by FEMA reviewers, the plan was awarded the Approval Pending Adoption (APA) status and returned to the town on 11/13/2018.
- The plan was then adopted by the Bristol **Selectboard on XX/XX/XXXX.**

## 1.4. Opportunities for additional comments

Additional opportunities for regional and state-level comments in the draft stage were provided throughout the planning process.

- Availability of the plan for review was announced monthly at the Addison County Regional Planning Commission's meetings and the public was invited to provide comments. Comments were instructed to be directed to Tim Bouton at ACRPC. No comments.
- A copy of the draft plan was posted on the ACRPC website for regional review and notice was given during monthly meetings of ACRPC as to its availability. Comments were instructed to be directed to Tim Bouton at ACRPC. None received.
- Copies of the plan in draft form were provided to clerks in the neighboring towns of New Haven, Middlebury, Lincoln, Starksboro, Monkton and New Haven and asked them to freely distribute the draft to the public and to town officials. Comments were instructed to be directed to Tim Bouton at ACRPC. No comments.

## 1.5. Extent of review

Throughout the plan update process all sections of the plan were reviewed and corrected for accuracy. Recently completed studies and newly developed data were included in the document. Examples of changes due to new data include addition of information from:

- 2017 Basic Emergency Operations Plan (previously identified high hazard and vulnerable sites)
- 2017 Bristol Town Plan (support for the committee's prioritization process and section 2 narrative)
- 2016 Addison County Regional Plan (general information about the Addison region)
- 2013 State of VT Hazard Mitigation Plan (provides a listing of statewide hazard concerns)
- Disaster updates within Section 4 Community Risk Assessment
- 2003, 2004, and 2008 Geomorphic Assessments of the New Haven River (Informs Landslide and flash flood narratives)
- 2016 Report of the State Fire Marshall (fire frequency and extent information)
- 2012 Vermont's Fire History 1905-2011- Lloyd C. Irland (informs wildfire hazard past occurrences)
- 2015 Town of Bristol Stormwater Infrastructure Mapping Project – VT DEC Watershed Management Section
- [www.fema.gov](http://www.fema.gov) (provided official data on declared disasters)
- The Vermont Weather Book by David Ludlum (provided historic accounts of past disasters)
- National Climatic Data Center website (provided information for Section 4.3)
- FEMA Snow Load Safety Guide (informed Section 4.3)
- FEMA FIRM and FIS dated 8/5/1986 (informed section 4.3)
- VT Center for Geographic Information data layers (incorporated into map products)
- LEPC #8 Tier II reports (reviewed for Section 4.3)
- VT ANR Atlas (informs Section 4.3 and provides visual depiction)
- State of Vermont dam inventory database (incorporated into section 4.3)
- Bristol Annual Town Reports 1980-2015 (informed FEMA reimbursements in table #1)

## **2. Community Background**

The Town of Bristol is located at the foot of the Green Mountains and as such has a topography that ranges from steep to relatively flat as the town extends out onto the bed of the Champlain Valley. The town covers approximately 23,000 acres of which 5,529 or 20% is owned by the Green Mountain National Forest. Bristol has two State highways running through it, Route 17 bisecting the Town and Village east/west and Route 116 going generally north/south.

Bristol experienced dramatic growth from 1960 to 1990 but the rate of growth has plateaued recently at just over 1.5%. The 2016 American Community Survey shows total population of 3,907, up from 3,894 in the 2010 Census. The overall population is also aging rapidly with significant drops being felt in the 18-34 age group. The rapid population growth experienced from 1970-1990 coupled with an overall reduction in family size was also reflected in an 80% increase in housing during that period. In 2016 the town had approximately 1,600 housing units. A little more than half (63%) of the housing units in Bristol are single-family, approximately 22% are multi-family units and nearly 15% are mobile homes. The slow rate of population growth and ageing is mirrored in new housing growth: about 1.4% of total housing units were built between 2010 and 2013, and only 0.2% were built after 2014 (ACS 2016). Nearly all new residential construction has occurred in the downtown area since 2000. More than a quarter (25.9%) of housing units were built before 1939. Bristol has seen an increase in the desire for the aging population to move into the village resulting in more renovation activity than new construction.

In Bristol, power is provided by Green Mountain Power through a 12.5KW line that is slated to be upgraded to 34.5KW within the next 20 years. The village has a water distribution system that is spring fed and includes a covered storage reservoir located above town off Mountain Street. This water system serves 646 connections and provides exceptional water pressure and volume, invaluable for fire suppression. Most Bristol residents outside of the Village area have private wells and springs that serve individual houses. There is a small Town-operated septic system that supports a portion of the commercial blocks downtown. Bristol's remaining residents are served by individual on-site septic systems. Storm water is an ongoing concern for many residents due to a limited village storm water system capacity and an outflow that directly discharges onto the banks of the New Haven River.

In Bristol, fire coverage is provided by the 38-member all-volunteer Bristol Fire Department. In 2016 the Fire Department reported 131 alarms of which, 40 were assistance to the rescue squad at motor vehicle accidents. 33 fires were reported during the same period and 25 false alarms rounded out the top three reporting types. In 2016 the department completed construction of a new \$3.2 million, 11,500-square-feet, energy efficient fire station.

The Bristol Rescue Squad, an independent volunteer group provides EMS ambulance coverage to the Town of Bristol. The nearest hospital services are provided by Porter Medical Center, a satellite of the UVM Health Network, which is a 45-bed community hospital located 10 miles away in Middlebury. The nearest Level I Trauma center is located 25 miles north in Burlington.

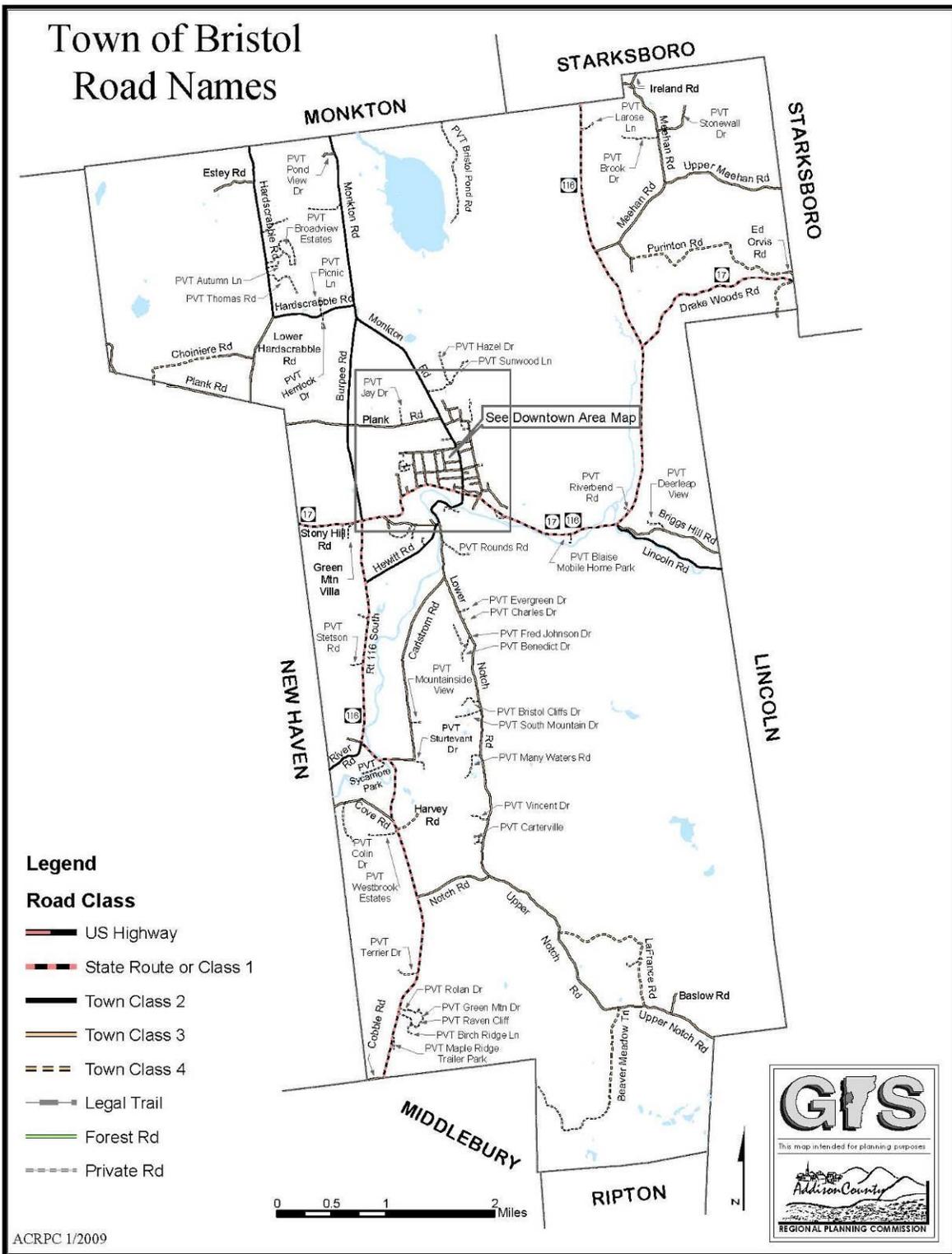
Law Enforcement in a designated Police District is provided by the 4 full time officers of the Bristol Police Department. The district is limited to an area of approximately 1 square mile around the central business district. Vermont State Police and the Addison County Sheriff's Department support the remainder of the Town of Bristol.

The Town uses a Local Emergency Operations Plan (LEOP) to guide its response to larger incidents and the LEOP identifies several high hazard/vulnerable sites that are associated with flooding, fire and transportation accidents. Additionally, the LEOP designates the Holley Hall the Bristol Police Department and the Rescue Garage as potential emergency operations centers. Mount Abraham Union High School, Bristol Elementary School and Holley Hall are designated community shelters. MAUHS Parking lot has been identified as a potential C-POD in the event Federal supplies need to be distributed in the area.

Fortunately for the Town of Bristol, a slow rate of growth and proactive renovations in the village have limited the overall risks to the population. The floods of 1998 and 2004 which resulted in DR 1228 and DR 1559 caused residents to think twice before attempting to build too close to the flood prone river and streams, and municipal leaders have implemented measures to mitigate risks. Based on these trends, overall vulnerability has decreased in the town of Bristol since 2012.



# Town of Bristol Road Names



ACRPC 1/2009



# Town of Bristol, Downtown Area



## Legend

### Road Class

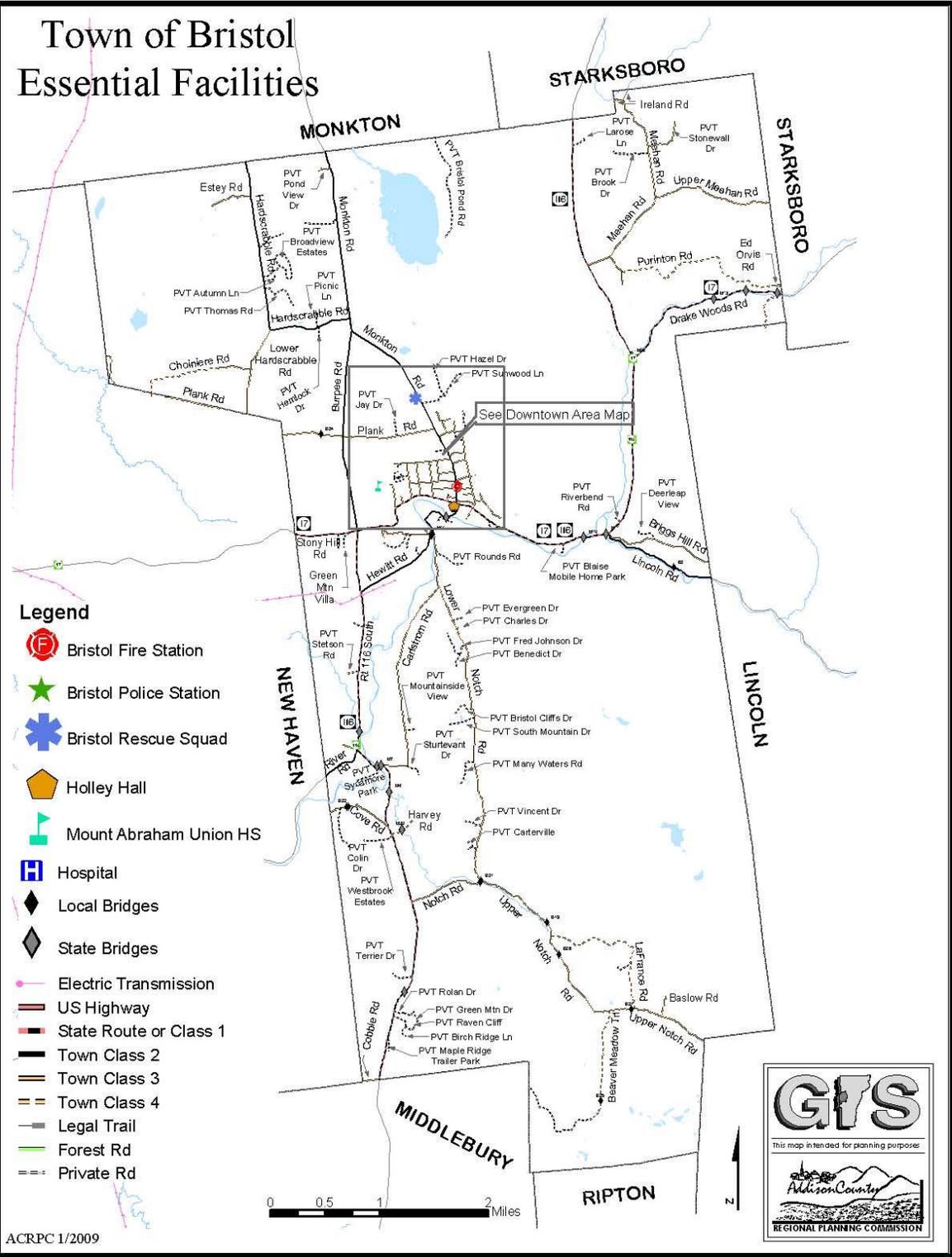
- US Highway
- State Route or Class 1
- Town Class 2
- Town Class 3
- Town Class 4
- Legal Trail
- Forest Rd
- Private Rd

ACRPC 1/2009

0 0.25 0.5 Miles



# Town of Bristol Essential Facilities

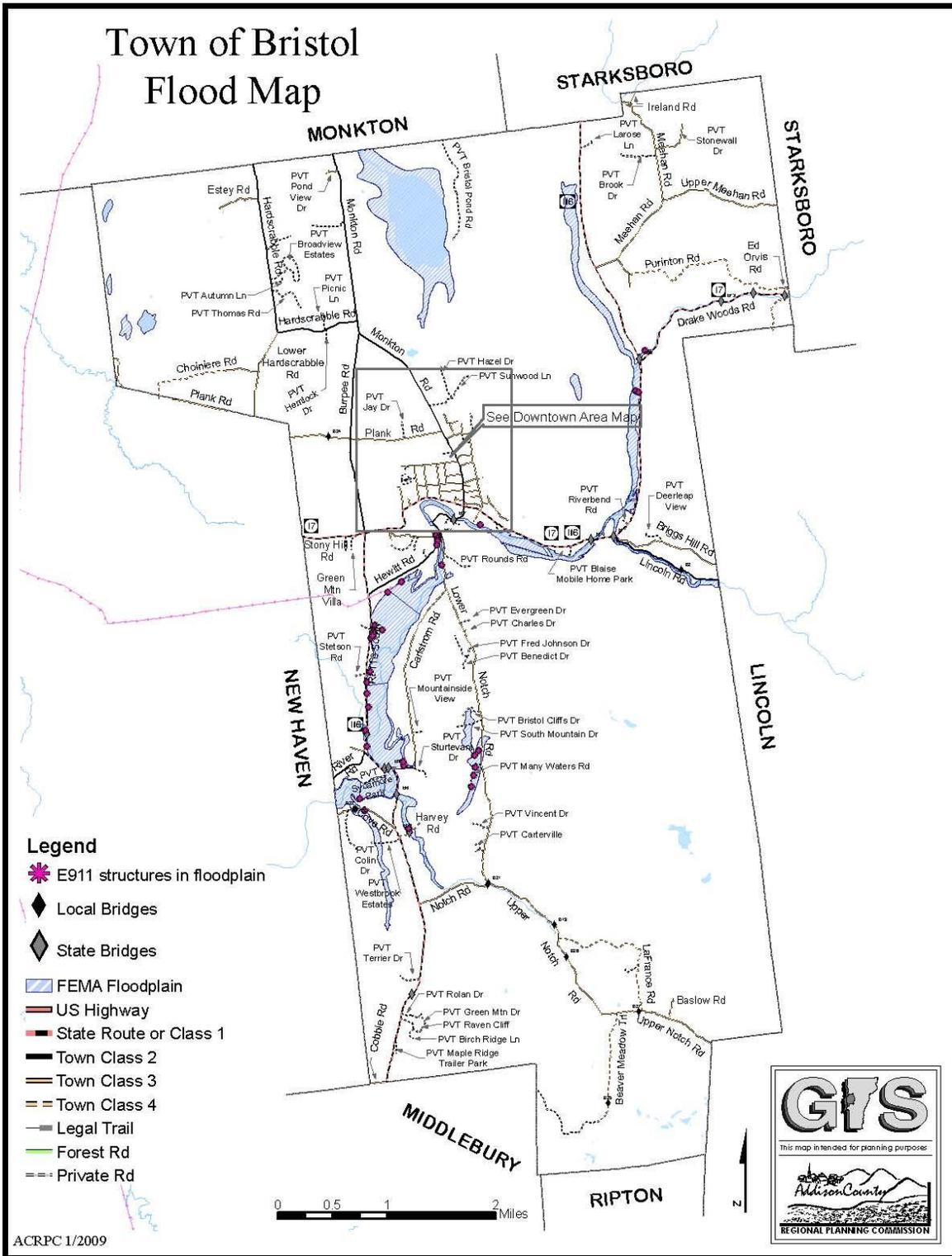


- Legend**
- Bristol Fire Station
  - Bristol Police Station
  - Bristol Rescue Squad
  - Holley Hall
  - Mount Abraham Union HS
  - Hospital
  - Local Bridges
  - State Bridges
  - Electric Transmission
  - US Highway
  - State Route or Class 1
  - Town Class 2
  - Town Class 3
  - Town Class 4
  - Legal Trail
  - Forest Rd
  - Private Rd

ACRPC 1/2009



# Town of Bristol Flood Map



- Legend**
- ✱ E911 structures in floodplain
  - ◆ Local Bridges
  - ◆ State Bridges
  - ▭ FEMA Floodplain
  - US Highway
  - State Route or Class 1
  - Town Class 2
  - Town Class 3
  - Town Class 4
  - Legal Trail
  - Forest Rd
  - Private Rd

ACRPC 1/2009



### **3. Existing Plans which support Hazard Mitigation**

The following plans pre-date this plan and are used as an example of how the community, the Addison region and the State of Vermont have incorporated mitigation thinking into standard planning mechanisms. As planning efforts continue forward, this plan will, in turn, inform and be integrated into these and other future planning processes.

#### **Bristol Local Emergency Operations Plan (Mitigation repairs identified)**

- Wellhead contamination during flood events- Construct flood-proof protection
- Low lying areas of north Route 116 & 17 Meehan Rd. (Flooding)
- Low Lying areas of south Route 116, South Main St. and Hewitt Rd. (flooding)
- 8 specific Tier II reporting facilities

#### **Bristol Town Plan (March 2017) Statements which support hazard mitigation.**

- The duty of the Planning Commission lies primarily in long-term mitigation. Ongoing efforts should be made to lessen the impact of natural disasters through improved zoning and other regulations. These include review and establishment of codes and standards, security of hazardous waste facilities, minimum standards for private road construction and drainage, and ensuring that flood hazard regulations and zones are properly written and enforced. Flood Hazard Area Regulations will be updated as a part of the ongoing review and planning for new Zoning Regulations.

#### **Bristol Town Plan (March 2017) Policies & Tasks that support Hazard Mitigation**

- Review and propose ordinances that address mitigation of natural and human-caused disasters, ensuring that controls are in place to lessen as much as possible the results of such occurrences.
- Require that all potential driveway locations be designated and approved prior to any subdivision or building permit.
- Control access to public roads to maintain safe use of those roads
- Provide cost-effective system maintenance and improvements that promote safety, preservation, and hazard mitigation on a priority basis.
- Apply the findings of geomorphic assessment to determination of setback requirements necessary to preserve riparian corridors and control water quality of the New Haven River and Baldwin Creek.
- Develop adequate stream bank buffers and setbacks that recognize the dynamic nature of the New Haven River and ensure additional infrastructure is not added in at-risk areas.
- Continue process of adopting flood erosion hazard risk-reduction strategies into town zoning regulations
- Consider the establishment of Fluvial Erosion Hazard Areas using established geomorphic assessment procedures and, if appropriate, the adoption of zoning regulations to avoid and minimize losses in these areas.

**Addison County Regional Planning Commission Regional Plan (2016) Goals that support Hazard Mitigation**

- Work to restore and maintain stream equilibrium by developing and implementing river corridor plans.
- Reduce flooding and related damages through appropriate mitigation techniques.
- Encourage watershed-based cooperation and educate towns and the general public about water quality and stream dynamics
- Provide communities the support they need to be proactive in reducing flood and erosion hazards by adopting appropriate zoning regulations to limit development in hazardous areas.
- Encourage proper maintenance and sizing of bridges, culverts and other structures to accommodate flow from storm events and to mitigate flood hazards.
- Reduce the loss of life and injury resulting from all hazards.
- Mitigate financial losses incurred by municipal, residential, industrial, agricultural and commercial establishments due to disasters.
- Reduce the damage to public infrastructure resulting from all hazards.
- Recognize the connections between land use, storm-water, road design/ maintenance and the effects from disasters.
- Ensure that mitigation measures are sympathetic to the natural features of the region's rivers, streams and other surface waters; historic resources; character of neighborhoods; and the capacity of the community to implement them.
- Encourage hazard mitigation planning as a part of the Municipal Planning Process.

**State of Vermont Hazard Mitigation Plan (2013) Goals that support Hazard Mitigation**

- Ensure that current and proposed legislation and regulatory policies require effective hazard mitigation practices throughout the State.
- Ensure that grant-related funding processes allow for expedient and effective mitigation actions to take place at the municipal and State level.
- Provide timely and accurate technical assistance that supports hazard mitigation activities to regional and local jurisdictions as well as private sector partners.
- Identify state-level risks and vulnerabilities and protect or harden state infrastructure against hazards.
- Conduct hazard assessments, mapping and data collection projects to increase knowledge about both the hazards facing Vermont and the most effective mitigation actions for minimizing public exposure to hazards.

#### 4. Community Risk Assessment

In Bristol, the interviews conducted in 2010 indicated that the following hazards are considered High or Medium-High in terms of likelihood – Power Outage, Flooding, High Winds, Landslide, Lightning, HazMat Spill, Structure Fire, Wildfire, and Winter Storm/Ice Storm. In terms of Vulnerability, the town rated these hazards as High or Medium-High – Flooding, Landslide, HazMat spill, Structure Fire, and Earthquake. Hazards that rated as likely and to which the town is vulnerable include Flooding, Landslide, HazMat Spill, Structure Fire, and Winter Storm/Ice Storm.

As part of the process for updating the 2012 plan, the hazard mitigation update committee conducted a new Hazard Identification and Risk Assessment (HIRA) to see whether the community would keep the same priorities. The results of that assessment indicated that the highest hazard vulnerabilities are: Flash Flood, Landslide/Rockslide, and Earthquake which scored as State-wide priorities. The next lower scoring vulnerabilities are listed as High Priority and include Wildfire, Invasive Species, HazMat Spill, and Structure Fire. With the exception of Invasives which were not evaluated in 2010, the two HIRAs, 8 years apart, are nearly identical in highlighting risk. For in depth evaluation of the community’s hazards, only the 7 most vulnerable hazards from the 2017 analysis were used. The remaining 13 hazards assessed (see Town of Bristol Risk Assessment) were considered by the committee members to be either low or moderate priority requiring minimal community investment.

Given the actual expenses the community has incurred since 1973, (See Table #1 Below), the committee’s assessment closely mirrors its disaster experience.

<b>Date</b>	<b>Description</b>	<b>Dec. #</b>	<b>County Cost</b>	<b>Bristol</b>
7/6/1973	Storms, Flooding, Landslides	DR397	\$ Unavailable	Unknown
8/5/1976	Storms, High Winds, Flooding	DR518	\$ Unavailable	Unknown
9/6/1977	Drought	EM3053	\$ Unavailable	Unknown
8/4-5/1989	Severe Storms, Flooding	DR840	\$ 31,033	\$5,862.00
4/24-5/26/1993	Flooding, Heavy Rain, Snowfall	DR990	\$ 17,639	Unknown
1/19-2/2/1996	Storms, Flooding	DR1101	\$ 130,529	\$4,506.00
1/6-16/1998	Ice Storms	DR1201	\$ 662,388	\$48,327.00
7/17-8/17/1998	Severe Storms and Flooding	DR1228	\$2,146,484	\$299,713.00
7/14-18/2000	Severe Storms and Flooding	DR1336	\$738,127.27	\$0.00
3/5-7/2001	Snowstorm	EM3167	\$ 138,333.08	\$7,214.67
8/12-9/12/2004	Severe Storms and Flooding	DR1559	\$430,551.00	\$0.00
6/14-17/2008	Severe Storms and Flooding	DR1778	\$1,114,515.70	\$0.00
7/21-8/12/2008	Severe Storms and Flooding	DR1790	\$2,273,481.42	\$31,540.68
4/23-5/9/2011	Severe Storms and Flooding	DR1995	\$384,416.53	\$0.00
8/26-9/2/2011	Hurricane Irene	EM3338	\$ Unavailable	Unknown
8/27-9/2/2011	Tropical Storm Irene	DR4022	\$1,175,911.2	\$44,342.92
5/29/2012	Storm, Tornado & Flooding	DR4066	\$172,847.70	\$0.00
12/9-13/2014	Severe Winter Storm	DR4207	\$184,715.05	\$43,267.17
6/9/2015	Severe Storm/Flooding	DR4232	\$893,310.63	\$0.00
6/29-7/1/2017	Severe Storm/Flooding	DR4330	Unknown	Unknown
10/29-30/2017	Severe Storm/Flooding	DR4356	Unknown	\$3,150.00

**4.1 Risk Prioritization Results**

**Town of Bristol Risk Assessment 12/05/2017**

<b>Hazard</b>	<b>Damage Type</b>	<b>Frequency of Occurrence</b>	<b>Warning Time</b>	<b>Geographic Impacts</b>	<b>Property Damage</b>	<b>Committee Concern</b>	<b>Total Score (Overall Vulnerability)</b>
Flash Flood	Water or Erosion	2	4	2	3	3	14 (4)
Inundation Flooding	Water Damage	2	1	1	1	3	8 (1)
Dam Failure	Water or Erosion	1	1	1	1	1	5 (1)
Ice Jam	Water Damage	1	1	1	1	1	5 (1)
Severe Snow	Closed Roads	4	1	1	1	1	8 (1)
Ice Storm	Power Outages or Fire	4	1	1	1	1	8 (1)
High Winds	Power Outages	2	1	2	3	1	9 (2)
Lightning Strike	Fire or Electronics	1	1	1	1	1	5 (1)
Landslide/ Rockslide	Property or Infrastructure	2	4	1	3	3	13 (4)
Hail	Crop or Property Damage	2	2	3	1	1	9 (2)
Tornado	Power Outage or Structural Damage	1	1	1	1	1	5 (1)

<b>Hazard</b>	<b>Damage Types</b>	<b>Frequency of Occurrence</b>	<b>Warning Time</b>	<b>Geographic Impacts</b>	<b>Property Damage</b>	<b>Committee Concern</b>	<b>Overall Vulnerability</b>
Drought	No Drinking Water/Crop Loss	1	1	4	2	2	10 (2)
Wildfire	Structure Fire	4	4	1	1	2	12 (3)
Earthquake	Property Damage	1	4	4	3	1	13 (4)
Infectious Disease	Health Risks	2	1	2	1	1	7 (1)
Insect-borne Illness	Health Risks	2	1	3	1	2	9 (2)
Invasive Species	Ecological Damage	4	1	3	2	2	12 (3)
Extreme Temperature	Health Risks	2	1	3	2	2	10 (2)
HazMat Spill	Health Risks/ Contamination	2	4	1	3	2	12 (3)
Highway Accident	Human Injury	2	4	1	1	2	10 (2)
Structure Fire	Property Damage, Human Injury	2	4	1	2	3	12 (3)
Hurricane/ Tropical Storm	Property and Infrastructure Damage	1	1	4	3	1	10 (2)

## Hazard Identification and Risk Assessment Parameters

### 1) Frequency of Occurrence: Probability

1= Unlikely	<1% in a given year
2= Occasionally	1%-10% probability in a given year
3= Likely	>10% but <100% in any given year
4= Highly Likely	100% probability in a given year

### 2) Warning Time: Time available to give notice to the majority of the population

1= More than 12 hours
2= 6-12 Hours
3= 3-6 hours
4= <3 hours (minimal)

### 3) Geographic Impacts: How much of the population is expected to be impacted

1= Isolated Locations/neighborhood	<20% of population impacted
2= Moderate impact	>20% and <75% of population impacted
3= Community-wide	>75% of population impacted within community
4= Region-wide	Level 2 & 3 impacts in surrounding communities

### 4) Property Damage: Severity of damages and disruption

1= Negligible	Isolated property damage, minimal disruption to infrastructure
2= Minor	Isolated moderate to severe property damage, brief disruption to infrastructure
3= Moderate	Severe damages at neighborhood level, temporary closure of infrastructure
4= Major	Severe damages town-wide, temporary to long-term closure of infrastructure

### 5) Committee Concern: How Worried are Committee Members

1= Low level of Concern	Not worth spending a lot of time with
2= Moderate Level of concern	Could happen, but mitigation costs are high and benefits are low
3= High Level of Concern	Worth exploring more, developing mitigation projects for
4= Extreme Concerns	Town is generally mitigating as much as they can, really need assistance.

### Vulnerability: Total score of 1+2+3+4+5

1= Low Priority	≤ 8 total score, low cost –no cost mitigation projects only
2= Medium Priority	>8 and ≤10 total score
3= High Priority	>10 and ≤12 total score
4= Regional/State-wide Priority	>12 total score

## 4.2 Hazard Type, Location, Extent and Vulnerability

The Town of Bristol's Hazard Mitigation Planning Committee reviewed 21 hazards in its Hazard Identification and Risk Assessment (12/5/2017). In reviewing these hazards, the committee identified 7 hazards which they would consider High or Regional/Statewide Priorities based on the completed Risk Assessment. These highest priority risk/vulnerabilities are: Flash Flood, Landslide/Rockslide, Earthquake, Wildfire, Invasive Species, Hazardous Materials Spill, Structure Fire. These 7 highest vulnerability hazards have been profiled below in their order of importance based on the 2017 HIRA and updated from their 2012 profiles. Profiles of other hazards from the 2012 plan are included as reference. The remaining 14 hazards scored at a lower 1 or 2 level vulnerability rating either due to the unlikelihood of their occurrence or the limited damages that would be expected from them and were not re-profiled. In reviewing these hazards, Hurricane and Tropical Storm which are identified in the state mitigation plan were not reviewed as their primary effects were profiled under high wind and flooding.

### **Flash Flood** (Vulnerability Score of 4)

- **Location:** Bristol's moderate to steep terrain, when combined with heavy rainfall are conditions conducive to flash flooding throughout town. The New Haven River transitions from a steep fast flowing stream north and east of town to a much lesser gradient just south of the village. It is prone to flash flooding all along this route depending on the amount of rainfall, upstream in Lincoln. The only area of town where inundation flooding may be more common than flash flooding is along the north-south valley of the New Haven River on the flats south of town along Rte. 116. Based on the results of overlaying the FIRM flood maps with the location of the E911 points, thirty-four 911 locations in the town are vulnerable to potential flooding. These locations include 27 single family homes, 3 mobile homes, 2 camps, 1 commercial establishment and 1 utility substation located on Hewett Road. The estimated loss for damage to these properties ranges between \$5-7 million.

Flash flood and related erosive failure risks are associated almost entirely with the instability of the New Haven River along its entire route through town. Flash floods identified as a primary risk in Bristol generally also produce major erosion events as river banks and road bases along the river are destabilized. Infrastructure at risk to erosive damage is generally located along the river between the Lincoln Town line and the A Johnson lumber mill located south of the village area. This stretch of river includes portions of River Road and VT Route 116 east of town, both of which have experienced major damages over the past 20 years.

Geomorphic assessments conducted since the 1998 flood of record have identified multiple locations where infrastructure and private homes are at risk due to channel migration and flooding as shown in the following table:

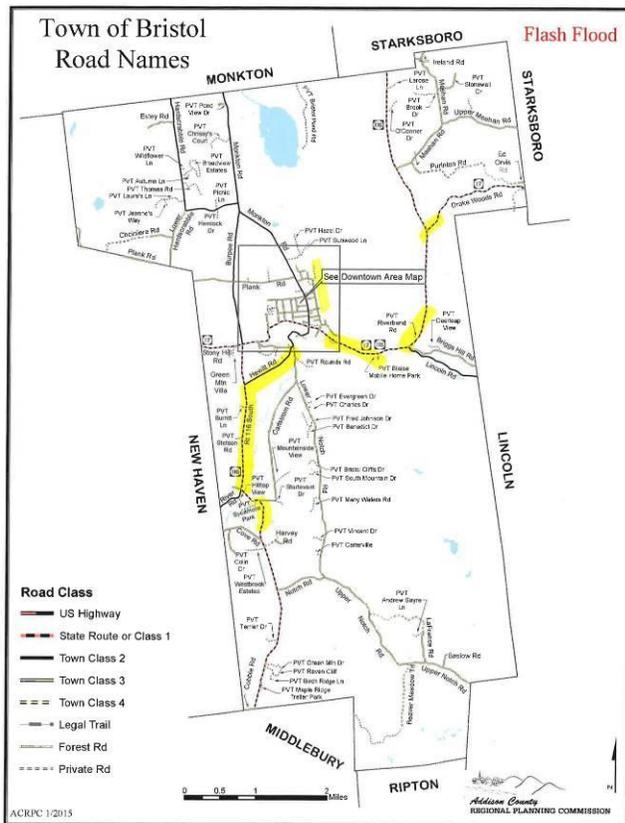
<b>Reach</b>	<b>Town</b>	<b>Structure</b>	<b>Description/Identified Vulnerability</b>
M10	Bristol	Residence, Left Bank	One residence is positioned mid-way along the reach at the southern boundary of the historic channel migration zone and could be subject to future erosion hazards if the channel migrates to the south. (avg. house value \$200,000)
M11	Bristol	Route 116	A series of 90-degree meander bends in the reach has resulted in low-to-moderate flows directed nearly perpendicular to Route 116 armoring along right bank at the upstream extent and mid-reach. (Continued expansion of meanders could adversely affect State Rte. #116 in this area)
M11	Bristol	residence, RB	A residence along right bank has experienced erosion and inundation hazards in past floods, including the recent 2004 flood. (avg. House value \$200,000)
M12, M13	Bristol	Lumber Mill, RB	This mill was constructed on the historic floodplain decades ago and is susceptible to erosion and inundation hazards during flood events. (Total Mill value \$1,758,900)
M14	Bristol	Town Septic System, RB	Erosive action could put the town septic system at risk during high volume flooding events. (replacement cost: \$1,500,000)
M14	Bristol	Residences, Commercial properties along High RB	These structures are potentially susceptible to both mass failure of the West Street bank above (Top-Down) or from erosion of the toe of the slope below. (Total values; \$1,434,000)
M14	Bristol	Mill, LB	Potentially susceptible to mass failure from RB failure of West Street above and from erosion of LB during flood event. (Total Mill value \$695,000)
M14	Bristol	South Street, Notch Road LB	Erosive action could put these town roads at risk during high volume flooding events. (Repair Costs \$350,000)
M15	Bristol	residences, RB	The newly-constructed home and Blaises Trailer Park homes along right bank are at imminent risk from streambank erosion and failures in this actively adjusting reach. Other homes and businesses in the Rockydale development are also at risk. (Total at risk property values \$308,000)
M15	Bristol	Route 17 / 116	Route 17 / 116 is highly susceptible to failures from streambank erosion particularly mid-way along the reach. (State owned highway failed in this area during the 1998 flood event)
M16	Bristol	potential infrastructure	The downstream 750 feet of reach M16 near the confluence with Baldwin Brook is a highly adjusting subreach of river channel subject to braiding flows and lateral channel migration. Future development and placement of infrastructure in this area should be minimized. (Currently largely undeveloped)

- Extent:** Based on National Weather Service’s precipitation records for nearby Burlington, VT, the summer months of June July and August receive the greatest amount of rain. The Bristol Flood Map indicates where flooding risk is highest. Generally, any rains in excess of 2.5” in a 24-hour period are likely to result in some flash flooding. Rains in excess of 3-4” can cause floods in multiple locations with considerable damage to town roads. Single 24-hour storm totals exceeded 6” in both 1927 and 2011, the two “watershed” events which resulted in statewide devastation. Due to its siting near the river, there is also a possibility of contamination to the spring that supports the water distribution system in the village.

- **Previous Occurrences:**

The committee identified several storms in Bristol where damage was great enough to warrant federal assistance. In late June of 1998, Bristol was the recipient of a chain of successive rainstorms. Once the ground was saturated, the remainder flowed into streams in torrents. The nearby Town of Lincoln was entirely cut off from the rest of the state and Bristol also had major damages. The damage resulted in disaster declaration DR1228 which caused over \$2 million in damages in Addison County alone. This same storm flooded several mobile homes that had slowly crept into a floodplain and resulted in one of the first major mitigation buyouts in the state.

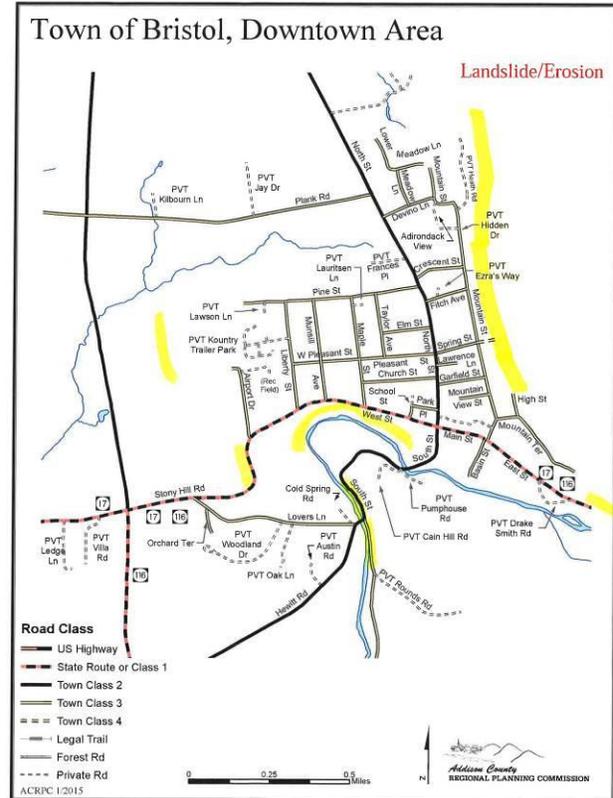
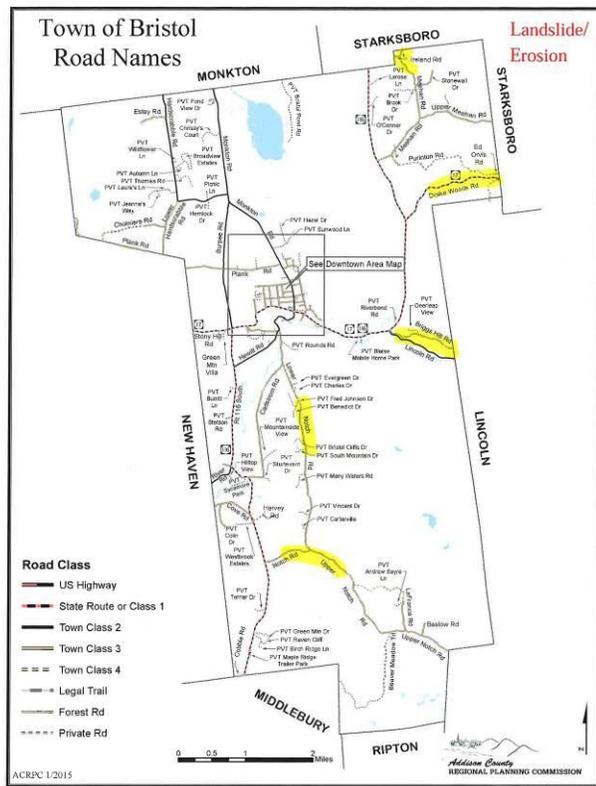
In 2004, a stalled summer storm dropped large amounts of rain onto South Mountain and Deer Leap causing flooding to residences and businesses in the downtown area as well as inflicting damage to town and state highways. The 2004 storm caused over \$70,000 in damage to the Town of Bristol, much of which was reimbursed through State and Federal sources.



In 2008 a single storm concentrated its rain on the towns of Bristol and Nearby New Haven, causing localized flash flooding resulting in DR1790. 2011 saw another banner year for flooding/flash flooding in Bristol. Tropical Storm Irene DR-4022 alone contributed to damages of over \$44,000 in town. There have been no flash flooding events large enough to warrant federal assistance in Bristol since 2011.

- **Future Probability:** Whether the current climate change trend is the direct result of human activity or due to other circumstances, it is impossible to not see it happening. While FEMA has only existed for the past half century, the increase in disaster declarations in Vermont has been noticeable. As one committee member identified, we had five, 700yr storms in a 10yr period. Observing and predicting a rising trend in larger and more severe storms is not a stretch. Following an extended period of calmer/drier weather from the 1950s through the 1980s, this current trend is even more obvious and it is likely to continue on into the future.
- **Vulnerability Summary:** The Town of Bristol’s topography and location along the western slopes of the Green Mountains practically guarantees the likelihood of flash flooding events. The most damages to date have occurred to the town highway infrastructure in the form of washouts and culvert failures. Fortunately, a progressive road crew monitors trends and proactively installs culverts and repairs ditching in anticipation of ever worsening

rainfall/flooding events. The Bristol hazard mitigation committee rightly identified flash flooding as the highest vulnerability to the community. Scoring a risk rating of 14, the vulnerability to flash flooding would be considered of regional concern which shows as a similar vulnerability in much of the rest of Vermont. Fortunately, the community understands this vulnerability and supports the road crew's efforts to prepare against future risk.



**Landslide/Rockslide Hazards-** (Vulnerability Score of 4)

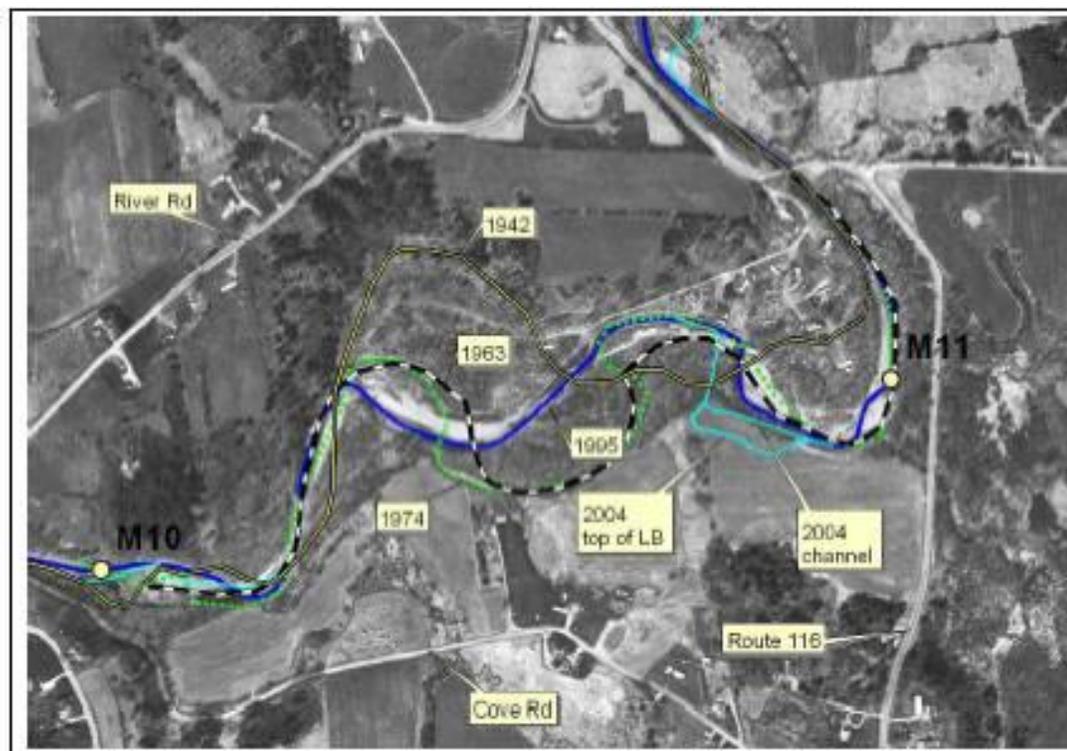
- **Location:** Landslide/Rockslide hazards occur in the Town of Bristol as the result of glacial deposits and how both roads and rivers interact with these deposits. The Town is located at the transition between the steep sloped Green Mountains and the flatter Champlain Valley. This transition area contains large gravel deposits which are easily erodible and subject to mass failure. The more densely settled village portion of the Town of Bristol is located on the surface of one such deposit.

A 2016 study of landslide potential conducted by the Vermont Geological Survey, indicates 6 major areas where there is a moderate to high risk. Four of these areas coincide with the fluvial erosion risk encountered along streams flowing out of the higher elevations in town. Three of these streams are also bordered by town roads, Drake Woods Rd. (Rte. 17), Lincoln Rd., and the Lower Notch Rd., all known locally as areas at risk. An additional at-risk area follows along West St (Rte. 116) east of town below Deer Leap which was washed away by the force of the river in 1998. In each of these examples the risks also include land sliding into the road from above. In the village of Bristol, perched on top of an alluvial fan, landslide/erosion risks associated with nearby river can equally be the result of waterlogged soils breaking away from the escarpment and erosion from the river below.

The remaining two moderate to high risk areas exist at the outer edges of the village to the south and west. The western risk area is located behind the high school where gravel mining operations have helped to create a steep gravel bank which is at risk for a failure. The last area follows along south of West Street behind the Village Cree-Mee stand and several houses. Both of these are of concern as the built environment is currently perched at the top of what could be a 90ft drop should there be a mass failure.

- **Extent:** While erosion and rockslides are guaranteed along steep streams, the extent of a channel's lateral movement due to erosion is relatively unpredictable. In one example, for reach M10 of the New Haven River at Sycamore Park, historic aerial photographs dated 1942, 1963, and 1974 indicated 60-year channel migration zones with widths up to 950 feet. (see aerial photo depiction)

The most recent large-scale channel migration event in this area occurred as a result of 1998 flooding. Multiple mobile homes had been placed on floodplain in the Sycamore Park area before floodplains were effectively managed. During this flood event, the river channel migrated and flooded the entire area resulting in multiple rescues. These homes became some of the first FEMA buyouts in the state.



*Historic Channel Migration on Reach M10 of the New Haven River in South Bristol*

Failure of either of the high gravel banks at the edge of the village could result in losses of up to 30-50 feet at the top of the bank. Unfortunately, the high school, several homes and businesses, and portions of West St (Rtes. 116 & 17) are located within possible risk locations and would be lost should the gravel bank fail.

- **Previous occurrences:** Each flood event of the past 20 years has resulted in erosion of river banks, some more than others. As previously identified, the landmark flooding of 1998 was the worst in recent memory. Bristol's location at the transition of the New Haven River from steep topography to gradual slope has resulted in 4 disaster declarations in the past 20 years. Each of these, while considered mainly flood events, have also had a component of erosion associated with them. DR1228 in 1998, DR1559 in 2004, DR1790 in 2008 and DR4022 in 2011 have each impacted the community.

A history of landslide prior to 1998 was not available but certain locations in town show clear historic landslide activity. Deer Leap along Route 116 east of town shows what is likely a continuing slide. Researchers also note scars from past mass failures on the slope that follows West St.

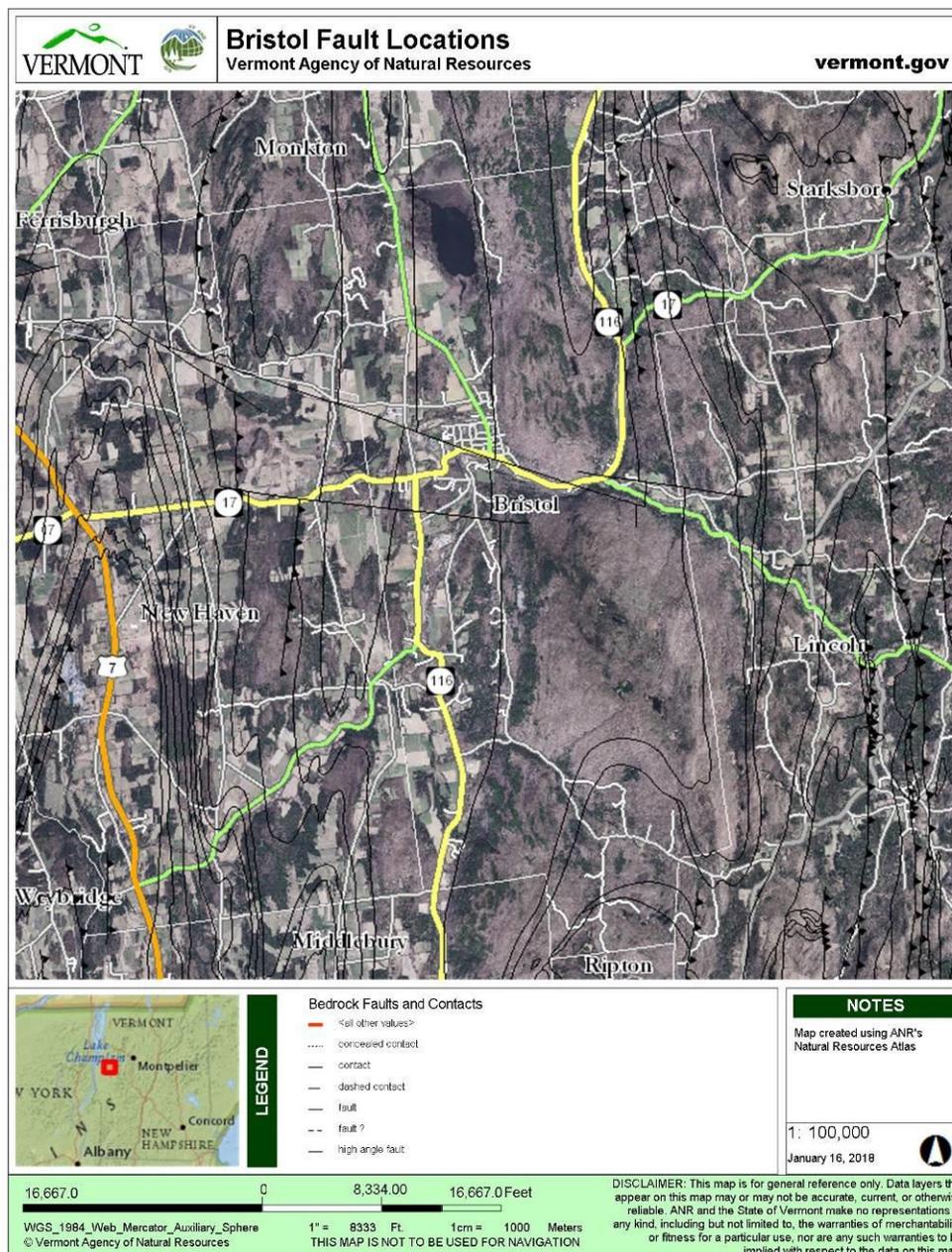
- **Future probability:** The inherent instability associated with erosion of gravel deposits is and will be of great concern to the Town of Bristol into the future. Actions of water courses, especially the New Haven River, will likely continue to move them laterally, putting riverside homes and infrastructure at risk. Additionally, the value of the underlying gravel makes it attractive to continue removing this resource by landowners. When gravel removal excavates the base of these gravel deposits, the gravel bank, itself, becomes potentially unstable. Increases in the value of gravel and the frequency of severe rain events will both point to greater risks in the future.

Adding to the naturally occurring erosion along the toe of the slope south of West St. are multiple outflows from storm drainage. While the steep bank, on one hand, is a great place to deposit stormwaters, major outflows such as those associated with heavy rains may be serving to slowly erode the bank and making it more susceptible to mass failure.

- **Vulnerability summary:** Bristol has existed in its current location for over 200 years and during that period, has experienced the effects of landslide and erosion events. It is reasonable to expect that trend will continue, especially with predicted increases in storm severity. This trend would continue whether the area had been settled or not. The community's vulnerability to this hazard continues to be of high concern to the town. The 12/5/17 hazard assessment indicated that committee members are concerned and feel there is considerable value in pursuing mitigation measures which address this hazard. With an overall vulnerability score of 13, this hazard should be considered to be of statewide importance.
- **Earthquake:** (Vulnerability Score of 4)  
**Location:** Surprising as it is to some, the entire State of Vermont is classified as an area with "moderate" seismic activity. This can be compared to the west coast of the U.S., which is classified as "very high" and the north-central states classified as "very low." Areas of particular concern within Bristol mirror the locations of landslide potential as this type of disturbance could result in failures. The other area of concern would be in the village business district made up of brick buildings which were likely not built to today's earthquake standards.

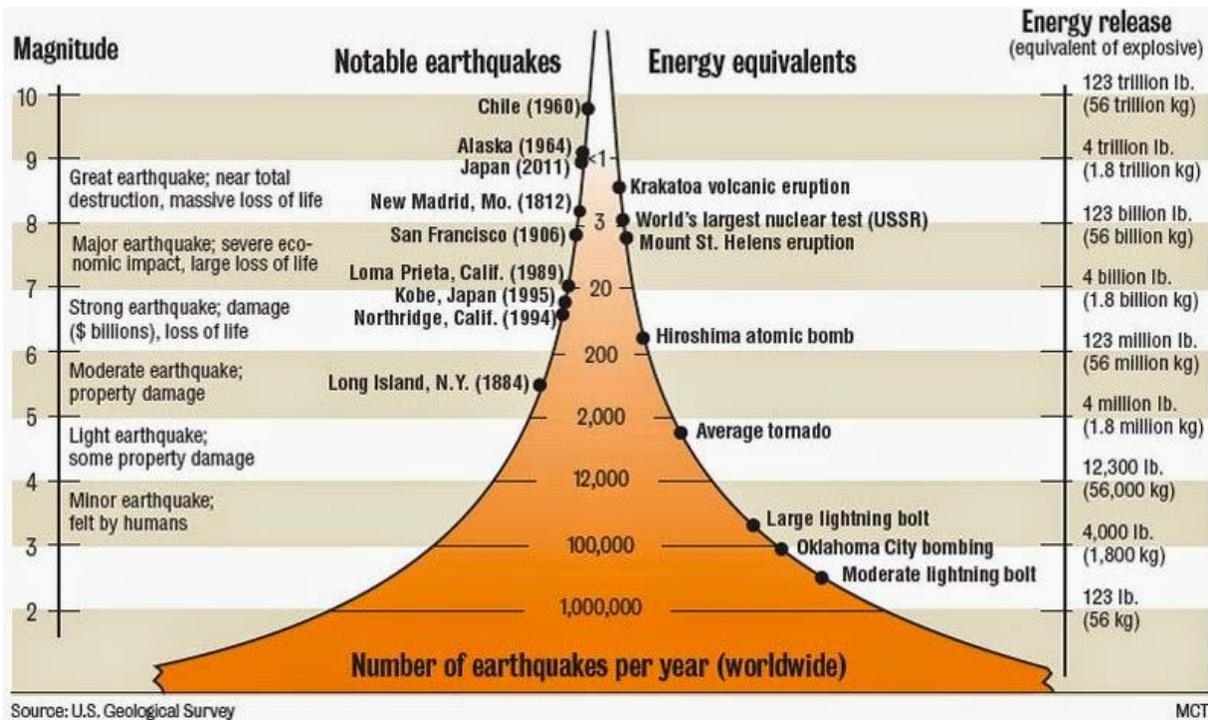
**Extent:** Based on information provided by the Vermont Geological Survey, Department of Environmental Conservation, Agency of Natural Resources, HAZUS outputs for the region in 2005 are summarized as follows:

The Middlebury Once-in-500-year earthquake (5.7 magnitude) could cause significant damage in Addison County. The Goodnow, NY Once-in-500-year earthquake (6.6 magnitude) could cause shaking just above the lower limit for building damage. The Montreal, Quebec (6.8 magnitude) and the Tamworth, NH (6.2 magnitude) Once-in-500-year earthquakes probably would not cause damage in Addison County. Only the loss data from the Middlebury and Goodnow events are shown below:



*Middlebury Scenario:*

- Building damage – HAZUS estimates that over 1600 buildings will receive at least moderate damage. This is a little more than 13% of the total number of buildings in the county. (13% of buildings in Bristol would be 187). HAZUS also estimates that all essential facilities (hospital, schools, police stations and fire stations will receive at least moderate damage. 13 families would be predicted to be displaced from their homes and will need temporary shelter in Bristol.
- Transportation & utility systems – HAZUS estimates minimal disruption of the transportation and utility systems. However, over 9000 households in the region are expected to be without electrical power for up to three days.
- Casualties – Minimal casualties are also expected with less than twenty-five requiring medical attention and less than three needing hospitalization in the region.
- Economic loss – Direct building losses are estimated at > \$83 million and business interruption losses are expected to be as much as \$105 million. HAZUS estimates that although there was minimal damage to the transportation system the loss would still be close to \$15 million. Approximately \$4.4 million would be needed to repair damaged communications systems.



**Earthquake Energy Equivalents**

*Goodnow Scenario:*

- Building damage – HAZUS estimates that over 600 buildings will receive at least moderate damage. This is a little more than 5% of the total number of buildings in the county. (5% of buildings in Bristol would be 72) HAZUS also estimate that all essential facilities (hospital, schools, police stations and fire stations will receive at least moderate damage. 6-7 families are predicted to be displaced from their homes and will need temporary shelter.
- Transportation & utility systems – HAZUS estimates minimal disruption of the transportation and utility systems. However, over 4000 households are expected to be without electrical power for up to three days in the region.
- Casualties – Minimal casualties are also expected with less than six requiring medical attention and only one needing hospitalization.
- Economic loss – Direct building losses are estimated at > \$17 million and business interruption losses are expected to be as much as \$24 million. HAZUS estimates that although there was minimal damage to the transportation system the loss would still be close to \$3.6 million. Approximately \$0.9 million would be needed to repair damaged communications systems.

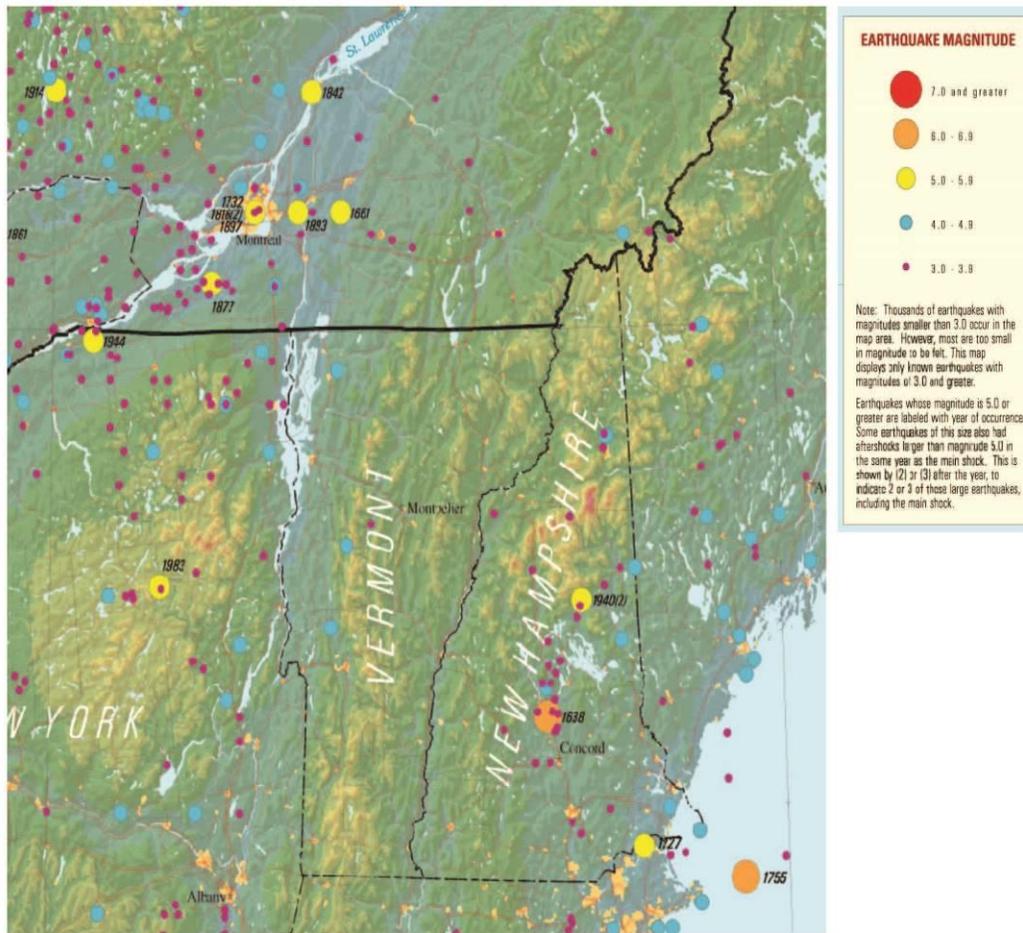
**Past Occurrences:** Sixty-four known or possible earthquakes have been centered in Vermont since 1843 (*Ebel et al. 1995*). The two strongest recorded quakes measured in Vermont were of a magnitude 4.1 on the Richter scale. One was centered in Swanton and occurred on July 6, 1943, and the second occurred in 1962 in nearby Middlebury. The Swanton quake caused little damage, but the Middlebury quake did result in broken windows, cracked plaster and falling objects (*VEM, 1995*).

Earthquakes centered outside the state have also occasionally been felt in Vermont. Twin quakes of 5.5 occurred in New Hampshire in 1940. In 1988, an earthquake with a magnitude 6.2 on the Richter scale took place in Saguenay, Quebec and caused shaking in the northern two thirds of Vermont (*Ebel et al. 1995*).

In May 2001 and again in the summer of 2010, earthquakes in the 5.0-5.5 range have been felt in Bristol with epicenters in New York and Quebec respectively.

**Future probability:** The USGS database shows there is a 2.26% probability of an earthquake measuring 5.0 or above within 31 miles of the Town of Bristol in the next 50 years.

**Vulnerability summary:** The Bristol Hazard Mitigation Committee scored Earthquake hazard a risk score of 13 resulting in a vulnerability score of 4. With this community vulnerability score, earthquakes would be considered REGIONAL/STATE-WIDE PRIORITY based on a low probability of a significant event in any given year but with a high overall impact to infrastructure should a significant event occur. Residents of the community do not generally consider earthquake to be a high enough risk to require preparing for one. This results in little or no preparedness should an earthquake occur.



### Regional Historical Earthquake Records

**Wildfire** – (Vulnerability Score of 3)

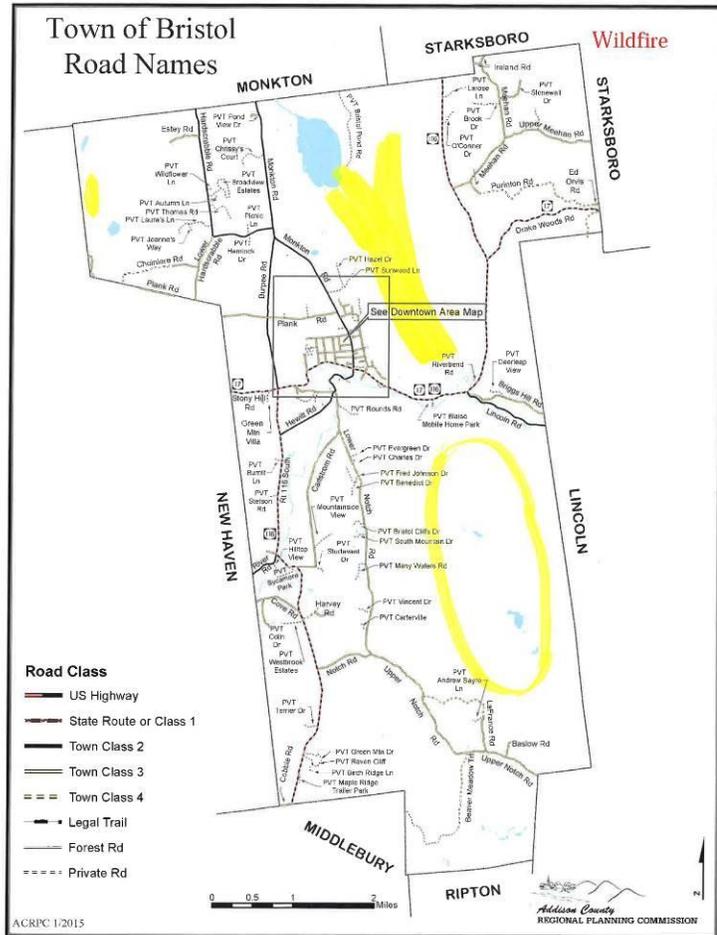
**Location:** Generally, two different wildfire fuels can be found within the boundaries of the Town of Bristol. Forested areas of town, 3,750 Acres of which is contained within the Bristol Cliffs Wilderness Area are characterized by fuels found in the duff layer (leaves, fallen branches, etc.). Deer Leap, seems to attract lightning strikes on a regular basis and is a common wildfire response location for the Bristol Fire Dept. The agricultural portions of Bristol generally have a fuel base of dried grasses and shrubs. The entire community is at risk of wildfire during dry periods. Forested areas and open fields are both most at risk each year in the spring following snow melt and before spring growth has started.

**Extent:** Springtime burning of open fields has been a longstanding historic practice thought to improve field fertility. Every few years, these get out of control due to either poor planning or unexpected winds. Generally, this type of wildfire is limited to a few acres and poses limited threats to structures lying close to the fuel source in the path of the fire. Fires in the forest tend to be smaller, usually limited to under an acre in size. These are generally mitigated by hardwood tree species and cover on the forest floor.

Based on a 2012 study of wildfire in Vermont between 1905 and 2011, the size of wildfires has decreased to less than 2 acres per fire on average. Prior to 1930, however, fire size was considerably larger with the banner year of 1908 recording 9 fires of over 1,000 Acres and two of those in the 5,000 Acre range.

**Previous Occurrences:**

The State Agency of Natural Resources keeps track of fires in the entire state. Most wildfires are never reported to State forestry officials and are therefore not shown in their annual reports. Based on the period between 2007 and 2015 those reported averaged just under 196 fires per year with 2015 being the outlier with 665 fires. Fire reports for the 2017 fire season were well below normal and the lowest since 2011.



**Vermont Wildfire Statistics**

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
# Fires	81	115	95	88	28	95	126	470	665	?	51
# Acres	180	138	164	84	38	359	274	?	?	?	49
Ave. Size	2.22	1.20	1.73	.95	1.67	3.77	2.17	?	?	?	1.04

**Addison County Wildfire Statistics**

Year	2010	2011	2012	2013	2014	2015
# Fires	1	0	19	7	30	36
# Acres	0.5	0	226.51	8.85	?	?

Over the past 50 years, forests have been closed to recreation state-wide 3 times due to extreme fire conditions. While these incidents have not resulted in large-scale damage in the Town of Bristol, the conditions existed for widespread forest fires. From 2010- 2014 there were 13 total wildland fires reported in the town of Bristol. In 2017 lightning caused a 4-acre fire on steep terrain of Hogback Mountain above Bristol that required two days to extinguish. The Bristol Fire Department was commended for their use of ICS and their efficient, organized and well-documented management of the incident (Vermont Wildland Fire Program Annual Report 2017).

**Future Probability:** The combinations of factors which lead to widespread wildfires usually coincide with extended drought conditions. Periodic droughts occur every 30-40 years in Vermont and based on observed patterns, would be next expected in the decade between 2020 and 2030. During this period, additional risk for wildfire would exist and an increase in wildfires would also be expected.

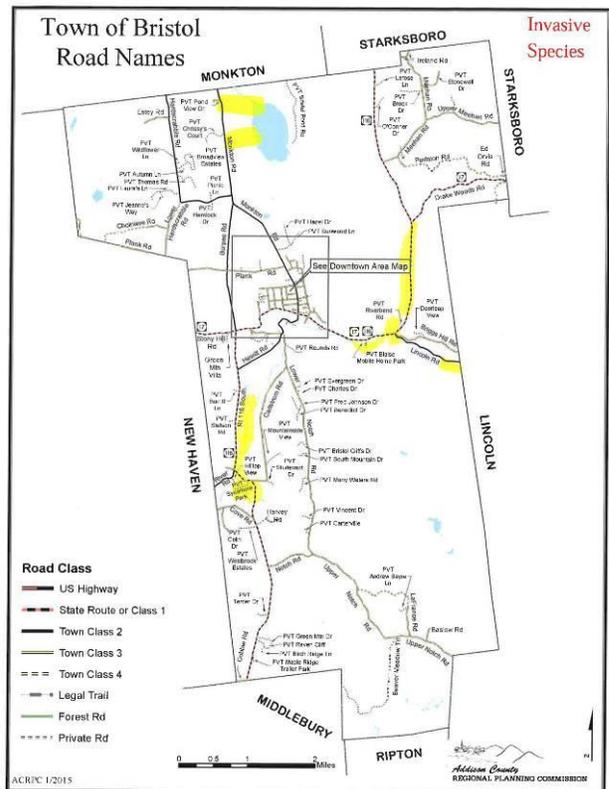
**Vulnerability Summary:** Located next the Green Mountain National Forest and with a historically active forest products industry, much of the Town of Bristol is still forested. Much of the downtown, as well as many of the structures along the Rte. 116 and Lower Notch Rd corridors, are located within the wildland-urban “interface” (areas with housing in the vicinity of contiguous wildland vegetation) and “intermix” (areas where housing and vegetation intermingle). This increased risk for wildfire due to proximity is moderated by the so-called “Teflon Forest” conditions of the Northeastern US. While moisture levels generally tend to be higher than in the fire-plagued western forests, scattered periods of drought can increase fire danger levels to *Extreme* particularly during spring and fall seasons when dry leaves cover much of the forest floor.

It is becoming increasingly important that residences and essential facilities be constructed with an eye toward wildfire resistance by establishing no-burn zones around structures and by providing suitable water supplies for fire-fighting to more remote residences. With a community vulnerability score of 3, wildfire is considered a **HIGH PRIORITY** influenced by a historically high likelihood of occurrence and a low overall impact to the community.

**Invasive Species** (Vulnerability Score of 3)

**Location:** Invasive species are becoming a widespread problem throughout Bristol and the rest of Vermont. Damages range from skin blistering and scarring in the case of poison parsnip, to the devastating effect the Asian Longhorn Beetle (ALB) or Emerald Ash Borer (EAB) could have on Bristol’s forest products industry.

The Bristol hazard mitigation committee pointed out that much of the spread of unwanted invasive plants is along roadsides and has entered the town via state highways. Flying insect invasives will be far more widespread due to the mobility of these pests and could strike anywhere in the community where their hosts live (Ash for Emerald Ash Borer and Maple for Asian Longhorned Beetle). From small woodlots to large-tract forests, all treed land is susceptible.



**Extent:** Widespread establishment of Wild or Poison Parsnip (*Pastinaca sativa*) along roadsides and/or open fields can effectively remove those areas for recreational purposes through much of the summer months. Once contracted, many are quite hesitant to venture far from cleared paths and given the non-developed nature of much of Vermont's attraction for tourists, could heavily impact future visits.

Ash trees are the source for hardwood that can bend and withstand considerable stress. Historically, ash has been the source for axe handles, hockey sticks and baseball bats. It is a component of timber harvesting in Vermont and provides that industry with a moneymaking product. Spread of the Emerald Ash Borer (*Agrilus planipennis*) (EAB) into Vermont's forests would have a significant impact on timber values.

A third invasive of immediate concern to Vermont is the Asian Longhorned Beetle (*Anoplophora glabripennis*) (ALB) which attacks and kills maple trees. Vermont is famous for its maple syrup and is the largest producer of maple products in the United States. Widespread loss of maple trees could result in the collapse of this iconic industry and a severe impact to the state's economy.

Other invasives include Purple Loosestrife, Japanese Knotweed, Rock Snot and many others which all have a detrimental impact on the state's native populations and the state's ecological balance.

**Previous Occurrences:** The most noticeable impact of invasives in Vermont began when a load of elm lumber was imported into this country from Europe in the early 1900s. Embedded in this load were spores of what we now call Dutch elm disease. At the time, elm was the most popular street tree in the US due to its hardiness in many types of conditions. The loss of these trees which were liberally planted as shade trees in many village greens and along roadsides had an extreme impact both aesthetically and due to the loss of shade, in the overall use of electricity in summer months. Now, elm is uncommon in most of the north east and the disease continues to spread westward.

Other examples include the importation of gypsy moth in an attempt to create locally grown silk, the spread of zebra mussels which threaten water intakes on infested water bodies and the unintentional importation of the Norway Rat in ships holds with early colonists. Each of these has had its own impacts on the economy and ecological stability of the US and Vermont.

**Future Probability:** With an increasing global economy, new and unknown invasives are sure to be imported from other countries in the future. In recognition of the inevitable spread of EAB and ALB into Vermont, trapping is being conducted by foresters and biologists along the border areas of Vermont. ALB is expected in Vermont within the next few years and damage caused by their spread is already anticipated by the Vermont Agency of Natural Resources. EAB was reported in the State of Vermont for the first time in early 2018 and State plans have been put into action.

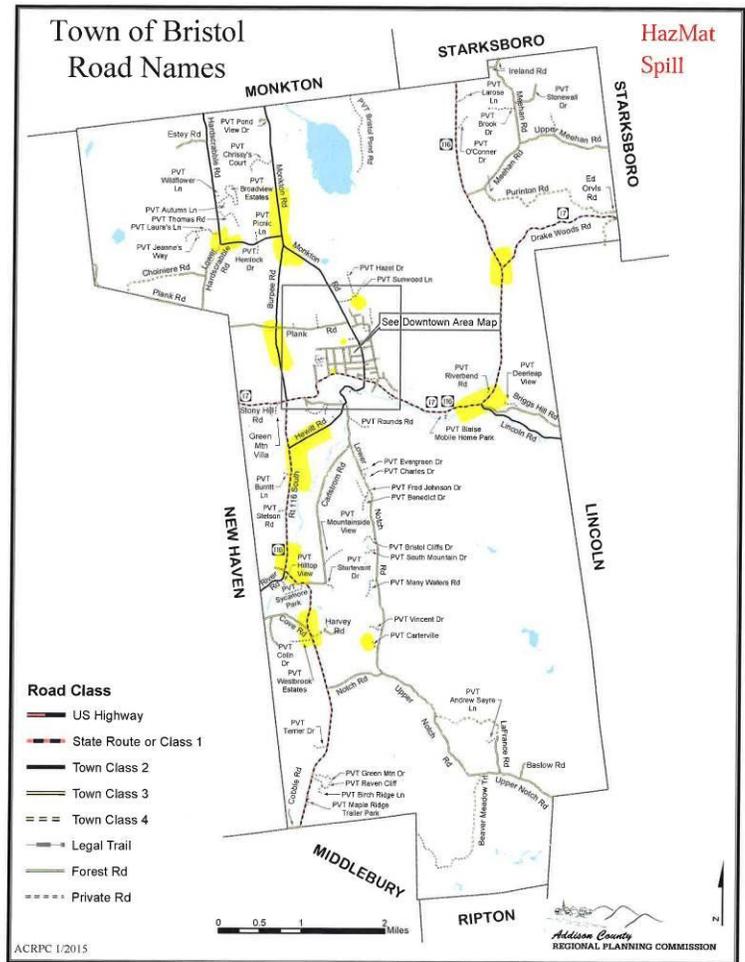
**Vulnerability Summary:** Bristol is extremely vulnerable to the economic impacts of invasives and is limited in its ability to combat their spread. The community does what it can but is highly dependent on State and Federal agencies to slow down the spread of invasives. With a local economy highly focused on the forests and forest products, the community is highly at risk. The hazard mitigation committee scored Invasives at its second highest risk rating with a score of 12 and a vulnerability rating of 3. This reflects the HIGH PRIORITY that should be given to these hazards to the community.

- **Hazardous Materials Spill** –

**Location:** There are 7 sites in town that have sufficient types and/or quantities of hazardous materials to require reporting and have reported via Tier II submissions. An additional 7 locations have been identified by members of the local LEPC as likely needing to report via Tier II.

In addition, two State highways pass through town (Rtes. 17 & 116). Route 116 is a known bypass route by those wishing to enter Chittenden County's Eastern side, avoiding Rte. 7. Contrastingly Rte. 17 is a major east-west route through Vermont which connects New York State to Rte. 100, the north/south route located in the center of the state. Rte. 17, in particular is occasionally used as a shortcut through the Green Mountains in spite of "No Trucks or Buses" warnings at either end.

**Extent:** Based on the recommended Public Safety evacuation distance from the 2016 Emergency Response Guidebook, a 1000-foot circle was drawn around reporting Tier II sites. Structures inside the circle would be those that may need to be evacuated if an incident occurred at one of those sites. Of the 1439 buildings (E911 locations) in Bristol, there are 121 (residences, public facilities and commercial facilities) or 8.4% of the structures in town that might be impacted by a release at one of these facilities.



The Addison County Hazardous Materials Commodity Flow Study was last updated during the summer of 2010. At the sampling site in Bristol at the corner of Rte. 116 and Rte. 17,

3.5% of trucks were recorded as carrying a hazardous material. Of these trucks, 2/3 were transporting propane and those recorded were relatively small volumes. Results of this sampling would indicate that Bristol's transportation risk would be relatively small but a more thorough sampling would need to be undertaken before a solid conclusion could be arrived at.

**Past Occurrences:** Bristol has been fortunate to have had limited exposure to major hazardous materials spills. Generally, minor spills due to overfilling fuel tanks are the most common occurrence. Though major hazmat incidents have been rare in the Town of Bristol, there have been incidents in neighboring communities including a train derailment involving significant quantities of gasoline.

**Future Probability:** As additional housing and commercial space is created along state highways, the risk associated with transportation of hazardous materials increases as well. In addition, new commercial and/or industrial uses often result in new hazmat storage (Tier II) locations. In theory, Vermont's commitment to reach a goal of 90% renewables by 2050 should reduce the frequency of hazmat transport on the town's roads.

**Vulnerability Summary:** In general, Bristol's exposure to damages caused by a hazardous material spill closely mirrors other Vermont communities. Nearly 10% of structures in town could be impacted by a facility release of hazardous materials, and hazardous materials are frequently transported along Rte. 116 and Rte. 17 through town. Unfortunately, trained and equipped response teams are located at least 45 minutes away in Chittenden County and clean-up contractors are not even that close. The committee scored this hazard at 3 HIGH PRIORITY which reflects these realities. Though Bristol maintains the training of its fire department at the required levels, the lack of nearby resources for a large spill are outside of the capacity of any department in the region. Committee concerns for the impacts a spill and subsequent fire and/or environmental issues largely and rightly drives this level of concern.

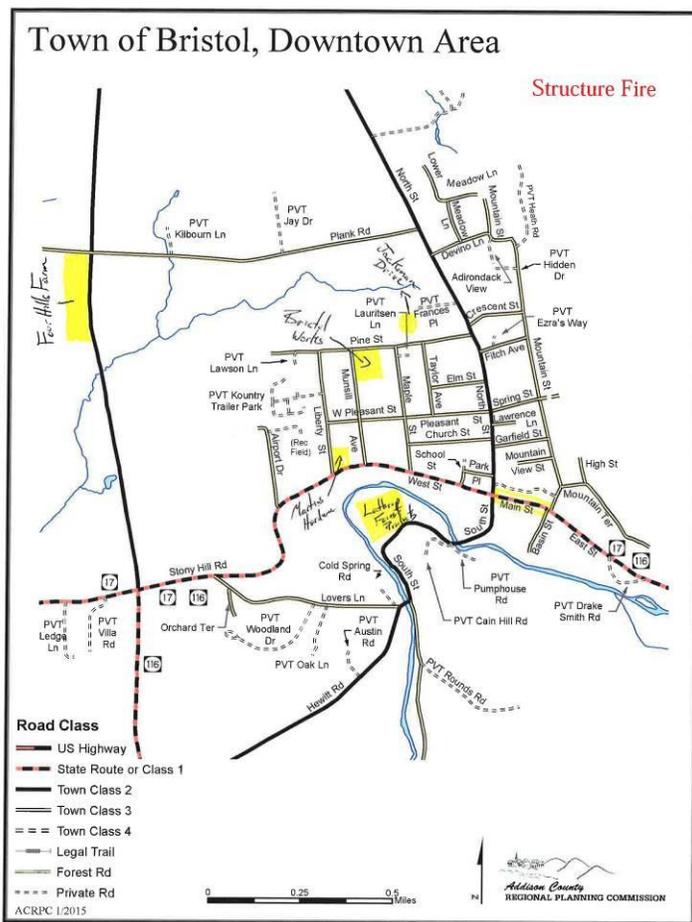
- **Structure Fire**

**Location:** The Town of Bristol's greatest risk for large-scale fire is located within the "downtown" commercial blocks. These interconnected structures were built in the late 1800s and early 1900s, prior to modern building techniques. As such, they were built without sprinkler systems in place and without the benefit of modern fire preventative construction between buildings. Outside of the village, structures most at risk for fire are those which lie furthest from reliable water sources and/or have been built within the urban/wildfire interface.

**Extent:** Residential structures outside of the village of Bristol can catch fire from a myriad of sources including wood stoves, electrical failure and lightning among others. If the resident is not at home residential fires in the more remote areas of town could burn for a while before being discovered potentially resulting in a complete loss. Structures located in the interconnected business blocks can also be ignited by many different sources but the potential impacts to the community are far worse than a single residence. An uncontrolled fire started in one of these buildings has the possibility of spreading along the block. The destruction of this core of the business district would have a devastating impact to the community and its economic base.

**Past Occurrences:** Bristol witnessed major fires in the business blocks in 1872, 1898, 1914 and 1924. In each case the interconnected wooden structures were destroyed despite the heroic efforts of citizens and later the fire department. Reconstruction following these disastrous fires slowly evolved into brick structures which are considerably more fire resistant.

Similar patterns of fire/rebuild/fire/rebuild are seen in all nearby communities that have “downtowns”. Middlebury experienced its worst fires in 1875 and again in 1891 when an entire business block as well as the town’s only bridge burned. The City of Vergennes has a similar history though the most recent fires happened in the 1950s



**Future Probability:** State codes for commercial construction have fire protection embedded within the standards. In addition, the village’s downtown blocks are being renovated and made more fire-resistant by their new owners as these properties change hands. Bristol’s downtown blocks, however, are still the buildings of highest risk and would have the highest impact on the community as a whole. Fortunately, the community is very supportive of the fire department as evidenced by a new firehouse constructed in 2016. This type of support serves to encourage new membership and keeps the firefighting ability of the town in good shape.

**Vulnerability Summary:** Overall Bristol’s vulnerability to a major fire in its downtown is moderately high. The downtown

blocks with adjoining ordinary construction are at highest risk for catastrophic fire. That vulnerability is moderated by the community’s well trained and equipped fire department with long-standing mutual aid agreements with other county departments. In spite of the fire department’s capabilities, the Bristol hazard mitigation committee still scored structure fire as a high priority hazard with the limited warning time for a fire impacting the overall score.

**Hazard assessments from Bristol's 2012 hazard mitigation plan  
(reflecting changes to community concerns)**

- **Dam Failure** – The Town of Bristol is home to four dams which were identified in the 2008 State DEC Dam survey. All of these are relatively small structures whose failure would result in extremely limited flooding should they fail at any time.

The Lake Winona/Bristol Pond dam is the most obvious and serves to increase the elevation of Bristol Pond 2-3 feet above natural elevations.

On the former Vergennes Waterworks Property in northwest Bristol, two earthen dams have served to increase the water holding capacity of these former city water supplies. Since the development of the Vergennes-Panton Lake Champlain water source, these water supply ponds have been discontinued and their water levels have been lowered so as to limit downstream effects of failure.

The final dam in Bristol serves to create a small 2-3-acre pond off North Street. In each case, if a dam were to fail, no existing homes would be at risk and town highway infrastructure would experience temporary inundation.

Historical water power sources at Bartlett Falls and along the river at A Johnson's and Lathrop's Sawmills have not been used once mills were repowered with electricity in the early 20<sup>th</sup> century. Associated check dams failed years ago and were never rebuilt.

The community vulnerability to Dam Failure would be considered LOW based on the low likelihood (10% probability in the next year) of occurrence and the Low (<5% of the community) impacted

- **Drought** – Local knowledge indicates dry spells are periodic in nature and would be considered severe about every 10 years on average, and significant every 30-40 years. Generally, risks associated with these droughts include drying up of shallow wells and reduced productivity of agricultural crops.

An extended drought period in the 1960s saw the development of several community-owned water systems in communities along Lake Champlain. Similar conditions could result in new calls for expansion/extension of the public water supply in Bristol. Most recently a dry period in 2000 saw a few residents without water for several weeks which was finally relieved by fall rains. Direct costs of drought conditions tend to be borne by individual residents and therefore are difficult to track accurately. No direct costs to the town have been recorded in the past 25 years.

The community vulnerability to drought would be considered MODERATE based on a limited overall impact to the community with a relatively common period of occurrence.

- **Widespread Power Failure** – Based on local knowledge, widespread power outages are a common yet low impact event throughout the Town of Bristol. Possible during all seasons of the year, the lack of power becomes particularly an issue during winter as it often translates into lack of heat as well.

Widespread outages have been common through much of the past 50 years with limited overall impact to the community. However, extended outages during winter months coupled with extreme cold have periodically resulted in more extensive damage associated with freezing pipes particularly in private residences.

In 1998 a severe ice storm hit much of northern Vermont however much of the village area of Town of Bristol was spared due to microclimate differences associated with its elevation. Power outages continued for several days in some areas as remote power lines were accessed by off-road vehicles. In spite of being spared much of the destruction, the Town of Bristol still incurred over \$48,000 in damages. Subsequent mitigation activities by power companies have re-routed many of those remote lines onto town highway rights of way and an increased pruning effort has reduced the impact of a similar event would it happen today.

The community vulnerability to Widespread Power Outage would be considered HIGH based on a high likelihood of occurrence (near 100% possibility within the next year) and a moderate (<75%) geographic impact within the town. Due to existing preparedness levels within Bristol, these factors alone do not effectively measure actual impact. Actual vulnerability could be considered LOW based on limited unmitigated impacts to infrastructure, health, and environment.

- **High Winds** – High winds come in many forms in Addison County and are included in damages associated with Hurricane, Tornado and Hail Storms. In addition to these specific events, high winds are often associated with collision of major weather fronts when high pressure and low-pressure systems create extreme gradients between them. Locally developing thunderstorms due to convective forces in the atmosphere can also generate high winds, such as those experienced in parts of eastern Vermont on July 6, 1999, downing hundreds of large trees in a few minutes.

The State can also experience tornadoes, which are capable of damaging or destroying structures, downing trees and power lines and creating injuries and death from collapsing buildings and flying objects. Tornadoes are less common than hail storms and high winds, but have occurred throughout Vermont. In fact, 34 tornadoes were recorded in the State between 1950 and 1999, injuring 10 people and causing over \$8.4 million dollars in estimated property damage. Nearly all of these occurred from May through August and most of these occurred in the afternoon.

Remnants of Hurricanes striking New England are a rare but possible occurrence in all of Vermont and Bristol has not been spared. Hurricanes in 1938 and 1950 are still remembered by older residents when barns collapsed and animals needed to be rescued or put down due to injuries.

While Bristol has managed to avoid many of the larger events, localized strong winds have resulted in occasional loss of roofs on lesser maintained structures. With its location at the intersection of the Champlain Valley and the Green Mountains winds from the SSW tend to be compressed against the mountains causing locally higher winds than are experienced in other areas of the region. Fortunately for Bristol, these same geographic conditions tend to break up potential tornadic wind patterns.

The community vulnerability to a High Wind incident is MODERATE based on the moderately likely (25% chance) occurrence of an incident with the potential for limited (10% to <25% of the community including homes and infrastructure) impact.

- **Lightning** – Severe storms which include lightning along with wind and rain events are a common occurrence in Bristol during summer months. Lightning strikes routinely cause fires to trees along ridge tops and less commonly start fires in structures. Fires associated with lightning strikes to inhabited buildings occur fewer than once every five years on average. More common is loss of power and damage to electronic equipment in homes where there has been a proximity strike. Anecdotally, there are multiple reports each year of electronic equipment unprotected by surge suppressors which are damaged by lightning strikes. Generally, these homeowners file insurance claims for damages and total annual damages in the entire community likely do not exceed \$10,000.

Community vulnerability to lightning strike is considered LOW due to the limited and scattered effects of strikes combined with the very common occurrence.

- **Winter Storm/Ice Storm** -With the almost annual occurrence of a significant snow or ice storm, the town feels an impact most on the infrastructure of the community. The town is able to keep the roads open and treated for most storms and any loss of power is usually limited to hours, however, the intersection of Burpee Road and Monkton Road is subject to frequent drifting of snow (Tab c). This area has the potential to be a high accident area.

The community vulnerability to Winter Storm/Ice Storm is LOW based on the highly likely (near 100% probability in the next year) occurrence and the negligible (<10% of the community) impact.

As population growth and housing expands into the more rural areas of town, increasing dependency on local roads by the new homeowners requires changes in winter maintenance. The town has, thus far, been able to keep up with those increased demands on its services.

In 1998 a severe ice storm hit much of northern Vermont. Fortunately, the Town of Bristol was spared the brunt of the damage due to micro-climate differences from its neighboring communities. As recently as February 2006, a significant snowstorm coupled with high wind nearly crippled much of Vermont including the Addison County region. This storm stressed the resources of most local communities, including the Town of Bristol, to capacity.

## 5. Community Mitigation Strategies

### 5.1. Hazard Mitigation Goals by Hazard Type

Each hazard type identified in Section 4 “Community Risk Assessment” can be mitigated dependent on the willingness to do so at the local, state or federal level. For example, the mitigation of flood damage is basically a simple fix- don’t allow anything in the floodplain that can’t afford to be lost and when it is lost, don’t replace it. This would include all forms of infrastructure whether it be homes, highways, dams or croplands. Unfortunately, political will can rarely stand up to such a simple mitigation strategy.

The Town of Bristol has identified that its goals for hazard mitigation are to reduce and/or avoid all long and short-term vulnerabilities to the hazards identified in section 1.3. In doing so, it also recognizes that political will and lack of funding stand in the way of many mitigation projects. The town particularly supports local residents’ efforts to mitigate their personal risks. The Town also supports projects that lead to a positive benefit vs. cost evaluation and which the voters can afford.

<b>Identified Hazard</b>	<b>Primary Mitigation Goal</b>
Flash Flood	Protect the health and safety of the public
Landslide/Rockslide	Ensure that highway improvements result in safer conditions
Earthquake	Protect existing and new properties and structures
Wildfire	Protect the health and safety of the public
Invasive Species	Reduce impacts to residents and local industry and provide for the outdoor recreational safety of the public
HazMat Spill	Protect the health and safety of the public
Structure Fire	Protect the health and safety of the public

### 5.2. Ongoing Mitigation Strategies by Hazard Type

#### **Authorities of Town Officials:**

Selectboard: The Selectboard is responsible for the basic administration of the town. They take care of roads, make appointments to other boards and commissions, and authorize expenditures of voted budgets. The selectboard may enact ordinances and rules in many areas including traffic regulation, regulating nuisances, managing solid waste, dogs and recreation, and establishing bike paths.

Town Administrator: The Town Administrator is responsible for the day-to-day workings of the town. As designated coordinator of town departments a town administrator ensures Selectboard policies and decisions are executed in a timely manner. They work with all departments in a town.

Planning Commission: The Planning Commission is responsible for long range planning in a town particularly as it relates to future land uses and resilience. They prepare a municipal plan and zoning bylaws which are adopted by the Selectboard. Planning Commission members are elected town officials in Bristol.

Conservation Commission: The Town Conservation Commission is responsible for inventories of the natural resources of a town and making recommendations to the Planning Commission related to conserving them. Conservation Commission members are appointed by the Selectboard.

Zoning Administrator: The Zoning Administrator (ZA) is appointed by the town's Selectboard with consideration given to the recommendation of the planning commission. Their responsibilities include administration and enforcement of a town's zoning bylaws, The ZA and usually also serve as the administrator of town floodplain regulations.

Tree Warden: The Town Tree Warden is responsible for the shade and ornamental trees within the town rights-of-way. They oversee tree health and removal when necessary. The tree warden is appointed by the Selectboard.

Fire Warden: The Town Forest Fire Warden has the responsibility for suppression of wildland fires, regulating open burning in the town by issuing burn permits, and wildfire education/prevention. The Town Fire Warden is appointed by the state Commissioner of Forests, Parks and Recreation with approval by the town's Selectboard.

Health Officer: The Town Health Officer is the executive officer of the local Board of Health. A local board of health may make and enforce rules and regulations...relating to the prevention, removal, or destruction of public health hazards and the mitigation of public health risks. The Town Health Officer is appointed by the Commissioner of Health with approval by the local Selectboard. They take direction from the state Department of Health in investigation and enforcement of public health issues.

Town Service Officer: The Town Service Officer's responsibilities are to coordinate aid for residents needing assistance during hours when State offices are closed. In many towns, this office has become redundant as State agencies have developed 24/7 emergency assistance programs.

Emergency Manager or Coordinator: By default, a towns Selectboard chair is the town's emergency management director (EMD) unless one is appointed. Many communities retain the authorities of an EMD within the Selectboard and appoint an emergency coordinator instead. The emergency manager is responsible for the organization, administration and operation of the local emergency management organization. Emergency managers prepare local emergency operations plans, coordinate a local emergency management group and perform emergency management functions at the local level.

## **Current mitigation policies and the ability to expand upon these:**

### **Flood/Flash Flood**

The Town of Bristol is a member in good standing of the National Flood Insurance Program. There are 8 structures in town that have policies under the NFIP. These structures represent \$1,447,900 in total coverage in the community. A total of \$26,096.36 has been paid out to NFIP policy owners since 1978. There are currently no structures in the Town of Bristol which are considered to be Repetitive Loss Structures under the National Flood Insurance Program.

The Town of Bristol has an adopted and approved set of floodplain regulations which are administered by the Town Administrator in his role as Zoning Administrator. All town zoning applications are reviewed against a map that has the FIRM superimposed over the zoning districts. Required reports are submitted to FEMA on an annual basis indicating compliance with the NFIP.

The Town of Bristol has been active in mitigating some of its hazards by utilizing available FEMA mitigation funds to complete buyouts of at-risk residences. Following the 1998 flooding, multiple homes were purchased in the “Tin City” area, removed and the space converted into “Sycamore Park” which serves as an education and recreation area for the town.

The Town of Bristol has also adopted road and bridge standards as recommended by VT AOT. These documents address road and bridge construction standards designed to mitigate local traffic issues and are particularly designed to mitigate potential damages due to flooding and flash flooding. The standards address culvert sizing, ditch treatments and driveway access to reduce flood caused erosion.

The Town supports continued compliance with the NFIP and would support Community Rating System (CRS) improvements where the benefits to the town’s residents would outweigh the costs of additional administration and compliance. The town also supports buyouts where this solution is economically feasible and supported by the landowners.

### **Landslide/Erosion Hazard**

Unfortunately, the relatively short lives (compared to geologic time) of property owners lead them toward the belief that the river has always been stable and that it is poor management that causes channel migration rather than the unstoppable forces of nature.

In 2007, the Addison County Regional Planning Commission supported a river corridor planning effort which included reaches M10 and M11 in the Town of Bristol. Landowners along these reaches were contacted and potential projects discussed. Specific recommendations of the resulting corridor plan include protection of the riverbanks through adoption of fluvial erosion hazard zones, streambank stabilization through tree plantings and continued buyouts of properties when supported by landowners.

The Bristol Conservation Commission supports identification of erosive hazards associated with riverbank instability as a first step in the process of mitigating hazards associated with erosion vs infrastructure conflicts in river corridors. Adoption of a Fluvial Erosion Hazard Overlay District could be difficult to adopt as property owners often do not recognize the threats associated with river channel migration over time. Additional education of residents will be a long-term mitigation process which could result in eventual adoption of protective exclusion zones along the sensitive reaches of the New Haven River.

### **Earthquake**

The Town of Bristol has identified earthquake as a hazard it feels could have a large negative impact on the community and the state as a whole. Despite the probability of an earthquake within the next 50 years, most town residents do not even attempt to mitigate its hazard. A program of earthquake education might be one way to elevate residents understanding of the hazard. The town could also inspect its infrastructure to identify possible earthquake resistant actions.

### **Wildfire**

The town currently has no guidelines for home construction in place that would limit the risk to wildfire in Bristol. The appointment of a town Fire Warden and enforcement of state and local laws limit the setting of uncontrolled outdoor fires and ultimately result in an overall limited risk. Fire ponds required as an impact assessment should mitigate fire risk in future developments.

### **Invasive Species (Insects, Plants)**

The Town of Bristol has an active tree warden appointed annually to oversee the publicly owned trees located in the Town's right-of-way. Unhealthy or hazardous trees are removed on a regular basis. Careful watch of these trees may identify the presence of Emerald Ash Borer, Asian Long-horned Beetle or others. Any drastic increase in tree deaths due to invasives may need to be budgeted for separately from the highway budget should the need arise.

Biting insects and the diseases they carry are not currently officially addressed by the Town of Bristol. A variety of lands in town are home to insects, some of which also carry arboviruses. In other parts of the state where the disease risk is higher, towns have joined together to create insect control districts which primarily spray for mosquitoes as a nuisance. The ability to join or create such a district with shared spray costs is possible should these hazards rise in priority.

Roadside invasive plants are spreading rapidly throughout town. The Town currently addresses this spread through use of recommended roadside mowing schedules. This seems to be the best treatment known at this point short of an active herbicide spray program to rid or reduce the spread of these plants.

Active programs to combat the impacts of these species are a possibility, though the benefit vs. cost equation is often challenging to justify.

### **Hazardous Materials and Highway Transport Accidents**

Representatives from the Town of Bristol are considered to be members of the Local Emergency Planning Committee in planning for hazardous materials incidents. The Town mitigates risk to local responders by reporting its Tier II facilities as required at both the state and local levels.

The Town zoning bylaws section 521 and 522 specifically address storage of flammable liquids above ground and within specified distances of property lines including up to 200ft setback in the case of 10,000-gallon tanks or greater. Aboveground storage of flammable liquids also requires a retention dike of at least 1.5 times the capacity of the tank for storage greater than 550 gallons. In addition, Town zoning bylaws limit storage of hazardous materials in the mapped floodplain.

The Town of Bristol is in the process of evaluating its bicycle and pedestrian access throughout the village area to reduce accident risks associated with bike/ped vs vehicle interactions.

A representative from the town sits on the local Transportation Advisory Committee, a regional group whose purpose is to prioritize potential transportation related projects within the region. This group rates High Accident Locations (HAL) highly in prioritizing projects to mitigate the risks associated with these locations by changing alignments, added signage and reduced speeds.

### **Structure Fire**

The Town of Bristol actively mitigates structure fire hazards in its community through its ongoing support of the Bristol Fire Department and its support of fire prevention programs at the local elementary school. These two indications of support both show a reduction in fire loss over time.

In addition, the installation of dry hydrants at water supply locations outside of the village area as well as village area wet hydrants increase the availability of and speed in which water can be accessed for firefighting purposes. Recent inquiries by the fire department to reevaluate its ISO rating may ultimately result in lower insurance costs to its residents by recognizing the high level of preparedness in the community.

Actions identified under the Drought hazard would also mitigate structure fire and wildfire risk in future developments.

## **Community Mitigation Strategies from Bristol's 2012 hazard mitigation plan (reflecting changes to community concerns)**

### **Drought**

Most homeowners with shallow wells have learned to live with the inconvenience of dry spells by purchasing bottled water and using public toilets and laundries for the short periods they would be without a dependable water supply. When the inconvenience has become too much, many of these homeowners have mitigated the problem by drilling deep wells. Increasingly, home mortgages are requiring a dependable deep well water supply as a condition of a loan.

Agricultural activities highly dependent on water such as fruit and vegetable crops can be severely impacted by lack of rain. Most of these businesses have mitigated the effects of periodic droughts by providing irrigation systems. Other farms, dependent on crops to feed livestock rather than humans, are highly impacted by low water supplies and may be dependent on a USDA disaster declaration to find relief.

Reduced water supplies also impact the community's fire-fighting capabilities. Since outside of the village area no public water supply is available, the fire department is highly dependent on surface water supplies for fire-fighting. Increasingly, the department is installing dry hydrants in deep water ponds and streams to make access easier but as housing continues to expand into rural areas, the potential lack of a dependable water supply for fighting fire is becoming an issue. As a mitigation measure shared with structure fire and wildfire, larger subdivisions should be required to provide fire ponds as part of an impact assessment.

### **Widespread Power Failure**

Many private residences have their own back-up power sources and essential Town facilities like the Fire Station, Bristol Rescue Garage, Water Department, Police Department/Holley Hall, and Mt Abraham Union High School have been retrofitted in recent years.

As population growth and housing expands along remote road corridors, increasing reliance on dependable power by the new homeowners requires changes in line maintenance. Central Vermont Public Service Company (CVPS) the utility servicing the Town of Bristol has an ongoing program of line clearing and relocation to ensure outages are kept to a minimum. In addition, recent improvements to the transmission system in northwest Vermont have provided redundant systems to bring electric power to the region.

Specifically, improvements to the primary transmission line serving Bristol from the New Haven substation currently underway should provide a more robust power grid for the town. One major liability to power robustness is the utility substation at Hewett Road which lies within the FEMA designated floodplain. Loss of this substation due to flooding would cause power outages throughout much of town.

The Town of Bristol supports development of a robust and redundant local electric generation and transmission system for its residents.

### **High Winds**

Residents of the Town generally do not recognize high wind as a hazard which can be mitigated with the exception of the effects previously discussed under widespread power failure.

Newly constructed buildings may have tie downs between roof and side walls but no building codes exist within the community that require residential construction to any particular standard.

Where high wind hazards have been recognized, it is usually a function of damage that might be caused if a tree were to be blown over and its effect on a residents' home. For this reason, some trees are removed from the landscape to reduce their vulnerability to high wind events.

The Town of Bristol supports removal of dead and hazardous trees in the town rights-of-way to mitigate the hazards associated with their falling either on town highways or on power lines. The Town also supports the efforts of individual residents in making their properties more wind resistant but does not require specific construction standards.

### **Lightning**

The town has mitigated potential damage to Town-owned structures due to lightning strike by installing lightning rods to channel the electrical energy directly to ground rather than through the structure's electrical system.

Most of the larger, privately-owned structures in vulnerable locations have similarly installed lightning rod systems to protect them from lightning strike with the encouragement from insurance companies and extension agents.

The Town has no adopted building standards which would require this action but feels the risk to private residences should be borne by each resident on their own.

### **Winter Storm/Ice Storm**

Mitigation activities by power companies have re-routed many of the remote lines along town highways since a 1998 ice storm and an increased pruning effort has reduced the impact of a similar event would it happen today.

The Town of Bristol generally mitigates its winter storm risk through preparedness activities in the form of appropriately sized equipment and training. The periodic cutting of brush along town highways also mitigates the effects of large winter storm events by reducing their ability to act as snow fence dropping windblown snow into the town highway system.

Where drifting snow is an annual problem, the Town highway crew routinely erects snow fence in the fall to mitigate drifting snow.

### **Dam Failure**

The Town of Bristol does not generally address dam failure mitigation in its day-to-day activities leaving the protection of the public up to State dam safety inspectors.

The Town Planning Commission, however, has considered writing of water impoundment construction standards into its zoning regulations. The intent of such standards would be to limit the volume of water which could be stored in a man-made impoundment and therefore limit risk.

### **5.3. Proposed Mitigation Actions and Projects by Hazard Type**

In developing the following list of proposed mitigation actions and projects, care was taken to include only those projects which could be considered reasonable and feasible based primarily on cost and political willingness.

#### **Flood/Flash Flood**

The Town supports continued enrollment in the NFIP to allow residents the option of purchasing flood insurance on their properties. As a part of continued compliance, the Town supports participation in NFIP training for the Zoning Administrator when offered by the State or NFIP.

*Estimated cost: \$200-\$300*

*Source of Funds: Town General Fund Planning and Zoning budget*

*Responsibility: Town Zoning Administrator*

*Timeframe: 2018 to 2025 and ongoing*

*Current Project Status as of January 2018: Ongoing, ZA has attended quarterly ZA roundtables which include all aspects of zoning administration including NFIP*

The following specific projects have been identified which will serve to mitigate the effects of flooding and/or flash flooding in the Town of Bristol:

- Protect the village spring from contamination due to flooding. A feasibility study and/or engineering will be needed prior to implementation.

*Estimated cost: \$5,000- \$10,000*

*Source of Funds: Village water budget*

*Responsibility: Town Administrator and water dept*

*Timeframe: Q3 2021-Q3 2022*

*Current Project Status as of January 2018: No action since 2012. Funds have not been available*

The following stormwater projects are planned concurrently with a West St/Main St. paving project scheduled for 2020.

- Improve storm water capacity on Mountain Terrace and East Street to limit basement flooding

*Estimated cost: \$208,000*

*Source of Funds: HMGP, PDM-C*

*Responsibility: Town Administrator, highway dept and selectboard*

*Timeframe: Q3 2020 (tentative based on funding)*

*Current Project Status as of January 2018: (See general stormwater progress following)*

- Expand storm water capacity in the Mountain Street/ Crescent Street area to meet a minimum 10-year flooding event.

*Estimated cost: \$364,000*

*Source of Funds: HMGP, PDM-C*

*Responsibility: Town Administrator, highway dept and selectboard*

*Timeframe: Q3 2020 (tentative based on funding)*

*Current Project Status as of January 2018: (see general stormwater progress following)*

- Replace and upgrade storm water system along Spring Street and North Street to prevent flooding damage to the elementary school during heavy rain events.

*Estimated cost: \$1,330,000*

*Source of Funds: HMGP, PDM-C*

*Responsibility: Town Administrator, highway dept and selectboard*

*Timeframe: Q3 2020 (tentative based on funding)*

*Current Project Status as of January 2018:*

*Portions of the previous three projects have been completed as well as a 2017 rebuild of stormwater infrastructure on West St.*

*A stormwater infrastructure mapping project was conducted in 2015 which identified multiple areas of concern in Bristol's village center. The Town has applied for funding to create a stormwater master plan which will identify priority areas and provide 30% design for 5-10 of those locations. Utilizing "Green Infrastructure" techniques, projects will be designed to reduce direct flow into surface waters. Projects will reduce stormwater surges and nutrients flowing into the New Haven River.*

Replace South St. Bridge with more flood resistant span when needed

*Estimated cost: \$1,200,000*

*Source of Funds: State bridge/culvert grant program*

*Responsibility: Town Administrator, highway dept and selectboard*

*Timeframe: 2019-2030, as funding allows*

*Current Project Status as of January 2018: Bridge was replaced with a more flood resistant structure in 2016*

### **Landslide/Erosion Hazard**

The Town supports adoption of a Fluvial Erosion Hazard Overlay district in its zoning bylaw rewrite.

*Estimated cost: \$2,000 as part of an overall rewrite*

*Source of funds: Municipal planning grants.*

*Responsibility: Joint Selectboard and Planning Commission*

*Timeframe: 2020-2023, once studies are finalized*

*Current Project Status as of 2018: The recently adopted town plan (March 2017) reaffirms the town's support for this project and the town has requested State ANR support in determining the potential boundaries of the river's corridor in advance of any ordinance adoption. Final determination of language and locations to be determined*

*Note: State of Vermont guidance has been adjusted since major flooding statewide in 2011. Fluvial Erosion Hazard Zones have been replaced by River Corridors sized and located so as to protect the area needed for future meandering.*

The Town also supports the following specific projects which are intended to limit erosion hazards in known locations:

- Stabilize the intersection of Basin Street where it meets East St./Rte. 17  
*Estimated cost: \$5,000- \$10,000*  
*Source of Funds: Village water budget*  
*Responsibility: Town Administrator and water dept*  
*Timeframe: Q2 2020 or as repaving occurs*  
*Current Project Status as of 2018: No action taken*
- Explore options for river bank stabilization along West Street behind existing structures especially behind the Merchants Bank.  
*Estimated cost: \$15,000*  
*Source of Funds: State ERG grants, town highway funds, cooperative private funding*  
*Responsibility: Town Administrator and water dept*  
*Timeframe: 2020-2023*  
*Current Project Status as of 2018: Ongoing, A stormwater infrastructure mapping project was conducted in 2015 which identified multiple areas of concern in Bristol's village center. The Town is currently applying for funding to create a stormwater master plan which will identify priority areas and provide 30% design for 5-10 of those locations. Utilizing "Green Infrastructure" techniques, projects will be designed to reduce direct flow into surface waters. Projects will reduce stormwater surges and nutrients flowing into the New Haven River.*
- Support a study of options for additional bank stabilization West of Mount Abraham Union High School.  
*Estimated cost: \$5,000- \$10,000*  
*Source of Funds: UHSD budget*  
*Responsibility: UHS School Board and Superintendent*  
*Timeframe: Q2 2018 or following passage of bond.*  
*Current Project Status as of 2018: No Action Taken. Proposed as part of a High School bond as of March 2018.*
- Explore options for bank/ditch stabilization along Upper Notch Road.  
*Estimated cost: \$70,000*  
*Source of Funds: BBR, Town Highway funds, stormwater pollution grants*  
*Responsibility: Town Administrator and highway dept*  
*Timeframe: 2019-2023 as funding allows*  
*Current Project Status as of 2018: Stabilization completed Fall 2017*

### **Earthquake**

While recognizing the potential for severe damage in the region, the Town does not believe the risks associated with earthquake are large enough to require any town building retrofits at this time.

*No local action necessary-cost \$0*

*Current Project Status as of 2018: No Change*

The Town believes it is the responsibility of private homeowners to be ready for earthquakes. The town generally believes that building construction standards are the responsibility of each private homeowner.

*No local action necessary-cost \$0*

*Current Project Status as of 2018: No Change*

### **Wildfire**

The Town supports the fire warden system requiring outdoor burn permits prior to any outdoor burning.

*Estimated cost: None*

*Source of funds: Town General Fund*

*Responsibility: Joint Selectboard and Fire Warden*

*Timeframe: Annually*

*Current Project Status as of 2018: Ongoing*

The Town believes it is the homeowner's responsibility to mitigate their susceptibility to wildfire through "firewise" practices.

*No local action necessary-cost \$0*

*Current Project Status as of 2018: No change*

### **Invasive Species**

The Town encourages residents to be observant of invasive species and eliminate them early in their cycle, if at all possible.

*Estimated cost: None*

*Source of funds: Town General Fund*

*Responsibility: Bristol Conservation Commission (educational outreach)*

*Timeframe: Ongoing*

The Town instructs the Highway Dept. to follow best practices when conducting summer mowing in an effort to control spread of noxious weeds along roadsides.

*Estimated cost: Additional time from road crew*

*Source of funds: Town General Fund*

*Responsibility: Joint Selectboard and highway dept.*

*Timeframe: Ongoing*

The Town encourages residents to take the "Forest Pest First Detector Program" when offered by VT ANR. Graduates will be prepared to recruit other volunteers to be "First Detectors as well.

*Estimated cost: None*

*Source of funds: Town General Fund*

*Responsibility: Town Tree Warden.*

*Timeframe: Ongoing*

### **Hazardous Materials and Highway Transport Accidents**

The Town has identified the following high-risk locations on its highway system and supports mitigation of the hazard in any future construction/reconstruction activities:

- Implement Better Back Roads low cost safety improvements at intersection of Burpee Road and Monkton Road to reduce the likelihood and severity of motor vehicle accidents.  
*Estimated cost: \$5,000- \$10,000*  
*Source of Funds: HMGP, BBR, Town Highway Funds*  
*Responsibility: Town Administrator and highway dept*  
*Timeframe: 2018-2020*  
*Current Project Status as of 2018: Study was completed in 2015 and recommended actions including appropriate signage was installed.*
- Explore possible Plank Road/Burpee Road intersection improvements (signage, painting, 4-way stop?) to reduce numbers of accidents.  
*Estimated cost: \$2-3,000*  
*Source of Funds: State/local highway funds*  
*Responsibility: Town Administrator and highway dept*  
*Timeframe: 2018-2020*  
*Current Project Status as of 2018: No actions other than as recommended above have been undertaken.*
- Work with State transportation personnel to realign the intersection of River Road with Rte. 116 as part of the bridge replacement on Rte. 116 in this area.  
*Estimated cost: \$10,000*  
*Source of Funds: State Highway Funds*  
*Responsibility: Town Administrator and highway dept*  
*Timeframe: Dependent on state bridge replacement schedule*  
*Current Project Status as of 2018: Route #116 bridge was replaced in 2015. Some improvements to the 116/River Rd. intersection were installed as part of the project.*
- Support a feasibility/design study to address the intersection of Briggs Hill Rd, Lincoln Rd. and State Rte. 116 including possible abandonment of Lincoln Road in favor of Briggs Hill Road improvements  
*Estimated cost: \$15,000- \$20,000*  
*Source of Funds: State Highway Funds*  
*Responsibility: Town Administrator and highway dept*  
*Timeframe: 1-5 years*  
*Current Project Status as of 2018: No progress to date. – Low public support*

- Support designs that would reduce accidents at the traffic light at Rte. 116/17 and North/South Streets.  
*Estimated cost: \$5,000- \$10,000*  
*Source of Funds: State Highway Funds*  
*Responsibility: Town Administrator and highway dept*  
*Timeframe: 2019-2021*  
*Current Project Status as of 2018: Bump outs, turning lanes, pedestrian crossings installed in 2016*
- A study exploring a realignment of Plank Road at the Waterworks property should be conducted in conjunction with New Haven to review the feasibility of eliminating the two sharp curves.  
*Estimated cost: \$10,000,*  
*Source of funds: Town highway budget or Regional Planning funds*  
*Responsibility: Joint Town Highway Dep. and Selectboard*  
*Timeframe: 0-3 years*  
*Current Project Status as of 2018: No action to date. Concerns about wetlands permitting have reduced enthusiasm for this project.*

### **Structure Fire**

The Town supports efforts by the fire department to install dry hydrants throughout town not served by the village water supply.

*Estimated cost: None additional beyond annual FD support*  
*Source of funds: Federal Rural fire protection grants and town FD funds*  
*Responsibility: BFD*  
*Timeframe: Annually dependent on grant awards*  
*Current Project Status as of 2018: New Hydrant installed south on Rte. 116 at picnic pull-off, hydrant repaired in Upper Notch, 2 more installations scheduled for Q3 2018*

The Town supports efforts by the fire department to improve its ISO rating through testing and training activities.

*Estimated cost: None additional beyond annual FD support*  
*Source of funds: Federal Rural fire protection grants and town FD funds*  
*Responsibility: BFD*  
*Timeframe: 1-3 years*  
*Current Project Status as of 2018: Department supported reevaluation in 2013 resulted in 5X rating*

The Town is exploring the feasibility and/or need for sprinkler system as part of a current Town buildings energy conservation project.

*Estimated cost: \$10,000 as part of an overall project*  
*Source of funds: Town Funds*  
*Responsibility: Joint Selectboard and Energy Committee*  
*Timeframe: 0-3 years*  
*Current Project Status as of 2018: Renovation did not include sprinklers due to costs associated with historic preservation.*

**Additional Mitigation Projects from Bristol's 2012 hazard mitigation plan  
(reflecting changes to community concerns)**

**Drought**

The Town supports recent changes to state rules which require a potable water supply and septic plans prior to development and supports groundwater protection efforts around both public and private water supplies.

*No local action necessary-cost \$0*

*Current Project Status as of 2018: No action needed*

**Widespread Power Failure**

Green Mountain Power (GMP) the utility servicing the Town of Bristol has ongoing programs of line clearing and relocation to ensure outages are kept to a minimum. The town balances its support for these efforts with residents' desires to keep the beauty of tree-lined streets and roads.

*No local action necessary-cost \$0*

*Current Project Status as of 2018: Green Mountain Power (GMP) continues its efforts to mitigate future line damage.*

**High Winds**

The town generally supports limiting damages due to high winds by removing dead and dying trees within the town right-of-way that could fall during a high wind event.

*Estimated cost: \$5,000 annual cost*

*Source of funds: Town highway budget.*

*Responsibility: Joint Town Highway Dept and Selectboard*

*Timeframe: Annual maintenance task*

*Current Project Status as of 2018: Ongoing task*

**Lightning**

The Town feels the risk to private residences of lightning strike should be borne by each resident on their own.

*No local action necessary-cost \$0*

*Current Project Status as of 2018: No change*

**Winter Storm/Ice Storm**

The Town supports the installation of snow fence when and where it can mitigate drifting on town highways.

*Estimated cost: \$2,000 annually*

*Source of funds: Town Highway Funds*

*Responsibility: Town Highway Dept.*

*Timeframe: Annual treatments in fall*

*Current Project Status as of 2018: Town explored the feasibility of this action and has removed it from this project list.*

The Town supports ongoing efforts by power companies to mitigate power outages due to ice storms by pruning and tree removal activities.

*No local action necessary-cost \$0*

*Current Project Status as of 2018: Green Mountain Power continues its efforts to trim and remove trees which threaten power lines.*

### **Dam Failure**

The Town of Bristol does not generally address dam failure mitigation in its day-to-day activities leaving the protection of the public up to State dam safety inspectors.

*No local action necessary-cost \$0*

*Current Project Status as of 2018: No Change*

The Town Planning Commission, is considering writing of water impoundment construction standards into its zoning regulations. The intent of such standards would be to limit the volume of water which could be stored in a man-made impoundment and therefore limit risk.

*Estimated cost: \$2,000 as part of an overall rewrite*

*Source of funds: Municipal planning grants.*

*Responsibility: Joint Selectboard and Planning Commission*

*Timeframe: 0-3 years*

*Current Project Status as of 2018: Rewrite is ongoing*

## **5.4 Project Prioritization process**

Projects and actions included in Section 5.2 are conducted by the Town of Bristol or regional and State agencies where noted. The Town encourages its residents to adopt mitigation actions which could protect their personal property by making educational materials available to residents. Many of these potential actions are contained in Annex C as mitigation measures for individuals. Mitigation actions identified in Section 3.3, however, are considered the jurisdiction's priority mitigation actions. These projects continue the community's dedication to mitigation and since projects have been completed in the past 7 years, new ones reflecting the same priorities have been added.

The Town has established the following priorities for choosing mitigation projects: Life safety and the safety of its residents, keeping local roads and bridges open to ensure access for emergency vehicles, and protecting critical infrastructure facilities in the town. These actions/projects are constantly evaluated for benefit to the community, estimated project cost and political will to implement and will be implemented as those factors indicate. The actions identified in Section 5.4 under each hazard have passed a preliminary evaluation utilizing those general concepts by the hazard mitigation committee and are listed in their order of priority. Before undertaking these projects, they will additionally be prioritized based on their feasibility and a benefit vs. cost review. A minimum C/B result of 1.0 will be required prior to any request for federal mitigation funds. Annex D identifies only some of the available programs which can help to fund some of these actions/projects. All projects in section 3.3 will be reviewed for progress following any local disaster declaration and will be considered annually as part of overall town budgeting.

## **6. Plan Maintenance Procedures**

Any Hazard Mitigation Plan is dynamic and should not be static. To ensure that the plan remains current and relevant, it is important that it be updated periodically. The plan will be updated at a minimum, every five years in accordance with the following procedure:

1. The Bristol Selectboard assembles a Review/Update Committee to include government officials and interested public.
2. The Committee will discuss the process to determine if any modifications or additions are needed due to changing conditions since the last update occurred. Data needs will be reviewed, data sources identified and responsibility for collecting/updating information will be assigned to members.
3. Other Town plans (Emergency Operations Plan, Town Plan, Road Plan, etc.) will be reviewed to ensure a common mitigation thread still exists throughout.
4. A draft update will be prepared based on these evaluation criteria:
  - Changes in community and government processes, which are hazard-related and have occurred since the last review.
  - Progress in implementation of plan initiatives and projects.
  - Effectiveness of previously implemented initiatives and projects.
  - Evaluation of unanticipated challenges or opportunities that may have occurred between the date of adoption and the date of the report.
  - Evaluation of hazard-related public policies, initiatives and projects.
  - Review and discussion of the effectiveness of public and private sector coordination and cooperation.
5. The public will be invited to review and give input on drafts as they are produced.
6. Selectboard members will have an opportunity to review the draft update. Consensus will be reached on any changes to the draft.
7. The Selectboard will notify and schedule a public meeting to ensure adequate public input.
8. The Selectboard will recommend incorporation of community comments into the draft update.

### 6.1.1. Programs, Initiatives and Projects Review

Although the plan should be reviewed in its entirety every five years as described above, the Town will monitor and evaluate its goals, strategies and actions/projects annually as the town budget is created. A town budget is created by the Selectboard of a town in publicly noticed meetings utilizing budget requests from town committees and the citizenry. This will ensure that progress will be reviewed and actions/projects either added or removed from the towns work plan based on changing local needs and priorities. In creation of the municipal plan by the planning commission, concepts, goals and strategies from this plan will be used to inform the development of that plan and will be incorporated into that plan when appropriate.

### 6.1.2. Post-Disaster Review Procedures

Should a declared disaster occur, a special review will occur in accordance with the following procedures:

1. Within six (6) months of a declared emergency event, the Town will initiate a post disaster review and assessment.
2. This post disaster review and assessment will document the facts of the event and assess whether existing Hazard Mitigation Plans effectively addressed the hazard.
3. A report of the review and assessment will be created by a Review/Update Committee.
4. The committee will make a determination whether the plan needs to be amended. If the committee determines that NO modification of the plan is needed, then the report is distributed.
5. If the committee determines that modification of the plan IS needed, then the committee drafts an amended plan based on its recommendations and forwards to the Selectboard for public input.
6. Following completion of a public input process, further amendments may be made and a final plan delivered to the Selectboard for adoption.
7. The Selectboard adopts the amended plan.

**7. Plan Adoption Resolution**

**TOWN OF BRISTOL, VERMONT SELECTBOARD ADOPTION RESOLUTION**

WHEREAS, the Town of Bristol has occasionally experienced severe damage from natural hazards and it continues to be vulnerable to the effects of the hazards profiled in the **Town of Bristol, Vermont Single Jurisdiction All-Hazards Mitigation Plan (Plan)**, which can result in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Bristol has developed the **Plan** and received conditional approval from the Federal Emergency Management Agency (FEMA); and

WHEREAS, the **Plan** identifies specific hazard mitigation strategies, and plan maintenance procedures applicable to the Town of Bristol; and

WHEREAS, the **Plan** identifies actions and/or projects intended to provide mitigation for specific natural hazards that impact the Town of Bristol; and

WHEREAS, adoption of this **Plan** will make the Town of Bristol eligible for additional funding to help alleviate the impacts of future hazards;

Now, therefore, be it RESOLVED by Town of Bristol Selectboard:

1. The **Town of Bristol, Vermont Single Jurisdiction All-Hazards Mitigation Plan** is hereby adopted as an official plan of the Town of Bristol, Vermont;
2. The respective Town officers identified in the action plan are hereby directed to pursue implementation of the recommended actions assigned to them.
3. Support agencies within the Town of Bristol are also requested to implement actions assigned to them within this plan;
4. Plan maintenance procedures described in Section 6 of this plan are also adopted as part of this resolution

IN WITNESS WHEREOF, the undersigned have affixed their signatures for the Town of Bristol, this \_\_\_\_ day of \_\_\_\_\_ 201\_\_.

\_\_\_\_\_  
Selectboard Chair

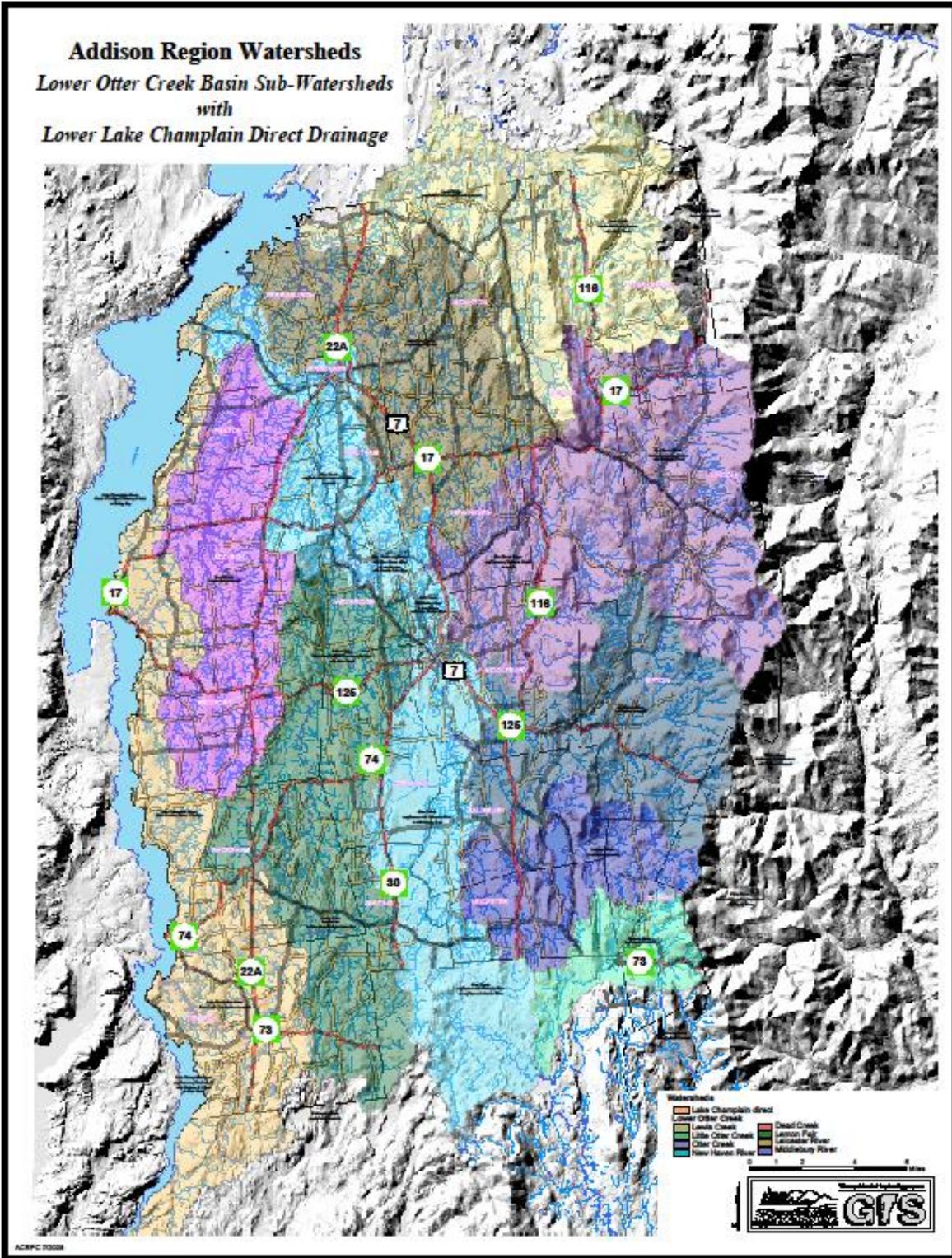
\_\_\_\_\_  
Selectboard Member

\_\_\_\_\_  
Selectboard Member

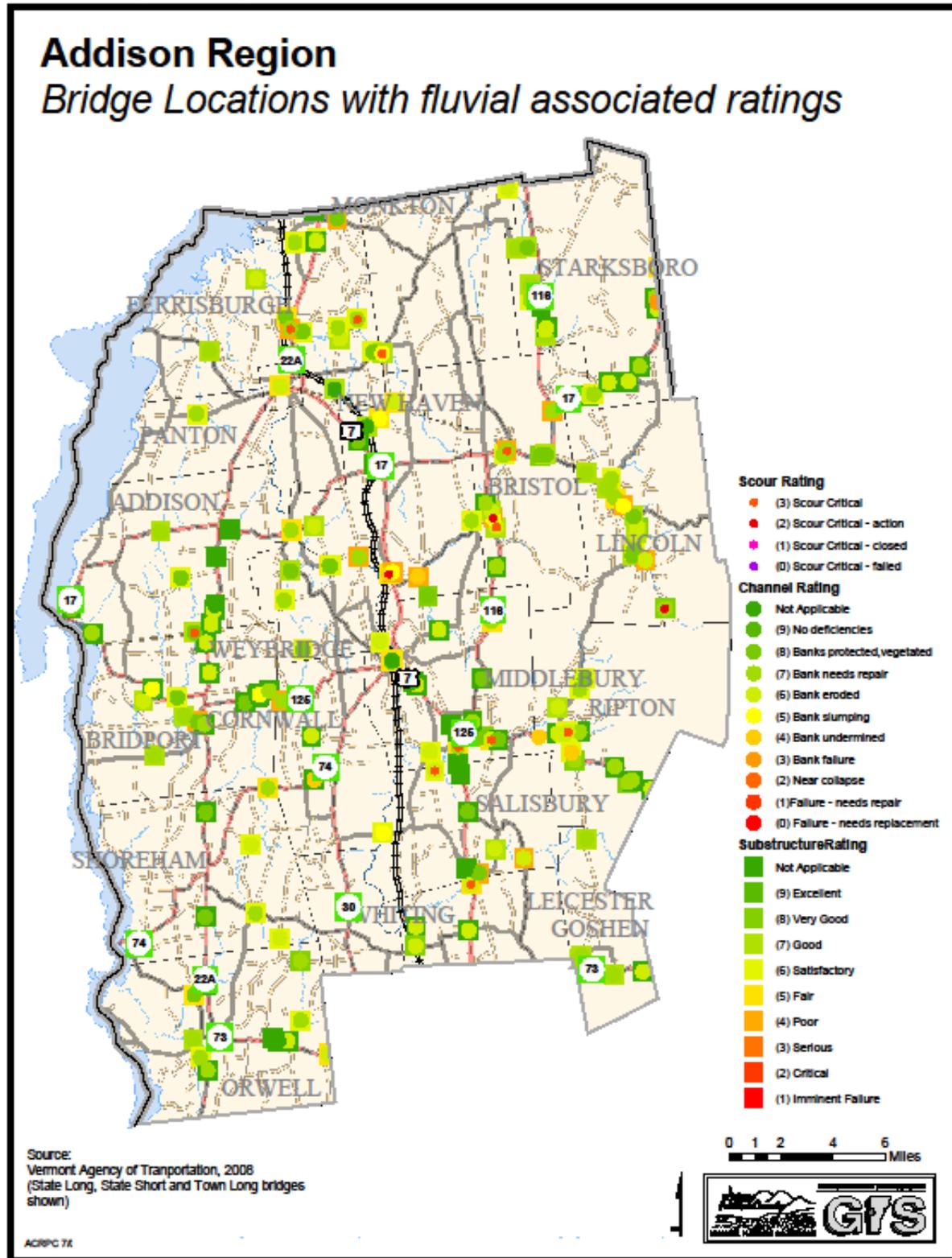
ATTEST:\_\_\_\_\_

Annex A  
Regional Maps

Addison Region Watersheds



Addison Region Bridge Locations



## Annex B

### Local Documentation

#### Tim Bouton

---

**From:** Town Administrator <townadmin@bristolvt.org>  
**Sent:** Monday, November 6, 2017 5:36 PM  
**To:** Tim Bouton  
**Cc:** Joel Bouvier ; Joel Bouvier; Peter Bouvier ; Town Administrator; Brett LaRose; Kris Perlee; Kristin Underwood; Katie Raycroft-Meyer; Jill Marsano  
**Subject:** Bristol All-Hazards Plan Update Committee  
**Attachments:** Bristol\_All-Hazards\_Mitigation\_Plan\_update\_Selectboard\_overview\_2017-10-23.pdf

Hi Tim, et al.,

Below is contact list of appointees to the BAHPU (how's that for an acronym?). Though interested, the PC has not select a representative yet, so I listed the PC Chair. Attached is the summary provided at the Oct. 23 Selectboard meeting. And here is a link to the on-line All-Hazards Mitigation Plan: [http://www.bristolvt.org/wp-content/uploads/2017/10/Bristol\\_CFR\\_44\\_All-Hazards\\_Mitigation\\_Plan\\_Oct2011.pdf](http://www.bristolvt.org/wp-content/uploads/2017/10/Bristol_CFR_44_All-Hazards_Mitigation_Plan_Oct2011.pdf)

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Kristin Underwood, Conservation Commission  
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--Valerie

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[www.bristolvt.org](http://www.bristolvt.org)

## Meeting Attendance

Thank you for participating in our ongoing efforts to help Addison County communities prepare for natural and/or man-made emergencies. Because available funding sources often require non-federal matches to the dollars our region is receiving, we need to document your time and expenses in lieu of hard dollars. We appreciate the time and effort you are volunteering. Thanks for your assistance.

1. Incident Name (Meeting/Course)	2. Operational period Date: Time:	3. Check-In (Meeting/Course) Location		Check-In List ICS 211-P		
4. Name	5. Town or Agency	6. Position?	7. Volunteer? (Y/N)	8. Mileage? (to & from)	9. Hrs. contributed (include travel)	
Bristol Hazard Mitigation Committee	11/5/11 3:00 →	Holly Hall				
Peter J. Bouvier	Bristol	Road Foreman	N	3.4		
Gary L. Clark	Bristol	Planning Comm.	Y			
Katie Raynoff-Megan	Bristol	PC	Y	.2		
Valerie Capels	"	Town Admin				
Brett LaRose	Bristol	Fire Chief	Paid on-call	NA		
Joel Bourner	Bristol	JB		NA		
Kristen Underwood	Bristol	Cons. Comm.	Y	NA		
Page ____ of ____	10. Prepared by:		Date/Time			

Thank you for participating in our ongoing efforts to help Addison County communities prepare for natural and/or man-made emergencies. Because available funding sources often require non-federal matches to the dollars our region is receiving, we need to document your time and expenses in lieu of hard dollars. We appreciate the time and effort you are volunteering. Thanks for your assistance.

1. Incident Name (Meeting/Course)	2. Operational period Date: Time:	3. Check-In (Meeting/Course) Location		Check-In List ICS 211-P		
4. Name	5. Town or Agency	6. Position?	7. Volunteer? (Y/N)	8. Mileage? (to & from)	9. Hrs. contributed (include travel)	
Bristol Hazard Mitigation Committee Meeting	3/13/16 6:30	Holly Hall				
Tim Bouton	ACR PC	SP Planner	N			
Kristen Underwood	Bristol	Cons. Comm.	Y		1	
Brett LaRose	Bristol F.D	Fire Chief	Y			
Krist Perdue	Zionsg	Zionsg Admin	N			
Valerie Capels	Bristol	Town Admin	N			
K. Raynoff-Megan	Bristol	Planning Comm.	Y			
Page ____ of ____	10. Prepared by:		Date/Time			

## Annex C

### Mitigation Measures by Hazard Type

Mitigation measures for “all-hazards” have been adapted from a flood mitigation approach developed by French Wetmore, of Wetmore and Associates in Park Forest, Illinois, into six categories:

- Prevention – measures intended to keep a hazard risk problem from becoming worse. They ensure that future development does not increase hazard losses. Examples would include: Planning and Zoning, Open space preservation, Land Development regulations, storm water management.
- Property Protection – measures used to modify buildings, or their surroundings, subject to hazard risk rather than prevent the hazard from occurring. Examples are: Acquisition of vulnerable properties, Relocation from hazard prone areas, Rebuild or modify structures to reduce damage by future hazard events, Flood-proofing of flood-prone buildings.
- Natural Resource Protection – measures intended to reduce the intensity of hazard effects as well as improve the quality of the environment and wildlife habitats. Erosion and sediment control and Wetlands protection are examples.
- Emergency Services – measures that protect people before and after a hazard event that would include: Warning, Response, Critical facilities protection, Health and safety maintenance.
- Structural Projects – measures that involve construction of man-made structures to control hazards. Some examples would include: dams, reservoirs, debris basins, channel modifications, storm sewers, elevated roadways.
- Public Information – activities intended to inform and remind people about hazardous areas and the measures to avoid potential damage and injury. Examples are: Outreach projects, Real estate disclosure, Technical assistance, Community education programs.

The following suggested Mitigation Measures were taken from the website of the Northeast States Emergency Consortium (NSEC).

#### ALL HAZARDS

- Map vulnerable areas and distribute information about the hazard mitigation strategy and projects.
- Provide information to contractors and homeowners on the risks of building in hazard-prone areas.
- Develop a list of techniques for homeowner self-inspection and implementation of mitigation activities.
- Organize and conduct professional training opportunities regarding natural hazards and hazard mitigation.
- Distribute NOAA weather radios.
- Develop sound land use planning based on known hazards.
- Enforce effective building codes and local ordinances.
- Increase public awareness of community hazards.

- Provide sites that are as free as possible from risk to natural hazards for commercial and industrial activities.
- Consider conservation of open space by acquisition of repetitive loss structures.
- Consider conservation of open space by acquisition of areas identified as “vulnerable or at risk”
- Ensure a balance between residential growth and conservation of environmental resources through a detailed analysis of the risks and vulnerability to natural hazards.
- Conduct joint planning and sharing of resources across regions, communities, and states.
- Establish a hazard mitigation council.
- For future proposed development design guidelines, incorporate hazard mitigation provisions, including improved maps.
- Consider adding a "safe room" requirement for all new buildings.
- Establish incentives to encourage business owners and homeowners to retrofit buildings with hazard resistant features.
- Teach disaster and hazard awareness in schools.

## **FLOOD**

### **Flood Hazard Mitigation Measures for Communities:**

- Developing and enforcing all-hazards building codes,
- Adopting incentives to encourage mitigation
- Developing administrative structures to support the implementation of mitigation programs
- Mitigation should be incorporated into future land use plans through riparian corridor protection, limiting flood hazard area development, and other measures.
- Developing and conducting public information campaigns on hazard mitigation should be a priority.
- Participate in the National Flood Insurance Program (NFIP).
- Conduct watershed geomorphic assessments.
- Encourage riparian corridor protection.

### **Flood Hazard Mitigation Measures for Individuals:**

#### *How to Protect Your Property:*

- Keep insurance policies, documents, and other valuables in a safe-deposit box. You may need quick, easy access to these documents. Keep them in a safe place less likely to be damaged during a flood.
- Avoid building in a floodplain. Some communities do not permit building in known floodplains. If there are no restrictions, and you are building in a floodplain, take precautions, making it less likely your home will be damaged during a flood.

- Raise your furnace, water heater, and electric panel to higher floors or the attic if they are in areas of your home that may be flooded. Raising this equipment will prevent damage. An undamaged water heater may be your best source of fresh water after a flood.
- Install check valves in building sewer traps to prevent flood water from backing up into the drains of your home. As a last resort, when floods threaten, use large corks or stoppers to plug showers, tubs, or basins.
- Seal walls in basements with waterproofing compounds to avoid seepage through cracks.
- Consult with a construction professional for further information if these and other damage reduction measures can be taken. Check local building codes and ordinances for safety requirements.
- Contact your local emergency management office for more information on mitigation options to further reduce potential flood damage. Your local emergency management office may be able to provide additional resources and information on ways to reduce potential damage.

## **HAZARDOUS MATERIALS**

### **Hazardous Material Hazard Mitigation Measures for Communities:**

FEMA's National Mitigation Action Plan suggests that state and local mitigation plans include the following:

- Developing and enforcing all-hazards building codes,
- Adopting incentives to encourage mitigation
- Developing administrative structures to support the implementation of mitigation programs
- Mitigation should be incorporated into land use management plans.
- Developing and conducting public information campaigns on hazard mitigation should be a priority.

Natural hazard events have often triggered technological hazards such as ruptured pipelines and building fires, clearly linking the natural and technological risks. Accordingly, the National Mitigation Strategy, as an all-hazards strategy, will build upon existing programs that mitigate technological hazards, and focus on the critical importance of coordination among efforts to mitigate hazards, regardless of the source of the risk.

- Recognize the dangers posed by hazardous materials.
- Identify places where hazardous materials are likely to be encountered.
- Understand when a hazard may exist.
- Contact the appropriate persons or agencies to give or receive specific hazardous materials information.
- Identify procedures to minimize personal and community exposure to hazardous materials.

Hazardous materials events can and do occur as independent events. Natural hazard events, however, have often triggered technological hazards such as ruptured pipelines and building fires, clearly linking the natural and technological risks. Accordingly, the National Mitigation Strategy, as an all-hazards strategy, will build upon existing programs that mitigate technological hazards, and focus on

the critical importance of coordination among efforts to mitigate hazards, regardless of the source of the risk.

Communities can and should:

- Recognize and identify the dangers posed by hazardous materials in the community.
- Identify industries and other locations places where hazardous materials are stored and used.
- Develop a community hazardous materials emergency plan.
- Develop an early warning and notification system.
- Work with local businesses and industry to identify procedures to minimize personal and community exposure to hazardous materials.

Hazardous Materials Hazard Mitigation Measures for Individuals: Individual and families should develop a personal plan of what to do in case of a hazardous materials accident.

*How to Plan for a Hazardous Materials Incident:*

- Learn to detect the presence of a hazardous material.
- Many hazardous materials do not have a taste or an odor. Some materials can be detected because they cause physical reactions such as watering eyes or nausea. Some hazardous materials exist beneath the surface of the ground and can be recognized by an oil or foam-like appearance.
- Contact your Local Emergency Planning Committee (LEPC) or local emergency management office for information about hazardous materials and community response plans.
- Find out evacuation plans for your workplace and your children's schools.
- Be ready to evacuate. Plan several evacuation routes out of the area.
- Ask about industry and community warning systems.
- Have disaster supplies on hand:
  - Flashlight and extra batteries
  - Portable, battery-operated radio and extra batteries
  - First aid kit and manual
  - Emergency food and water
  - Non-electric can opener
  - Essential medicines
  - Cash and credit cards
  - Sturdy shoes
- Develop an emergency communication plan. In case family members are separated from one another during a hazardous materials accident (this is a real possibility during the day when adults are at work and children are at school), develop a plan for reuniting after the disaster. Ask an out-of-state relative or friend to serve as the "family contact." After a disaster, it's often easier to call long distance. Make sure everyone knows the name, address and phone number of the contact person.

## **STRUCTURE FIRE**

### **Fire Hazard Mitigation Measures for Communities:**

FEMA's National Mitigation Action Plan suggests that state and local mitigation plans include the following:

- Developing and enforcing all-hazards building codes,
- Adopting driveway and water supply standards for new development.
- Adopting incentives to encourage mitigation
- Developing administrative structures to support the implementation of mitigation programs
- Mitigation should be incorporated into land use management plans.
- Developing and conducting public information campaigns on hazard mitigation should be a priority.

The United States Fire Administration (USFA) serves as the national focus on reducing fire deaths, injuries, and property losses. In 1974, Congress passed the Federal Fire Prevention and Control Act which established the USFA and the fire research program at the National Institute of Standards and Technology (NIST). The USFA works to involve the public and private sector to reduce losses through public education, arson detection and control, technology and research, fire data collection and analysis and fire service training and education. NIST performs and supports research on all aspects of fire with the aim of providing scientific and technical knowledge applicable to the prevention and control of fires.

### **Fire Hazard Mitigation Measures for Individuals:**

#### *How to Protect Your Property:*

- Keep lawns trimmed, leaves raked, and the roof and rain-gutters free from debris such as dead limbs and leaves.
- Stack firewood at least 30 feet away from your home.
- Store flammable materials, liquids and solvents in metal containers outside the home at least 30 feet away from structures and wooden fences.
- Create defensible space by thinning trees and brush within 30 feet around your home.
- Landscape your property with fire resistant plants and vegetation to prevent fire from spreading quickly.
- Post home address signs that are clearly visible from the road.
- Provide emergency vehicle access with properly constructed driveways and roadways, at least 12 feet wide with adequate turnaround space.
- Make sure water sources, such as hydrants and ponds, are accessible to the fire department.
- Burning yard waste is a fire hazard. Check with your local fire agency on a non-emergency number for fire permit requirements and restricted burning times.
- Use fire resistant, protective roofing and materials like stone, brick and metal to protect your home. Avoid using wood materials that offer the least fire protection.
- Cover all exterior vents, attics and eaves with metal mesh screens no larger than 6 millimeters.

- Install multipane windows, tempered safety glass or fireproof shutters to protect large windows from radiant heat.
- Use fire-resistant draperies for added window protection.
- Have chimneys, wood stoves and all home heating systems inspected and cleaned annually by a certified specialist.
- Fire Alarm Safety requires checking on or installing fire alarms in your home.
- Residential sprinklers have become more cost effective for homes. Currently, they protect few homes.

*How to Prepare for a Fire Emergency:*

- Know how to contact fire emergency services in your area.
- Plan ahead. Make sure you and your family are prepared for a fire emergency.
- Develop and practice escape and evacuation plans with your family.
- Install smoke alarms on every level of your home. Test them monthly and change the batteries at least once a year. Consider installing the new long-life smoke alarms.

## **WINTER STORM**

### **Winter Storm Hazard Mitigation Measures for Communities:**

FEMA's National Mitigation Action Plan suggests that state and local mitigation plans include the following:

- Developing and enforcing all-hazards building codes,
- Adopting incentives to encourage mitigation
- Developing administrative structures to support the implementation of mitigation programs
- Mitigation should be incorporated into land use management plans.
- Developing and conducting public information campaigns on hazard mitigation should be a priority.

In addition, FEMA recommends the following actions to further protect communities from the effects of winter storms:

- Building code development and enforcement of snow loads
- Develop a storm water management plan for snowmelt
- Assuring adequate supplies of sand and salt
- Maintaining snow removal equipment so that it is ready to be deployed
- Retrofitting public buildings to withstand snowloads and prevent roof collapse
- Clearing roofs of excessive snow accumulations
- Develop a winter storm plan or annex to the local emergency management plan
- Develop a capability to monitor weather forecasts, conditions and warnings issued by the National Weather Service
- Identify appropriate shelters for people who may need to evacuate due to loss of electricity, heat or coastal flooding due to storm surge

- Assure that critical facilities such as police and fire stations and schools are accessible and equipped
- Clearing streets and roads of snow to assure the passage of public safety vehicles and general traffic.

### **Winter Storm Hazard Mitigation Measures For Individuals:**

#### *How to Protect Your Property:*

- Make sure your home is properly insulated. If necessary, insulate walls and attic. This will help you to conserve electricity and reduce your home's power demands for heat. Caulk and weather-strip doors and windowsills to keep cold air out, allowing the inside temperature to stay warmer longer.
- Install storm windows or cover windows with plastic from the inside. This will provide an extra layer of insulation, keeping more cold air out.
- To keep pipes from freezing:
  - Wrap pipes in insulation or layers of old newspapers.
  - Cover the newspapers with plastic to keep out moisture.
  - Let faucets drip a little to avoid freezing.
- Know how to shut off water valves.
- If the pipes freeze, remove any insulation or layers of newspapers and wrap pipes in rags. Completely open all faucets and pour hot water over the pipes, starting where they were most exposed to the cold (or where the cold was most likely to penetrate). A hand-held hair dryer, used with caution to prevent overheating, also works well.
- Consider storing sufficient heating fuel. Regular fuel sources may be cut off. Be cautious of fire hazards when storing any type of fuel.
- Before winter, be sure you install and check smoke alarms.
- Install C/O detector and check annually.
- Use generator safely.
- Maintain functional transistor or battery radio.
- Maintain plug-in phone that functions when power is out.
- Consider keeping safe emergency heating equipment:
  - Fireplace with ample supply of wood.
  - Small, well-vented wood, coal, or camp stove with fuel.
  - Portable space heater or kerosene heater. Check with your local fire department on the legality of using kerosene heaters in your community. Use only the correct fuel for your unit and follow the manufacturer's instructions. Refuel outdoors only, and only when cool. Keep your kerosene heater at least three feet away from furniture and other flammable objects.
  - When using alternative heat from a fireplace, wood stove, space heater, etc., use fire safeguards and ventilate properly. Fire hazard is greatly increased in the winter because alternate heating sources are used without following proper safety precautions.

- Install snow fences in rural areas to reduce drifting in roads and paths, which could block access to homes, barns, and animals' feed and water.
- If you live in a flood-prone area, consider purchasing flood insurance to cover possible flood damage that may occur during the spring thaw. Homeowners' policies do not cover damage from floods. Ask your insurance agent about the National Flood Insurance Program if you are at risk.

*How to Plan for a Winter Storm:*

- Understand the hazards of wind chill, which combines the cooling effect of wind and cold temperatures on exposed skin. As the wind increases, heat is carried away from a person's body at an accelerated rate, driving down the body temperature. "Wind chill" is a calculation of how cold it feels when the effects of wind speed and temperature are combined. A strong wind combined with a temperature of just below freezing can have the same effect as a still air temperature about 35 degrees colder.
- Service snow removal equipment before winter storm season. Equipment should be available for use if needed. Maintain it in good working order.
- Keep your car's gas tank full for emergency use and to keep the fuel line from freezing.
- Get training. Take an American Red Cross first aid course to learn how to treat exposure to the cold, frostbite, and hypothermia.
- Discuss with your family what to do if a winter storm WATCH or WARNING is issued. Designate one household member as the winter storm preparedness leader. Have him or her discuss what to do if a winter storm watch or warning is issued. Have another household member state what he or she would do if caught outside or in a vehicle during a winter storm. Everyone should know what to do in case all family members are not together. Discussing winter storms ahead of time helps reduce fear and lets everyone know how to respond during a winter storm.

## **HIGH WINDS**

### **High Wind Hazard Mitigation Measures for Communities:**

FEMA's National Mitigation Action Plan suggests that state and local mitigation plans include the following:

- Developing and enforcing all-hazards building codes
- Adopting incentives to encourage mitigation
- Developing administrative structures to support the implementation of mitigation programs
- Mitigation should be incorporated into land use management plans
- Developing and conducting public information campaigns on hazard mitigation should be a priority

FEMA also suggests that communities further reduce their vulnerability to hurricanes through the adoption and enforcement of wind- and flood-resistant building codes. Sound land-use planning can also ensure that structures are not built in the highest hazard areas.

## **High Wind Hazard Mitigation Measures for Individuals:**

- Make a list of items to bring inside in the event of a storm. A list will help you remember anything that can be broken or picked up by strong winds. High winds, often in excess of 40 miles per hour, can turn unanchored items into missiles, causing damage or injury when they hit.
- Keep trees and shrubbery trimmed. Make trees more wind resistant by removing diseased or damaged limbs, then strategically remove branches so that wind can blow through. High winds frequently break weak limbs and hurl them at great speed, causing damage when they hit property. Debris collection services may not be operating just before a storm, so it is best to do this well in advance of approaching storms.
- Remove any debris or loose items in your yard. High winds can pick up anything unsecured, creating damage to property when the debris hits.
- Install protection to the outside areas of sliding glass doors. Glass doors are as vulnerable as windows to breakage by wind-driven objects.
- If you live in a flood plain or are prone to flooding, also follow flood preparedness precautions. Nor'easters and severe thunderstorms can bring great amounts of rain and frequently cause floods.

## **EARTHQUAKE**

### **Earthquake Hazard Mitigation Measures for Communities:**

FEMA's National Mitigation Action Plan suggests that state and local mitigation plans include the following:

- Developing and enforcing all-hazards building codes,
- Adopting incentives to encourage mitigation
- Developing administrative structures to support the implementation of mitigation programs
- Mitigation should be incorporated into land use management plans.
- Developing and conducting public information campaigns on hazard mitigation should be a priority.

FEMA's Earthquake Program has four basic goals directly related to the mitigation of hazards caused by earthquakes. They are to:

- Promote Understanding of Earthquakes and Their Effects.
- Work to Better Identify Earthquake Risk.
- Improve Earthquake-Resistant Design and Construction Techniques.
- Encourage the use of Earthquake-Safe Policies and Planning Practices.

### **Earthquake Hazard Mitigation Measures for Individuals**

*How to Protect Your Property:*

- Bolt bookcases, china cabinets, and other tall furniture to wall studs. Brace or anchor high or top-heavy objects. During an earthquake, these items can fall over, causing damage or injury.
- Secure items that might fall (televisions, books, computers, etc.). Falling items can cause damage or injury.
- Install strong latches or bolts on cabinets. The contents of cabinets can shift during the shaking of an earthquake. Latches will prevent cabinets from flying open and contents from falling out.
- Move large or heavy objects and fragile items (glass or china) to lower shelves. There will be less damage and less chance of injury if these items are on lower shelves.
- Store breakable items such as bottled foods, glass, and china in low, closed cabinets with latches. Latches will help keep contents of cabinets inside.
- Store weed killers, pesticides, and flammable products securely in closed cabinets with latches, on bottom shelves. Chemical products will be less likely to create hazardous situations from lower, confined locations.
- Hang heavy items, such as pictures and mirrors, away from beds, couches, and anywhere people sit. Earthquakes can knock things off walls, causing damage or injury.
- Brace overhead light fixtures. During earthquakes, overhead light fixtures are the most common items to fall, causing damage or injury.
- Strap the water heater to wall studs. The water heater may be your best source of drinkable water following an earthquake. Protect it from damage and leaks.
- Bolt down any gas appliances. After an earthquake, broken gas lines frequently create fire hazards.
- Install flexible pipe fittings to avoid gas or water leaks. Flexible fittings will be less likely to break.
- Repair any deep cracks in ceilings or foundations. Get expert advice if there are signs of structural defects. Earthquakes can turn cracks into ruptures and make smaller problems bigger.
- Check to see if your house is bolted to its foundation. Homes bolted to their foundations are less likely to be severely damaged during earthquakes. Homes that are not bolted have been known to slide off their foundations, and many have been destroyed because they are uninhabitable.
- Consider having your building evaluated by a professional structural design engineer. Ask about home repair and strengthening tips for exterior features, such as porches, front and back decks, sliding glass doors, canopies, carports, and garage doors. Learn about additional ways you can protect your home. A professional can give you advice on how to reduce potential damage.
- Follow local seismic building standards and safe land use codes that regulate land use along fault lines. Some municipalities, counties, and states have enacted codes and standards to protect property and occupants. Learn about your area's codes before construction.

#### *How to Plan for an Earthquake:*

- Pick "safe places" in each room of your home. A safe place could be under a sturdy table or desk or against an interior wall away from windows, bookcases, or tall furniture that could fall on you. The shorter the distance to move to safety, the less likely you will be injured. Injury

statistics show that persons moving more than 10 feet during an earthquake's shaking are most likely to experience injury.

- Practice drop, cover, and hold-on in each safe place. Drop under a sturdy desk or table, hold on, and protect your eyes by pressing your face against your arm. Practicing will make these actions an automatic response. When an earthquake or other disaster occurs, many people hesitate, trying to remember what they are supposed to do. Responding quickly and automatically may help protect you from injury.
- Practice drop, cover, and hold-on at least twice a year. Frequent practice will help reinforce safe behavior.
- Talk with your insurance agent. Different areas have different requirements for earthquake protection. Study locations of active faults, and if you are at risk, consider purchasing earthquake insurance.
- Inform guests, babysitters, and caregivers of your plan. Everyone in your home should know what to do if an earthquake occurs. Assure yourself that others will respond properly even if you are not at home during the earthquake.
- Get training. Take a first aid class from your local Red Cross chapter. Get training on how to use a fire extinguisher from your local fire department. Keep your training current. Training will help you to keep calm and know what to do when an earthquake occurs.
- Discuss earthquakes with your family. Everyone should know what to do in case all family members are not together. Discussing earthquakes ahead of time helps reduce fear and anxiety and lets everyone know how to respond.

## Annex D Potential Mitigation Project Funding Sources

### Federal

#### FEMA

- **Pre-Disaster Mitigation Program.** As part of the Disaster Mitigation Act of 2000 (Section 322 of the Robert T. Stafford Disaster Relief and Emergency Act), FEMA's Pre-Disaster Mitigation Competitive (PDM-C) Grant Program provides funds to states, territories, and federally recognized tribes for pre-disaster mitigation activities. The grant program is administered by FEMA for pre-disaster mitigation planning and projects primarily addressing natural hazards. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. The intent of the PDM-C grant program is to provide a consistent source of funding for pre-disaster mitigation planning and projects.
- **Hazard Mitigation Grant Program.** The Hazard Mitigation Grant Program (Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act) is activated during Presidential Disaster Declarations to assist in identifying mitigation projects, and funding these projects on a 75% Federal/25% non-Federal cost share basis. Mitigation program funding is based on 15% of the federal funds expended for the Infrastructure and Individual Assistance Programs. The HMGP supports other program activities, i.e. participation the NFIP is required for recipients of HMGP funds.
- **Disaster Preparedness Improvement Grants.** Under the Disaster Preparedness Improvement Grants (Section 201 of the Stafford Act), FEMA provides up to 50% matching funds to states annually to improve or update their disaster assistance plans and capabilities. States can use these funds to: implement measures in a Hazard Mitigation Plan; develop pre-disaster Hazard Mitigation Plans; expand an existing Hazard Mitigation Plan; develop hazard specific annexes; or develop administrative plans for the implementation of the Hazard Mitigation Grant Program.
- **Hazard Mitigation Technical Assistance Program Contract.** HMTAP was established to provide FEMA with response capability for various post-disaster mitigation opportunities. The contractor has the capability to: (1) evaluate construction science techniques and practices, including build codes; (2) prepare environmental assessments or impact statements and historic preservation reviews and assessments; (3) conduct biological assessments and surveys, (4) conduct surveys, assessments, and reviews of other areas of impact such as water quality and wetland delineation; (5) conduct benefit/cost, social science, and public administration assessments; (6) conduct post-event assessments to identify mitigation opportunities; (7) Provide post-disaster land surveying, mapping services and cost estimates using GIS, GPS, and remote sensing; (8) perform floodplain analyses; (9) conduct hazard

identification and risk assessment to confirm accuracy and specific actions or methodologies needed for disaster areas; (10) document estimated flood elevations to guide reconstruction and to compute flood frequency; and (11) provide training for benefit/cost analysis, retrofit options, the Hazard Mitigation Grant Program, and National Environmental Policy Act.

- **National Flood Insurance Program (NFIP).** The National Flood Insurance Program (NFIP) makes federally subsidized flood insurance available to property owners in locations agreeing to participate in the NFIP. If communities enter the NFIP they are required to adopt floodplain ordinances meeting criteria established by FEMA. These criteria include: requiring permits for development within designated floodplains; review development plans and subdivision proposals to determine whether proposed sites will be reasonably safe from flooding; require protection of water supply and sewage systems to minimize infiltration of floodwater; obtain, review, and utilize all base flood elevation data; and assure the maintenance of flood carrying capacities within all watercourses.
- **The Community Rating System.** An element of the NFIP is designed to promote the availability of flood insurance, reduce future flooding damage, and ensure the accurate rating of flood insurance policies. Participating communities may receive credit for proven mitigation measures, thus reducing the cost of flood insurance within their jurisdictions.
- **The Individual Assistance Loss Prevention Program.** Available to provide eligible owner- occupants, who sustained damage and received Disaster Housing Minimal Repair Funds, the opportunity to participate in a voluntary program where additional 100% federal funds are made available to break the damage-rebuild-damage cycle and help homeowners reduce or eliminate losses from future weather-related damage.
- **The Individual and Family Grant (IFG) Minimization Program.** Available to provide IFG-eligible owner- occupants the opportunity to participate in a voluntary program where additional state and federal funds are made available to break the damage-rebuild-damage cycle, and help reduce or eliminate losses from future weather-related damage. In addition, FEMA's 800 series provides funding for low cost mitigation measures.
- **The Infrastructure Program (Section 406 of the Stafford Act).** Authorizes funding for the repair, restoration, or replacement of damaged facilities belonging to public and private non-profit entities, and for other associated expenses, including emergency protective measures and debris removal. The Infrastructure Program also authorizes funding for appropriate cost-effective hazard mitigation related to damaged public facilities.
- **The National Inventory of Dams (US Army Corps of Engineers project).** Identifies high-hazard dams and encourages the development of warning systems and emergency plans for many of these facilities.

- **Hazardous Materials Program.** FEMA’s mission under this program is to provide technical and financial assistance to States and local jurisdictions and to coordinate with public and private sector entities to develop, implement, and evaluate HAZMAT emergency preparedness programs. FEMA supports State and local agencies in the design, implementation, and evaluation of HAZMAT- related training and planning exercises and cooperates with the U.S. Department of Transportation in the maintenance of electronic bulletin boards to provide the latest information on HAZMAT planning, training, exercises, and conferences.
- **US Fire Administration (USFA).** Through the USFA, FEMA administers a nationwide program to enhance fire prevention and control activities and to reduce significantly the loss of life and property caused by fires. Programs are carried out by: National Fire Academy; Office of Fire Prevention and Arson Control; Office of Firefighter Health and Safety; Office of Fire Data and Analysis; Office of Federal Fire Policy and Coordination; Office of National Emergency Training Center Operations and Support, and Office of Educational Technology.
- **ARRA Fire Station Construction Grants (DHS)** The purpose of the ARRA SCG is to create or save jobs in recession-hit areas and achieve other purposes stated in ARRA, and achieve AFG goals of firefighter safety and improved response capability/capacity based on need through the construction, renovation or modification of fire stations.

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

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

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

- Studies and projects
- Discretionary authority to implement certain types of water resources projects without specific Congressional approval. These projects are typically limited in cost and duration, and include:
  - Section 14 - Emergency Stream Bank Protection of Public Facilities, limitation of \$500,000 per project.
  - Section 107 - Small Navigation Projects, usually for port facilities and navigation channels. Work on channels usually improves stream flow and aids flood control efforts.
  - Section 205 - Small Flood Control Projects, not to exceed \$5 million. Funds may be used for projects such as upgrading flood protection structures and channelization of streams.
  - Floodplain Technical Assistance, to include:
    - Conducting floodplain mapping surveys to provide either first-time mapping of an area or to correct older floodplain maps;
    - Conducting flood studies in cooperation with FEMA to determine actual flood levels for settlement of flood insurance claims;
    - Providing technical advice regarding proposed floodplain ordinances and building codes.
- Emergency operations to respond to flood emergencies, to include flood fighting, constructing advance temporary measures in anticipation of imminent flood, and the repair of damaged flood control works after the flood event.
- Permit authority, the Corps has the authority to issue permits to cover construction excavation and other related work in or over navigable waterways; and permits covering the discharge of fill material in all waters of the United States and adjacent wetlands.

### **Department of Housing and Urban Development**

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

- Section 312 Loan Program. Provides funds to rehabilitate both residential and non-residential properties, including flood repair and flood proofing.

**Department of Agriculture Natural Resource Conservation Service (NRCS)** can provide technical assistance in the conservation, development, and productive use of water resources. In addition, the NRCS monitors use of prime farmland.

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

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

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

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

## State

### **VTrans**

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

### **Agency of Natural Resources**

- Ecosystem Restoration Grant Program. As part of a governor's initiative to improve water quality in Lake Champlain, funds have been allocated to assist in clean-up. Funds from this source have paid for a large portion of recent geomorphic studies in

the Addison region as well as supporting the development of Fluvial Erosion Hazard Zones. Additionally, funds have been allocated to purchase development rights in hazardous locations.

### **Department of Public Safety, Division of Emergency Management**

- Hazard Mitigation Grant Program. Previously described under Federal Programs.
- Pre-Disaster Mitigation Program. Previously described under Federal Programs.
- Local Emergency Management Director Program. A continuing program of training for local emergency management directors to provide a consistent base of knowledge to understand their roles and responsibilities in Emergency Management.
- Generator Grant Program. VEM allocates funds from FEMA EMPG to allow towns to purchase back-up power sources for emergency shelters for continued use in the event of a power failure.

### **Regional**

The Addison County Regional Planning Commission (ACRPC) provides assistance to local governments concerning planning for future land use, business, transportation, emergency management and population.

In addition to the specific programs mentioned below, ACRPC has identified Municipal Development Plans and Capital Improvement Plans as appropriate local planning mechanisms suitable for incorporating many of the provisions of this plan. These plans, by statute, need to be updated on a 5-year rotation. In Addison County, each municipality adopts these new or updated plans according to their own timetable and therefore, each is at a different place in the planning and adoption process. At the time of each rewrite, ACRPC generally assists local planning commissioners and will encourage inclusion of appropriate provisions of this plan into any new document.

One effective ongoing program is a local culvert survey and upgrade program, which is sponsored by the ACRPC. This program provides funding to communities for survey and location of installed culverts to determine condition and effectiveness. Those identified as needing repair and replacement are eligible for hazard mitigation funding.

Past regional mitigation projects and initiatives include:

Project Impact. FEMA and Vermont Emergency Management designated Addison County as a “Project Impact” community in 1999. The goal of “Project Impact” is to bring communities together to take actions that prepare for and protect themselves against disasters in a collaborative effort. “Project Impact” encourages communities to do these things:

- Identify Hazards and Community Vulnerability
- Prioritize Hazard Risk Reduction Efforts
- Build Community Partnerships for Risk Reduction Projects and Activities
- Communicate Successes and Establish Public Education

The list of projects that have all or a portion of the project cost supported by Project Impact include:

- Red Cross Schools Program
- Culvert Replacement/Stone Lined Ditch in Goshen
- Demonstration House in Cornwall
- Middlebury River Assessment
- Ripton Fire Station Move
- Weather Radio Purchases
- Shoreline Stabilization Handbooks for the Lakeside Towns
- Flood Warning Rain Gauges – Mountain Towns
- Monkton Evacuation Center
- Back-up Power Project

The Lewis Creek Study. Vermont Department of Environmental Conservation (VTDEC) River Management Program, in collaboration with academic, agency and watershed association partners, completed a pilot project in the Lewis Creek watershed. The project was intended to help develop remote sensing and rapid stream geomorphic assessment methodologies that would help to problem solve at the watershed level, gain a broader constituency for river management and to have a consistent statewide protocol.

Pre-Disaster Mitigation (PDM-C) Planning Grants: Development and continued updating of this and other mitigation planning activities are supported through funding from FEMA's PDM-C, Flood Mitigation Assistance (FMA), and Emergency Management Performance Grant (EMPG) grants.

Geomorphic Assessments, State of Vermont Agency of Natural Resources and PDM-C funding supported ongoing geomorphic assessments on the major flash flood prone streams and rivers in the Addison Region including the Middlebury River, New Haven River, Neshobe River, Leicester River, Lemon Fair, and Otter Creek. These studies have benefitted both mitigation of disasters and mitigation of ongoing surface water pollution.

### **Acknowledgements:**

The creation of this plan update is the result of many, many efforts to create hazard mitigation plans for communities in the State of Vermont. We have borrowed liberally from other adopted plans from throughout the state sometimes basic concepts and design, and at other times duplication of wording and illustrations.

ACRPC wants to thank specifically all other Regional Planning Commissions and their collective staff for the collaborative efforts that have resulted in this and many other plans statewide. Additional thanks for many of the same reasons need to go out to all the state agencies that are equally committed to mitigating the risks we face in Vermont.

Special thanks to the State of Vermont's Division of Emergency Management and Homeland Security and especially Lauren Oats the State Hazard Mitigation Officer (SHMO) and Stephanie Smith in the mitigation division.

Lastly, thanks to the residents and officials of the Town of Bristol who have spent countless hours living and working with these hazards.

Thank you for caring enough about your community to spend even more hours to bring that collective experience into this document.

Thank you to:

Joel Bouvier	Bristol Selectboard
Peter Bouvier	Bristol Road Foreman
Valerie Capels	Bristol Town Administrator
Brett LaRose	Bristol Fire Dept. Chief
Jill Marsano	VT Utility Management Systems
Kris Perlee	Bristol Zoning Administrator
Katie Raycroft-Meyer	Bristol Planning Commission Chair
Kristen Underwood	Bristol Conservation Commission