Town of Bradford, Vermont

2017 Local Hazard Mitigation Plan

Prepared by the Two Rivers-Ottauquechee Regional Commission and the Town of Bradford

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Date of Town Adoption: August 10, 2017

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Date of Final Approval by FEMA: August 21, 2017

U.S. Department of Homeland Security
FEMA Region I
99 High Street, Sixth Floor
Boston, MA 02110-2132

FEMA

AUG 21 2017

Lauren Oates
State Hazard Mitigation Officer
Vermont Department of Public Safety
45 State Drive
Waterbury, Vermont 05671-1300

Dear Ms. Oates:

We would like to acknowledge the Town of Bradford and the State of Vermont for their dedication and commitment to mitigation planning. The Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA) Region I Mitigation Planning Team has completed its review of the Town of Bradford, Vermont 2017 Local Hazard Mitigation Plan and determined it meets the requirements of 44 C.F.R. Pt. 201.

With this plan approval, the Town of Bradford is eligible to apply to the Vermont Division of Emergency Management & Homeland Security for mitigation grants administered by FEMA. Requests for mitigation funding will be evaluated individually according to the specific eligibility requirements identified for each of these programs. A specific mitigation activity or project identified in your community's plan may not meet the eligibility requirements for FEMA funding; even eligible mitigation activities or projects are not automatically approved.

Approved mitigation plans are eligible for points under the National Flood Insurance Program's Community Rating System (CRS). Complete information regarding the CRS can be found at http://www.fema.gov/national-flood-insurance-program-community-rating-system, or through your local floodplain administrator.

The Town of Bradford, Vermont 2017 Local Hazard Mitigation Plan must be reviewed, revised as appropriate, and resubmitted to FEMA for approval within **five years of the plan approval date of August 14, 2017** in order to maintain eligibility for mitigation grant funding. We encourage the Town to continually update the plan's assessment of vulnerability, adhere to its maintenance schedule, and implement, when possible, the mitigation actions proposed in the plan.

AUG 2 1 2017

Once again, thank you for your continued dedication to public service demonstrated by preparing and adopting a strategy for reducing future disaster losses. Should you have any questions, please do not hesitate to contact Melissa Surette at (617) 956-7559.

Sincerely,

Paul F. Ford
Acting Regional Administrator

PFF: ms

cc: Ben Rose, Recovery and Mitigation Section Chief, VT DEMHS
Stephanie Smith, Hazard Mitigation Planner, VT DEMHS

Enclosure

CERTIFICATE OF ADOPTION
August 10, 2017
TOWN OF Bradford, Vermont Selectboard
A RESOLUTION ADOPTING THE Bradford, VT 2017 Local Hazard Mitigation Plan

WHEREAS, the Town of Bradford has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of the hazards profiled in the **Bradford, Vermont 2016 Local Hazard Mitigation Plan,** which result in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Bradford has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its **Bradford, Vermont 2017 Local Hazard Mitigation Plan (Plan)** under the requirements of 44 CFR 201.6; and

WHEREAS, the **Plan** specifically addresses hazard mitigation strategies, and Plan maintenance procedures for the Town of Bradford; and

WHEREAS, the **Plan** recommends several hazard mitigation actions (projects) that will provide mitigation for specific natural hazards that impact the Town of Bradford with the effect of protecting people and property from loss associated with those hazards; and

WHEREAS, adoption of this **Plan** will make the Town of Bradford eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by Town of Bradford Selectboard:

1. The **Bradford, Vermont 2017 Local Hazard Mitigation Plan** is hereby adopted as an official plan of the Town of Bradford;

2. The respective officials identified in the mitigation action plan of the **Plan** are hereby directed to pursue implementation of the recommended actions assigned to them;

3. Future revisions and **Plan** maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as part of this resolution for a period of five (5) years from the date of this resolution; and

4. An annual report on the process of the implementation elements of the Plan will be presented to the Selectboard by the Emergency Management Director.

IN WITNESS WHEREOF, the undersigned have affixed their signature and the corporate seal of the Town of Bradford this 10th day of Aug 2017.

DANIELLE KINGSBURY
Notary Public - State of Vermont
Orange County
My Comm. Expires Feb. 10, 2019

8-10-17

Selectboard Chair

Selectboard Member

ATTEST

Town Clerk

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I. Introduction

Natural and human-caused hazards may affect a community at any time. Natural hazard events cannot be stopped; however, their impact on human life and property can be reduced through community planning. Accordingly, this Local Hazard Mitigation Plan (hereafter referred to simply as the Plan) seeks to provide an all-hazards mitigation strategy that will make the community of Bradford more disaster resistant.

"Mitigation" is defined as any sustained action that reduces or eliminates long-term risk to people and property from natural and human-caused hazards and their effects. Previous Federal Emergency Management Agency (FEMA), State and Regional Project Impact efforts have demonstrated that it is less expensive to anticipate disasters than to repeatedly ignore a threat until the damage has already been done. While hazards cannot be eliminated entirely, it is possible to identify prospective hazards, anticipate which might be the most severe, and recognize local actions that can be taken ahead-of-time to reduce the damage. These actions, also known as 'hazard mitigation strategies' can (1) avert the hazards through redirecting impacts by means of a structure, land treatment, or land use pattern change; (2) adapt to the hazard by modifying structures or standards or; (3) avoid the hazard through improved public education, relocation/removal of buildings in the flood zone, or ensuring development is disaster resistant.

II. Purpose of the Plan

The purpose of this Plan is to assist Bradford in identifying all hazards facing the town, ranking them according to local vulnerabilities, and identifying strategies to reduce risks from vulnerabilities of highest concern. Implementation of this plan will make our community more resistant to harm and damages in the future and will reduce public costs.

The Town of Bradford seeks to be in accordance with the strategies, goals, and objectives of the State Hazard Mitigation Plan.

The 2017 Bradford Local Hazard Mitigation Plan is the first single jurisdiction mitigation plan drafted for the Town. Previously, the Town had a town-specific 2010 Annex in the Regional (mulit-jurisdiction) Pre-Disaster Mitigation Plan. This new Plan has been reorganized and new sections have been added:

- Program eligibility subsequent to plan approval
- Authority for plan development
- Participating jurisdictions
- Funding for plan development
- Brief information about the community

Old assumptions have been challenged throughout, and new information has been added to make the plan stronger and more useful for the Bradford town officials and residents who will implement the hazard mitigation strategies in the future.

III. Community Profile

Bradford is located in the northeast corner of Orange County. It borders the Connecticut River and Piermont, New Hampshire to the east, the Towns of Fairlee and West Fairlee to the south, the Town of Newbury to the north, and the Town of Corinth to the west. The Town of Bradford's dominant landscape features are the Connecticut River Valley, The Waits River Valley, and Wrights Mountain. The Town contains the Bradford Village Center, which was last approved in 2016 by the Vermont Downtwon Development Board. In 2010, Bradford's population was 2,797, and grew by 6.8% from 2000. The Town's population is currently at its historic height. Bradford has had large historic population growth spurts in the late 1900s. The Town's population increased by 34.7% between 1970 and 1980, and it increased by another 15.1% from 1980 to 1990.

According to Vermont Housing data, there were 1,281 housing units, 1104 occupied and 177 vacant, in Bradford in 2010. This represents a 5.25% increase in housing units from 2000 (equivalent to more than 6 housing units being added to housing stock figures per year). 7.3% of the Town's housing stock is comprised of units for seasonal, recreational, or occasional use. While 5% of Bradford's housing units were built in the decade from 2000 to 2010, 34% of Bradford residences were built prior to 1939, according to the 2010 U.S. Census.

The Town lies within the service area of Green Mountain Power, which supplies electrical power to the majority of the town located along the main roads in Bradford. Washington Electric Coop supplies electric power to the western portion of Town.

Bradford is host to the largest dam in the Waits River watershed, the Waits River Dam, which is used to generate electricity. The Federal Energy Regulatory Commission regulates the Waits River Dam and manages it as a run-of-river dam, although there is a bypass reach which has low water levels. Dam break is considered highly unlikely.

Bradford owns and maintains a municipal water system, which consists of a 500,000 gallon concrete underground reservoir, a 500,000 gallon concrete tank, and a no longer in service 1,000,000 gallon open reservoir. This system provides water for the majority of U.S. Route 5 and the Lower Plain area.

Construction on Bradford's new Fire Station, located at 135 Carson Lane, was completed in 1998. It contains six bays for fire and rescue vehicles, an office for the Fire Chief, and a large meeting room. The fire department responds to structural fires, chimney fires, and all automobile-related rescue calls. The Fire Department responded to 169 calls in 2016. Bradford is part of the mutual aid network. The town currently employs one full-time Police Chief, and three part-time officers. The Orange County Sheriff's Department provides extra coverage when requested by the Chief. The Vermont State Police from the Bradford Barracks provides coverage of the town during other hours. The State Police also provides backup when requested by the Town Police Department.

The Bradford FAST Squad is a first-responder service that answers emergency medical calls and provides immediate and temporary medical treatment to the sick or injured until a doctor can be secured or an ambulance arrives so the victim can be transported to a hospital. Upper Valley Ambulance, located in Fairlee, provides ambulance services to Bradford and eight other municipalities in Vermont and New Hampshire. They provide emergency medical transportation services as well as non-emergency transportation services to hospitals, nursing homes, and residences.

IV. The Planning Process

A. Plan Developers

Michael Storace, a Planner at the Two Rivers-Ottauquechee Regional Commission (TRORC), assisted the Town of Bradford with updating its Local Hazard Mitigation Plan. Committee members who assisted with the revisions include:

This section of the Plan satisfies 44 CFR 201.6(b)(1) and 201.6(c)(1) (or, A3.a and A3.b of FEMA's Local Mitigation Plan Review Guide, 2011).

Name	Role/Organization	How Participation Was Solicited
Ted Unkles	Selectboard Chair	On 12/15/2014 Samantha Holcomb (TRORC Staff), and on 10/5/2015 Michael Storace (TRORC staff) reached out to the Bradford Selectboard (Ted Unkles, Randy Moore, Lisa Sharp, Dan Perry III, and Carole Taylor), and the Town Emergency Director (Gary Moore). TRORC staff coordinated with Bradford town officials to set up an introductory meeting. The first meeting was scheduled for 12/05/2016. Michael Storace of TRORC's staff attended that meeting, followed by many more meetings in which participants revised and developed the LHMP. See below for more meeting-specific details.
Gary Moore	Emergency Management Director	
Phil Page	Road Foreman	
Ryan Terrill	Fire Chief, LEPC Representative	
Bryan Mitofsky	Planning Commission Member	

B. Plan Development Process

The 2010 Bradford Annex was originally part of the 2008 multi-jurisdictional Regional Hazard Mitigation Plan, drafted by Two Rivers-Ottauquechee Regional Commission, and approved by FEMA on September 30, 2008 with its first local annex. The Bradford Annex received subsequent FEMA approval, but, since it was part of a larger plan, FEMA treats its start date as September 30, 2008, meaning the Bradford Annex expired on September 30, 2013.

This section of the Plan satisfies the Element A: Planning Process requirements set out in 44 CFR 201.6.

This Plan has been reconstructed now as a single jurisdiction, stand-alone Bradford Local Hazard Mitigation Plan that will be submitted for individual approval to FEMA. As such, several sections have been added or updated to include all necessary information.

<u>The changes to this Plan include</u>:

- **General**
  - New sections: Plan Development Process, 2010 Mitigation Strategies Status Update chart, Existing Hazard Mitigation Programs, Projects & Activities, Plan Maintenance;
  - Data updates: New hazard incidents, emergency declarations, Census data;
  - Hazards have been reevaluated with the hazard ranking system used by the Vermont Division of Emergency Management and Homeland Security.
- **Hazards Analysis**
  - Hazardous Material Spills, Flash Flood/Flood/Fluvial Erosion, Extreme Cold/Snow/Ice Storm, and Structural Fire remain on the list of "top hazards," which reflect the local officials' belief that the Town is still vulnerable to these hazards;
  - Severe Weather has been added to the list of "top hazards," which reflects the intention/priorities of local officials to expand their analysis of hazards that the Town is or may be vulnerable to in the next five years;
  - For each hazard, a location/vulnerability/extent/impact/likelihood table has been added to summarize the hazard description.
- **Maps**
  - A map of the Town of Bradford depicting critical facilities, town infrastructure, and the NFIP designated floodway, the 100-year, and 500-year floodplain has been added.

<u>The following represent the avenues taken to draft the Bradford Local Hazard Mitigation Plan:</u>

- **Activities and Public participation and involvement (44 CFR 201.6(b)(1))**

***Note: The meetings listed below were public sessions (the agenda was posted prior to the meeting).*

  - December 2015: A notice was placed in the Two Rivers-Ottauquechee Regional Planning Commission Newsletter alerting recipients that Bradford was engaging in hazard mitigation planning and updating their Local Hazard Mitigation Plan. Contact information was provided in the notice to allow those interested in Bradford's efforts to

receive more information and how to find out about upcoming meetings. No comments were received.

- 12/5/2016: Michael Storace met with Bradford LHMP committee members to introduce the update/plan development process, to review Bradford's existing Hazard Mitigation Plan (adopted in July 2010), to rank potential hazards, and to introduce data collection/research process. Michael explained to the committee what the next steps in the process are (draft plan, and then schedule a meeting to review and discuss it). The meeting was warned according to Vermont's Open Meeting Law. No public comments were received.
- December 2016: A notice was placed in the Two Rivers-Ottauquechee Regional Planning Commission Newsletter alerting recipients that Bradford was engaging in hazard mitigation planning and updating their Local Hazard Mitigation Plan. Contact information was provided in the notice to allow those interested in Bradford's efforts to receive more information and how to find out about upcoming meetings. No comments were received.
- 2/8/2017 Michael Storace met with Bradford Hazard Mitigation Committee to review previous hazard mitigation strategies identified in the 2010 Annex. Committee reviewed town capabilities for implementing mitigation strategies. Michael led a mapping exercise, where committee members identified roads that frequently flood, vulnerabilities to specific hazards, and critical facilities. The meeting was warned according to Vermont's Open Meeting Law. No public comments were received.
- 3/30/2017: Met with committee to discuss first draft and to draft and review Hazard Mitigation Strategies. The entire draft was reviewed in detail, with TRORC staff making note of any comments or errors. Committee also reviewed hazard mitigation strategies for each hazard identified in the Plan. No comments from the public were received.

- **Governmental participation and involvement** *(44 CFR 201.6(b)(2)*)
  - Sent revised draft to the Selectboard Chair, Ted Unkles, and provided contact information for receiving comments via email/hard copy—3/17/2017
    - Comments were imported into the Plan.
  - Sent revised draft to Planning Commission Chair, Marcey Carver, and provided contact information for receiving comments via email/hard copy-3/17/2017
    - Comments were incorporated into the Plan.
  - Sent revised final draft to Division of Emergency Management and Homeland Security—7/7/2015
    - Plan sent to FEMA
  - Note: Town officials were given the opportunity to review, provide feedback and approve the changes that were made through the Plan revision and FEMA review process.
- **Neighboring community participation and involvement** *(44 CFR 201.6(b)(2)*)
  - December 2015: A notice was placed in the Two Rivers-Ottauquechee Regional Planning Commission Newsletter alerting recipients that Bradford was engaging in hazard

mitigation planning and updating their Local Hazard Mitigation Plan. Contact information was provided in the notice to allow those interested in Bradford's efforts to receive more information and how to find out about upcoming meetings. No comments were received.

- Posted a notice in four local papers alerting the public to the hazard mitigation planning process that was taking place. Contact information was provided in the notice to allow those interested in Bradford's efforts to receive more information and how to find out about upcoming meetings. No comments were received.
  - Valley News—ran 02/08/2016
  - The Herald of Randolph— ran 02/08/2016
  - Journal Opinion— ran 02/08/2016
  - Vermont Standard— ran 02/08/2016
- December 2016: A notice was placed in the Two Rivers-Ottauquechee Regional Planning Commission Newsletter alerting recipients that Bradford was engaging in hazard mitigation planning and updating their Local Hazard Mitigation Plan. Contact information was provided in the notice to allow those interested in Bradford's efforts to receive more information and how to find out about upcoming meetings. No comments were received.
- Sent revised draft to neighboring towns' Selectboards for comment and provided contact information for receiving comments via email/hard copy—04/05/2017
  - Towns of: Newbury, Corinth, Fairlee, and West Fairlee.
  - No comments were received.

- **Review of existing plans, studies, reports, and technical information** (*44 CFR 201.6(b)(3)*)
  - State of Vermont Hazard Mitigation Plan, 2013
  - Bradford Hazard Mitigation Plan (Adopted 07/22/2010)
    - This Plan was referenced extensively during the plan development process, especially in regard to the worst threats and mitigation action strategies identified in 2010.
  - Bradford Town Plan (Adopted 01/28/2016)
    - The Town Plan provided TRORC's staff with background information on the community, as well as more detail on their emergency services.
  - Bradford, Vermont Zoning Bylaw (Adopted 10/27/2005)
    - The Zoning Bylaws were referenced for general knowledge and for Bradford's Flood Hazard Regulations.
  - Bradford Local Emergency Operations Plan (LEOP) (Adopted 04/28/2016)
    - The Bradford LEOP was referenced for general knowledge regarding the Town's emergency operations.
  - Flood Insurance Study: Town of Bradford, Vermont (June 3, 1991)

This section of the Plan satisfies 44 CFR 201.6(b)(3) (or, A4.a and A4.b of FEMA's Local Mitigation Plan Review Guide, 2011).

- The Flood Insurance Study was referenced for general knowledge of Bradford's water bodies, the Connecticut River and Waits River, and for historic flooding information.

C. Status Update on Mitigation Actions Identified in 2010

The following table outlines the mitigation actions that were proposed in Bradford's 2010 All-Hazard Pre-Disaster Mitigation Plan for the Town of Bradford (adopted on July 22, 2010 as an appendix to the Two Rivers-Ottauquechee Regional Commission's multi-jurisdictional Pre-Disaster Mitigation Plan).

This section of the Plan satisfies the requirements of 44 CFR 201.6(d)(3).

Participants in the new Plan update process reviewed these actions and reported on the status of each (in order of 2010 priority). Actions related to long-term mitigation of natural hazards are so noted.

Mitigation Action	Who (Leadership)	When (Timeframe)	How (Funding/ Support)	2017 – Status of Mitigation Actions
ALL HAZARDS 1. Ensure that the Basic Emergency Operations Plan (BEOP) is current.	Selectboard and Planning Commission	Yearly	Local resources with TRORC assistance	The newest iteration of the BEOP is the Local Emergency Operations Plan (LEOP). The Bradford LEOP undergoes an annual update, and it was last updated and approved on 04/28/2016.
FLASH FLOOD 2. Develop an inspection and road improvement planning program that addresses culvert survey and upgrade and ditching.	Road foreman and selectboard	2009 and Ongoing	Local resources	Bradford's town road foreman regularly maintains and upgrades culverts, improves ditching, and maintains stone-lined ditches to State stone standards. Bradford also maintains 5 year Highway Plan that identifies and prioritizes projects for the Town. This action has been carried over into the 2017 Plan and will be continued in the future.
3. Revise flood hazard regulations	Selectboard and Planning Commission	2009	Local resources	Bradford's zoning bylaws, last updated on October 27, 2005, contain a Flood Hazard zoning district. Updates to regulations could further limit development in floodplain and frequently flooded areas. This action has been carried over into the 2017 Plan.
4. Improve flood and fluvial erosion hazard identification and mapping using PDM	Selectboard and Planning Commission	2010	With TRORC assistance	The 2017 Plan includes a map that identifies special flood hazard areas and river corridor areas, formally called fluvial erosion hazard areas, which are vulnerable to flooding and erosion. This map identifies vulnerable structures that are located within these areas.
5. Identify frequently flooded road locations and bridges	Road foreman	2009	Local resources with	The 2017 Plan identifies frequently flooded roads and bridges and identifies mitigation actions to address these locations..

Mitigation Action	Who (Leadership)	When (Timeframe)	How (Funding/ Support)	2017 – Status of Mitigation Actions
and develop mitigation actions.			TRORC assistance	However, a comprehensive culvert inventory would aid in the identification of undersized structures that could contribute to future road flooding.
<u>HAZMAT</u> 6. Develop emergency access points to the railroad corridor in locations where access is presently difficult in the event of derailment. Install call boxes	Emergency Management Director	2010	With state transportation agency assistance	The Railroad corridor parallels the Connecticut River in Bradford and poses a Hazardous Materials Spill hazard. Currently there are large agricultural practices that are open and accessible for emergency access for the railroad. This action has been completed and there is no need to expand upon it at this time.
7. Ensure that all emergency response and management personnel receive HAZMAT awareness training as a minimum.	Emergency Management Director	Ongoing	Local resources	Yes, the fire department receives HAZMAT awareness training, and most firefighters receive Firefighter 1 and Firefighter 2. This ongoing mitigation strategy has been carried over into the 2017 Plan.
<u>FIRE</u> 8. Develop additional dry hydrant sites in rural locations.	Fire Department	Ongoing	Local resources, George Aiken RC&D	The most recent dry hydrant installed in Bradford is located on Fairground Road. This mitigation strategy, both to continuously maintain by flushing existing hydrants and to install new dry hydrants where needed, has been carried over into the 2017 Plan.
9. Replace existing water main on Main St. and provide adequate sizing and location of distribution mains for future installation of fire sprinkler systems in the closely space historic downtown structures.	Public works department with selectboard	2012	Local resources	This action was completed in 2012. There is no need to update or expand it at this time.
<u>WINTER STORM</u> 10. Educate citizens on preparedness for winter travel and extended power outages	Emergency Management Director	Ongoing	Local resources	This mitigation strategy has been carried over into the 2017 Plan.
11. Encourage the utilities to continue a regular schedule of tree trimming along power lines.	Emergency Management Director	Ongoing	Local Resources	Green Mountain Power routinely undergoes a tree trimming program to maintain right-of-ways. This ongoing mitigation strategy has been carried over into the 2017 Plan.

The 2017 Bradford Local Hazard Mitigation Plan reflects several changes to the Town of Bradford's vulnerabilities to hazards and addresses the Town's changes in priorities to different hazards. These priorities and vulnerabilities have changed in large part due to the implementation of mitigation actions that were listed in the 2010 Plan. The implementation of several of these mitigation actions has reduced the Town's vulnerability to specific hazards. However, several new hazards were addressed in detail in the 2017 Plan that were omitted from the previous 2010 Plan that currently pose a risk to the Town. The 2010 Plan addressed Flash Flood, Fire, Hazardous Material Spills, and Winter Storms. Winter storms, structural fires, flash flooding/flooding/fluvial erosion, and hazardous material spills were all determined by the Bradford Local Hazard Mitigation Committee to continue to be hazards that impact the Town, and should be addressed in detail in the 2017 Plan. In the 2017 Plan, the Flash Flood hazard was expanded to include Flooding and fluvial erosion. Bradford community members also included Severe Weather, Hurricanes, and Tropical Storms as a hazard that is likely/highly likely to occur in the future and that which could have a moderate effect on the Town.

There is relatively minimal development occurring in the Town of Bradford. In 2014 there were 3 building permits issued, in 2013 there were 3 permits issued for new houses, 2 permits were issued in 2012, and 3 permits were issued in 2011. From 2000 to 2010 there was an increase of 64 overall housing units. This increase in housing parallels the population increase that Bradford experienced from 2000 to 2010. The development pattern for commercial development tends to be within the Bradford Village Designated Downtown along Route 5 and in the Lower Plain area, which is at the intersection of route 5 and Route 25. There are no plans for large-scale development on the horizon. The Lower Plain area has a low vulnerability to future flooding due to large floodplain areas to the Connecticut River. Recent development has not changed current hazard vulnerabilities in Bradford.

Future development along Route 25 and 25B is vulnerable to flooding due to its close proximity to the Waits River. Future land use will likely follow the existing land use of this area, which is largely residential. Future development in this area should be avoided to limit the detriment to health and property.

Depending on the location, new development in the Town of Bradford may be vulnerable to flood or fluvial erosion hazard. Fortunately, the town's moderately slow growth rate and interest in pursuing options for reducing flood risks help reduce these risks. The Town's Zoning Bylaws, which include the Flood Hazard Overlay District, regulate new development within the Special Flood Hazard Area, which would help reduce threats to structures built near flood hazards. However, the areas vulnerable to flood hazards and fluvial erosion hazards are not necessarily analogous. Therefore, the Town's Flood Hazard Overlay District may not protect new development from fluvial erosion hazards.

D. Town Capabilities for Implementing the Mitigation Strategy (Existing Hazard Mitigation Programs, Projects & Activities)

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(3).

The Town of Bradford is currently engaged in the following hazard mitigation programs, projects and activities:

	Type of Existing Authority / Policy / Program / Action	Resources: Staffing & Funding	Ability to Expand/Improve on
Community Preparedness Activities	Program—Annual update of Bradford's Local Emergency Operations Plan (LEOP). Last updated and approved on 04/28/2016.	Volunteer time from the Emergency Management Director; assistance from TRORC. Funding from Vermont DEMHS.	This document is reviewed and updated each year to ensure that the contact information of emergency response personnel is up-to-date. This information is then sent to Vermont Emergency Management for their records. Current program works well, and there is no need to expand or improve on.
	Program—Participation in LEPC #12	Volunteer time from Emergency Management Director and the Fire Chief. Funding from LEPC #12 and assistance from TRORC.	The Town's current participation in the LEPC #12 is satisfactory. Therefore, there is currently no need to expand or improve on this program.
	Participation in Citizens' Emergency Response Team (CERT)	Staff time from the Town Clerk	The Town participates in LEPC #12, the CERT program in Orange and Windsor counties.
	Action— Designation of Red Cross Shelter Shelters designated at Bradford Congregational Church, Bradford Elementary School, and the Evangelical Church.	Staff/volunteer time from the Town Clerk, Emergency Management Director Funding from American Red Cross.	This is a one-time action. There is no need to expand on it at this time.
Insurance Programs	Authority/ Program—participation in National Flood Insurance Program (NFIP) [Note: This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(3)(ii).]	Assistance from TRORC and Vermont ANR. Funding from local resources—annual town budget.	The Town's initial Flood Insurance Rate Map (FIRM) was dated 01/31/1975. The Town's current Flood Insurance Rate Map (FIRM) was dated 06/03/1991. The Town continues its participation in the NFIP by administering and enforcing its "Flood Hazard" zoning district. The Town of Bradford adopted its most current Zoning Bylaw (which includes its "Flood Hazard" zoning district) on 10/27/2005. This zoning district prohibits new buildings in the floodway, and regulates new construction in the Special Flood Hazard Area. The Town employs a Zoning Administrator, Bob Wing, who enforces the "Flood Hazard" zoning district based on the 06/03/1991 FIRMs. The Town would like to request map revisions from FEMA. The town

			has the authority and intends to consider strengthening the Flood Bylaw in the next planning cycle.
Land Use Planning	Policy/Program— Bradford Municipal Plan Adopted on 01/28/2016, includes a "Flood Resilience" section.	Volunteer time from Planning Commission, and assistance from TRORC and other state agencies on specific subject matter. Funding from Municipal Planning Grants.	The Town Plan is updated every eight years, as required by statute. The Planning Commission may expand or improve on any section it deems necessary, or that is required by changes in state statue.
	Completed Authority— Bradford Zoning Regulations Bylaw Adopted on 10/27/2005, includes a "Flood Hazard" zoning district	Volunteer time from the Planning Commission, and assistance from TRORC. Funding from Municipal Planning Grants.	During the Town Plan review/update period, the Zoning Ordinance is also reviewed and updated if needed.
Hazard Control & Protection of Critical Infrastructure & Facilities	Policy/Program—Bradford Hazard Mitigation Plan Adopted on 07/22/2010	Volunteer time from Town officials; assistance from TRORC and Vermont DEMHS. Funding from FEMA; Vermont DEMHS; TRORC.	The 2017 Bradford Local Hazard Mitigation Plan will replace the 2010 Plan. The 2017 LHMP has evolved from the 2010 Plan and has greatly expanded and improved upon it. Future iterations of the Town's LHMP will be updated by the Town at least every five years.
	Program—Town road network inventory and capital budget planning	Staff time from the Town Road Foreman; and assistance from TRORC. Funding from VTran's Better Backroad grant program.	The Town does not currently have a road inventory. This action has been carried over into the 2017 Plan.
	Program— Culvert inventory.	Staff time from Town Road Foreman; assistance from TRORC. Funding from VTrans; local personnel time and funding.	The Bradford Road Foreman routinely updates the status of culverts in Town. He maintains a comprehensive inventory of culverts. A full inventory would feature georeferenced culvert locations and a prioritized list of mitigation improvement projects. There is no need to expand upon this action at this time.
	Ongoing Action— the Fire Department distributes fire prevention fliers at the school	Time from the Volunteer Fire Department and funding from Fire Department budget.	This action can currently be expanded, and it has been carried over into the 2017 Plan.
	Ongoing Action— the Town places emergency-related information in the Annual Report and on the Town's website.	Staff time from Town Office personnel and funding from the Town's budget.	This action can currently be expanded, and it has been carried over into the 2017 Plan.

E. Plan Maintenance

This Plan (the Bradford Local Hazard Mitigation Plan) will be updated and evaluated by discussing its effectiveness and making note to incorporate any necessary revisions in the update process. This update and evaluation will occur annually at an April Selectboard meeting along with the annual review of the Local Emergency Operations Plan (LEOP). At this meeting, the Selectboard will monitor the implementation of the hazard mitigation and preparedness strategies outlined in this Plan by noting those that have been completed, and identifying the next steps required to implement the Plan's remaining strategies. Comments from local officials and the public will be incorporated when relevant. This meeting will constitute an opportunity for the public and other town officials to hear about the town's progress in implementing mitigation strategies and to give input on future activities and Plan revisions. The public will be given the opportunity to comment at this meeting. Evaluation of the Local Hazard Mitigation Plan will consist of a thorough analysis of the status of mitigation and preparedness strategies and whether they are being implemented according to the time frames included in tables in this Plan. The Town of Bradford will evaluate the status of mitigation strategies to assess that goals of the Local Hazard Mitigation Plan are being met. Adherence to the mitigation, preparedness, and ongoing strategy implementation tables included in this Plan will constitute the degree of effectiveness of the Plan. The Town will also evaluate the status of vulnerabilities detailed in this Plan to evaluate their validity. The update of the Plan will bring up to date materials that have become outdated due to the passage of time. Bradford's Emergency Management Director will be the principal point of contact and will take primary responsibility for the monitoring, evaluation, and update process described here. He or she will bring the Plan's maintenance activities to the Selectboard's agenda and discussions.

Updates and evaluation of this Plan by the Selectboard and the local Emergency Management Director will also occur within three months after every federal disaster declaration directly impacting the Town of Bradford. The Town will monitor, evaluate, and update this Local Hazard Mitigation Plan at an April Selectboard meeting and after every federally declared disaster directly impacting the Town according to the graphic in Appendix B. The Town shall reference the Local Hazard Mitigation Plan when working on Town Plan amendments or changes to the Town's bylaws.

This section of the Plan satisfies 44 CFR and 201.6(c)(4)(i), 201.6(c)(4)(ii), and 201.6(c)(4)(iii).

At least one year before the Plan expires, the update process will begin (through annual updates, monitoring of progress and evaluation that will occur at the April Selectboard meeting). For this next Plan update, the Two Rivers-Ottauquechee Regional Commission (TRORC) will help with Plan updates if assistance is requested by the Town of Bradford and if funding is available. If TRORC is unable to assist the Town, then Bradford's Town Clerk, Emergency Management Director, Administrative Assistant, or Selectboard will update the Plan, or the Selectboard may appoint a committee of interested citizens (including the current local Emergency Management Director) to draft changes. Ultimately, it will be the Town's responsibility to update their Local Hazard Mitigation Plan.

The process of evaluating and updating the plan will include continued public participation through public notices posted on the municipal website, notice within the municipal building, notice in one or more area newspapers, and notice on the TRORC newsletter and website, inviting the public to the scheduled Selectboard (or specially scheduled) meeting. The public will be given the opportunity to comment during this process. Additional stakeholders may be invited to the meeting including: local businesses and non-profit organizations based in the Town, VTrans, and the Vermont Agency of Natural Resources (VT ANR). VT ANR can provide assistance with NFIP outreach activities in the community, models for stricter floodplain zoning regulations, delineation of River Corridor areas, and other applicable initiatives. These efforts will be coordinated by the Selectboard and the Planning Commission.

Updates will address changes in community mitigation strategies; new town bylaws, zoning and planning strategies if appropriate; progress on the implementation of initiatives and projects; effectiveness of implemented projects or initiatives; and evaluation of challenges and opportunities including overall effectiveness of plan goals and actions in reducing vulnerabilities. If new actions are identified in the interim period, the plan can be amended without formal re-adoption during regularly scheduled Selectboard meetings.

Bradford shall also incorporate mitigation planning into their long-term land use and development planning documents. The Bradford Municipal Plan was last updated and adopted on 01/28/2016. The 2010 Bradford Annex, the previous version of this Local Hazard Mitigation Plan for the Town of Bradford, provided guidance in the development of the Bradford Municipal Plan, including directing goals, policies, and recommendations towards mitigating the effects of future hazards on health and property in the Town. The 2013 Vermont Legislature passed a law requiring all towns to incorporate flood resiliency elements into their town plans as of July 2014. The Town of Bradford added a flood resiliency element to their Town Plan when it was updated January 28, 2016. Flood hazard and fluvial erosion hazards were identified, and strategies and recommendations were provided to mitigate risks to public safety, critical infrastructure, historic structures and public investments. This Local Hazard Mitigation Plan will incorporate information from the Town's Flood Resiliency Element.

The Town should review and incorporate elements of the Local Hazard Mitigation Plan into updates for the municipal plan, zoning regulations, and River Corridor bylaws. The Town shall also consider reviewing any future TRORC planning documents for ideas on future mitigation projects and hazard areas. During the Municipal Plan update process, the planning commission will review and consider incorporating mitigation actions and priorities described in this Local Hazard Mitigation Plan into Bradford's Municipal Plan. Mitigation strategies will directly influence goals, policies, and recommendations in future updates to the Bradford Town Plan. The incorporation of the goals and strategies listed in the Local Hazard Mitigation Plan into the municipal plan, zoning regulations, flood hazard bylaws, and River Corridor bylaws will also be considered after declared or local disasters.

V. Community Vulnerability by Hazard

A. Hazard Identification

Mitigation efforts must be grounded in the rational evaluation of hazards to the area and the risks these hazards pose. This is done through a process, which in essence asks and answers three basic questions:

- What bad things can happen, given the town's vulnerabilities?
- How likely are they to occur?
- How bad could they be?

This process, which is laid out in the table below, is an attempt to inventory the known hazards, establish the likelihood of them occurring in the future, and then assess the community's potential vulnerability to each. In performing this analysis, we are then able to prioritize actions that are designed to mitigate the effects of each of these disaster types and ultimately make Bradford a safer place.

It is important that we learn from the past in order to avoid the same disasters and their outcomes. Disasters that have occurred within the Town of Bradford, the larger region, and the State of Vermont can give us good information about what types of disasters we can expect in the future and what kinds of damage they might cause. However, while this historical data can inform our perspective of what might happen in the future, it is by no means a prophecy. While Bradford might not have been impacted by a specific hazard in the past, this does not necessarily mean it will never be affected in the future. Indeed, the advance of climate change means that old weather patterns may not remain consistent. For instance, in recent years, Vermonters have seen an increase in the number and severity of storms, especially rainfall events. Armed with historical data and a healthy respect for climate change and the unknown, we have tried our best to identify hazards and prepare for the future.

The following table reflects the hazards that we believe can be expected, or are at least possible, in the central Vermont area. We have considered factors such as frequency of occurrence, warning time and potential community impact to rank each and determine which hazards pose the greatest threats to life and property in Bradford.[1] The worst threats (bolded in the table, below) are then followed-up with discussion and mitigation strategies throughout the rest of this Plan.[2] It should be noted that hazards assigned with the same "Hazard Score" are not in order and their placement in the table should not be

[1] The ranking methodology used in this Plan (see Appendix A) is closely modeled on that which is used by the Vermont Division of Emergency Management & Homeland Security (VDEMHS). The only changes made were intended to reflect the more limited geographical scope of this analysis, which is focused on a small, rural town rather than the entire State of Vermont (which is the focus of VDEMHS). Those hazards which were not found to pose the greatest threats to Bradford – including Drought, Extreme Heat, invasive species infestation, wildfires, Tornadoes, Hail Storms, Wildfire, Landslides/Mudslides/Rockslides, Radon, Avalanches, water supply contamination, structural fire, and Earthquakes – were not addressed in this Plan due to low probability of impact and scarce community resources (time and money). For these hazards, please review the Vermont State Hazard Mitigation Plan.

[2] It's important to note that those hazards which were not found to pose the greatest threats may still occur in Bradford's future; however, they are not the focus of this Plan.

assumed to reflect their potential to create hazards for the town. See Appendix A to view the Hazard Ranking Methodolog8y that was used by the Hazard Mitigation Committee in determining the ranking in the following table.

Hazard	Frequency of Occurrence	Warning Time	Potential Impact	Hazard Score
Flash Flood/Flood/Fluvial Erosion ***Note: The hazard mitigation committee decided to combine and address this hazard with Ice jam.**	**Highly Likely**	**None-minimal**	**Moderate**	**11**
Hazardous Material Spill	**Likely**	**None-minimal**	**Major**	**11**
Extreme Cold/Snow/Ice Storm	**Highly Likely**	**6-12 hours**	**Moderate**	**9**
Structural Fire	**Likely**	**None-minimal**	**Minor**	**9**
Severe Summer Weather (Thunderstorm, Lightning, High Wind, Hail, and Flooding) ***Note: We have defined 'Severe Weather' to include two or more of the above hazards. The Hazard Mitigation Committee decided to combine this hazard with Hurricane/Tropical Storm.**	**Likely**	**6-12 hours**	**Moderate**	**8**
Hurricanes/Tropical Storms	**Likely**	**12+ hours**	**Major**	**8**
Ice Jams	**Likely**	**6-12 hours**	**Moderate**	**8**
Water Supply Contamination	Unlikely	None-minimal	Moderate	8
Invasive Species/Infestation	Likely	12+ hours	Negligible	6
Dam Failure (The frequency of occurrence of dam failure from dams on the Connecticut River is Highly Unlikely. Although, the Waits River Dam is more likely to fail, its potential impact would be minor due to low water impoundment).	Highly Unlikely	None-minimal	Minor	6
Wildfire/Brushfire	Unlikely	None-minimal	Negligible	6
Landslides/Mudslides/Rockslides	Unlikely	None-minimal	Negligible	6
Tornado	Highly Unlikely	None-minimal	Negligible	5
Earthquake	Highly Unlikely	None-minimal	Negligible	5
Drought	Highly Unlikely	12+ hours	Minor	2
Extreme Heat	Highly Unlikely	12+ hours	Negligible	2

The Bradford LHMP committee discussed the results of the hazard ranking activity and decided to focus on hazards that had the potential to impact the Town on a town-wide scale, and/or hazards that are ***Likely*** or ***Highly Likely*** to occur, and would have a moderate, minor, or major impact on the health and/or property of Bradford. The LHMP committee decided not to address dam failure because it is highly unlikely to occur, and the dam immediately in town, the Waits River Dam, would have a minor impact due to small volume of impounded water. For the purposes of this Plan, Severe Weather and Hurricanes/Tropical Storms will be combined into one hazard profile area for analysis due to their overlapping events and potential impacts to the Town. Similarly, ice jams have been detailed and analyzed in concert with flash flood/flooding/fluvial erosion due to the overlapping events, extents, impacts, and observed history of occurrence. Due to low probability of impact, small potential impact, and scarce community resources (time and money), the mitigation committee chose not to detail the following hazards in this LHMP: extreme heat, drought, water supply contamination, earthquakes, dam failure, tornadoes, wildfires/brushfires, landslides/mudslides/rockslides, and invasive species infestation. Refer to Appendix A for definitions of the hazard ranking terms used in the above chart.

After engaging in discussions using their best available knowledge, the Town of Bradford identified the following "top hazards" (based on frequency of occurrence and potential impact) that they believe their community is most vulnerable to:

- Flash Flood/Flood/Fluvial Erosion and Ice Jams
- Hazardous Material Spills
- Extreme Cold/Snow/Ice Storm
- Structural Fire
- Severe Summer Weather

The impact of a loss of services is a common element of the hazards discussed in this Plan. These include not only large scale services such as the loss of transportation and communication ability, but also the loss of services more directly associated with basic needs such as water, food preparation, and heat. Loss of power for an extended period of time has the potential to greatly impact households who are entirely reliant on a functional power supply in order to prepare food, heat the household, and ensure that the water supply is available. While many residences in Bradford utilize a variety of methods to ensure these basic needs, it is important to be aware that a number of households rely on electricity alone for all of these functions. In addition to the plans described in the Bradford LEOP, it is important to reinforce the need for adequate generators in this Plan, so that the town is prepared to ameliorate the effects of a sustained power loss in Bradford. Included in this would be an adequate supply of fuel for these generators.

The Bradford Hazard Mitigation Committee did not assess the impact of the combination of hazards and how multiple hazards occurring at the same time would affect the Town. The Committee noted that the combination of hazards would have a potential impact on the Town that would likely cause larger impacts. Similarly, the occurrence of one hazard has the possibility to lead into another hazard. The combination of hazards occurring simultaneously was not reflected on the hazard ranking table and the scores assigned by the Hazard Mitigation Committee to specific hazards.

A further focus that is important to address in this Plan includes the awareness of the population demographics of Bradford. This includes a comprehensive idea regarding the number of individuals in the town who may require assistance in the event of a severe weather incident. Age and ability should be factors taken into account, and as discussed in the LEOP, there should be individuals responsible for creating and updating such a list, including members of the ambulance service, town offices, the health officer, and service officer.

Each of these "top hazards" will be discussed in the following sections. Within each section, previous occurrences of each hazard will be listed, including the County-wide FEMA Disaster Declarations (DR-#), where applicable. Hazards information was gathered from local sources (ex., town history book), the National Climatic Data Center's (NCDC's) Storm Events Database (1950-2012 and 2006-2012), the Spatial Hazard Events and Losses Database for the United States (SHELDUS) 1960-2012, and Special Reports produced by the National Weather Service in Burlington, Vermont. This section also includes a description of each "top hazard" and a hazard matrix that will also include the following information (please see each hazard profile for a hazard-specific matrix):

Hazard	**Location**	**Vulnerability**	**Extent**	**Observed Impact**	**Likelihood/Probability**
Type of hazard.	General areas in community that may be vulnerable to the hazard.	Community structures, systems, populations, or other assets as defined by the community that are susceptible to damage and loss from hazard events.	The strength or magnitude and details of the most notable event(s).	Financial impact from an event and/or the number of structures that are impacted.	Occasionally: 1–10% probability of occurrence per year, or at least one chance in next 100 years Likely: >10% but <100% probability per year, at least 1 chance in next 10 years Highly Likely: 100% probable in a year

B. Hazard Profiles for Hazards Posing Highest Vulnerabilities

1. Flash Flood/Flood/Fluvial Erosion & Ice Jams

The most frequent form of flooding in the State of Vermont and the Town of Bradford is riverine flooding, or overbank flooding, which occurs to rivers when they receive more rain or snowmelt from their watershed than they typically experience. Flooding causes the inundation of land that is normally dry. Overbank flooding is experienced more frequently in mountainous and hilly areas where water moves with higher velocities. Flash floods occur when severe storms drop high amounts of rainfall in short periods of time. Flash floods occur more frequently in areas with steep slopes and narrow stream valleys. Riverine erosion is the gradual wearing away of land masses by rivers and streams. River channels are constantly changing. As rivers flow and water moves downstream, water exerts energy upon riverbanks and causes erosion.

Flooding is one of the worst threats to Bradford's residents and infrastructure. Past instances of flooding in Bradford have included rain and/or snowmelt events that cause flooding in the major rivers' floodplains and intense rainstorms over a small area that cause localized flash-flooding. Both kinds of events can be worsened by the build-up of ice or debris, which can contribute to the failure of important infrastructure (such as culverts, bridges, and dams).

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Flash Flood/Flood/Fluvial Erosion and Ice Jams**.

Similarly, Ice jams are a hazard of specific concern with overlapping extent and impact to flash flooding and fluvial erosion. Such events can occur with little to no warning and quickly escalate into life-threatening situations, thereby increasing the impact of such events when they happen. Ice jams are most prone to occur when heavy rains and rising temperatures cause rapid snow melt. Rivers, as a consequence, swell and ice layers begin to break, which then flow downstream and create obstructions around natural and man-made barriers. The majority of ice jams happen between the months of January and March, and the lead time for an ice jam or flow can range anywhere form a few hours to only one hour. The flows can cause water to rise by multiple feet per hour or even multiple feet within minutes. This can mean that there is insufficient time to prepare for rising water and ice levels. While flooding from ice jams is not often major, it has the possibility to be catastrophic, particularly in places that have an historic pattern of growth along waterways. Ice jams can have a disastrous impact on waterways and surrounding structures and infrastructure, and they can cause severe erosional issues along with endangering local fish and wildlife populations.

The worst flood disaster to hit the Town of Bradford, as well as the overarching region and the State of Vermont, occurred on November 3, 1927. This event was caused by up to 10 inches of heavy rain from the remnants of a tropical storm that fell on frozen ground. Eighty-four Vermonters, including the Lieutenant Governor, were killed. The flooding in the White River valley was particularly violent, with an estimated 120,000 to 140,000 cubic feet/second (cfs) flowing out of the White River at West Hartford, Vermont. Like many towns in the region, the Town of Bradford received heavy precipitation, seeing roughly 7-8 inches of rainfall over the storm period.

A more recent flooding event that devastated the region and the state was the result of Tropical Storm Irene, which occurred on August 28, 2011. Record flooding was reported across the state and was responsible for several deaths, as well as hundreds of millions of dollars of home, road and infrastructure damage. Due to the strong winds, 50,000 Vermont residents were initially without power, and many did not have electricity restored to their homes and businesses for over a week. Despite the damage wrought, the flooding caused by Tropical Storm Irene is considered to be the second greatest natural disaster in 20th and 21st century Vermont, second only to the Flood of 1927.

The Town of Bradford suffered some damage to property and infrastructure during Tropical Storm Irene, and no lives were lost. It is estimated that Tropical Storm Irene dropped 6.79 inches of rain over the Town of Bradford in a very short span of time, some of the highest precipitation totals in Orange County (which averaged 5-7+ inches over its land area). However, Bradford did not sustain widespread damage to health and property during Tropical Storm Irene unlike other Towns in Orange County. The county-wide damage for Orange County totaled $5 million. The Town of Bradford reported minimal damage during Tropical Storm Irene (approximately $3,420.00 according to FEMA's Public Assistance database).

Unfortunately, flooding is very common across the region, with many events impacting the Town of Bradford specifically, and Bradford has been hit hard by other flooding events that pre-date Tropical Storm Irene. As such, flooding is one of the worst threats to Bradford's residents and infrastructure. The following list indicates the history of occurrence with regard to this hazard in Orange County (given the small population of Bradford, town-specific data is limited); an asterisk "*" denotes the instances in which town-specific data is available, and federal disaster numbers are listed where appropriate. No detailed data was available for fluvial erosion damage in Bradford in terms of numbers of acres lost or amount of fill that that was used to compensate for fluvial erosion after flooding during each event. No detailed extent data was available in Bradford for ice jams in terms of physical size of ice jams.

History of Occurrences:

Date	Event	Location	Extent and Impacts
Period from 06/25/2013—07/11/2013 (DR-4140)*	Severe Storms, Flooding, and Fluvial erosion	County-; region-wide	Severe storms caused flooding and fluvial erosion throughout the region, causing damage to some infrastructure and facilities. During this period, the neighboring Town of Corinth received 7.96 inches of precipitation. There were several outages that occurred in Bradford during the disaster period. On 6/24 126 Green Mountain Power customers lost power for 2 hours. On 6/28 41 GMP customers lost power for .4 hours. No damage was claimed in the Town of Bradford.
08/28/2011 (DR-4022, TS Irene)*	Tropical Storm, Flooding, and Fluvial Erosion	Bradford, County-wide; Vermont	Widespread rainfall amounts of 3-5 inches occurred across Vermont with 5 to 7+ inches across much of southern, central Vermont. Devastating flash flooding occurred across much of central and southern Vermont mountain valleys with substantial and some record breaking flood stages on larger rivers. This flood event will likely rank second to the November 1927 flood in the scope of meteorological and hydrological conditions/impacts as well as loss of life (84 in 1927), but likely first in monetary damage ((approx. $500. million statewide vs $350. million (1927 in 2010 dollars)). There were nearly 2400 roads, 800 homes/businesses, 300 bridges and a half dozen railroad tracks destroyed or damaged from the flooding and fluvial erosion caused by Irene. According to spotter's reports, Bradford received over 5.7" of rain in 24 hours and 6.79 inches of rain in 48 hours. There was $3,420.00 in damage total for Bradford

Date	Event	Location	Extent and Impacts
			according to FEMA's Public Assistance database (captures at least 70% of total damage). Power outages were minimal in Bradford with only several isolated incidents that affected singular power customers at a time.
3/7/2011*	Ice Jam, Flooding, and Fluvial Erosion	Bradford; County-wide	Heavy rainfall preceded a cold front that swept through Vermont that caused temperatures to drop and changed rain to heavy sleet and wet snow. Rainfall totaled about 2 inches in the morning before changing to ice/sleet. Snow accumulations added another 6-7 inches of precipitation. Rapid snowmelt and heavy rainfall caused ice-covered rivers to melt and ice jams to form in Rowell Brook in Bradford. Ice jam caused flooding on Route 25 and Rowell Brook Road. Outage data was unavailable for this event.
9/30/2010-10/1/2010	Flooding and Fluvial Erosion	County-wide	An area of low pressure and a pocket of tropical moisture associated with the remnants of Tropical Storm Nicole caused heavy rain in Vermont on September 30 and October 1, 2010. Bradford experienced 3.75 inches of rain in 24 hours, and experienced 5 inches in 48 hours. Outage data was unavailable for this event.
07/21/2010*	Severe Weather and Flash Flooding	Bradford; County-wide	Several storms strengthened into super cells that produced widespread wind damage to trees, power poles and structures as well as large hail in excess of golf ball size in diameter. Very heavy localized rains caused some temporary problems in many communities. 2.43 inches of precipitation was experienced in Bradford. Outage data was unavailable for this event.
08/21/2009	Flash Flooding and Fluvial Erosion	Bradford; County-wide	Thunderstorms produced torrential downpours in nearby Chelsea, who experienced significant damage on several roads due to flash flooding and fluvial erosion. Damage was severe in Bradford, which received 1.26 inches in precipitation. Outage data was unavailable for this event.
08/07/2008* (Part of DR-1790 VT)	Flooding and Fluvial Erosion	Bradford; County-wide	Thunderstorms with heavy rainfall in a moist atmosphere moved through central and southern Vermont during the afternoon and evening hours. Bradford reported $15,080.21 in damage. Bradford received 2.6 inches of rain in 24 hours with an additional 1.22 inches of rain in the previous 24 hours. No significant power outages occurred.
07/11/2007 (DR 1715 VT)	Flash Flooding and Fluvial Erosion	County-wide	Localized heavy rainfall exceeded 3 inches within a two hour time frame. Some localized storm totals approached 6 inches across very hilly or mountainous terrain, which resulted in flash flooding and fluvial erosion of several communities in Orange County. Outage data was unavailable for this event.
1/18/2006	Flash Flooding and Fluvial Erosion	County-wide	A powerful storm moved across Ontario and Quebec that brought rising temperatures and caused snow melt. Widespread rainfall of 1.5 to 2.5 inches combined with increased runoff caused flooding and ponding of roadways across Orange county. Outage data was unavailable for this event.
9/12/2003*	Severe Storm, Flooding, and Fluvial Erosion	Bradford; County-wide	Bradford experienced $5,710.12 in damages.
6/26/1998-6/27/1998	Flooding and Fluvial Erosion	Bradford; County-wide	An area of low pressure caused heavy consecutive rainfall in Orange County, Vermont from June 26 through June27. Bradford experienced 4-8 inches of rain over the two days, which resulted in extensive flooding, with some roads experiencing as much as 2 feet of water. Washouts and erosion occurred on many town roads, including Chelsea Road and Goshen Road. The Waits River flooded, as well. Power outages did occur in

Date	Event	Location	Extent and Impacts
			Bradford, but specific outage data was unavailable. Damage from this storm set an important precedent in Bradford for road, culvert, and ditch maintenance. Town upsized all damaged culverts to substantially larger sizes, began to maintain a culver inventory and capital budget road improvement program, and purchased an excavator for ditch improvement.
06/28/1973—06/30/1973 (DR-397)	Flooding	County-wide	As much as 6 inches of rain fell in 24 hours in some locations. 3 deaths occurred and $64 million in damage occurred in Vermont.
11/02/1927—11/04/1927 ("Flood of 1927")	Flooding	County-wide; Vermont	Considered to be on of VT's most devastating events, the flood took our 1285 bridges, miles of roads and railways, and countless homes and buildings. 84 people were killed, including Lt. Gov. S. Hollister Jackson. Rainfall totaled 4-9" statewide, following a month with 150% the normal amount of rain.

There are several locations in Bradford that are specifically vulnerable to flooding. Vermont Route 25 is vulnerable due to their proximity to the Waits River. Rowell Brook Road, in the southern part of Town, is also vulnerable and experiences fluvial erosion. Old Creamery Road, which crosses the Waits River, has experienced historic ice jams. Other vulnerable roads that parallel streams, brooks, and rivers include Millpond Road, Chase Hollow Road, Flanders Brook Road, and Rabbit Track Road. Current ditching and culvert conditions in Bradford are exceptional, and current and recent road maintenance has prepared Bradford's infrastructure well for rain and flooding events. However, with the expected increased frequency and intensity storm events, vulnerable roads may experience future damage.

As part of its Zoning Regulations, the Town of Bradford has a Flood Hazard Overlay Zoning District that limits development within areas of potential flooding. The Flood Hazard Overlay District prohibits development in the Floodway. Restricted development in the special flood hazard area is permitted. See the Bradford Zoning Regulations for specific details. The Bradford Zoning Regulations were adopted on October 27, 2005.

There are 24 total properties that are located within the special flood hazard areas. These consist of 10 single-family residences, 4 government buildings, 2 industrial properties, and 8 commercial properties. If all of these properties were destroyed in a flood, the resulting damage would equal $6,483,224. Specific commercial properties that are located in the special flood hazard areas include Alexanders Restaurant and Pub, the Bradford Golf Club, the North Country Organics, ARC Mechanical Contractors, and the Oxbow Veterinary Clinic. The Bradford wastewater treatment plant is also located in the special flood hazard area. Bradford has mapped Special Flood Hazard Areas along the Connecticut River, the Waits River, and Halls Brook.

Across Vermont, most child and elder care facilities are not registered with the State. Most child day care in Bradford is likely private in-home care, but there are also eight licensed childcare providers. Bradford childcare providers include My Second Home, Watch Them Grow Childcare Center Inc., Valley Cooperative Preschool Inc, Bradford Elementary School Preschool, Orange County Parent Child Center, Bradford Elementary School and After School Program, and the private residences of Megan Smith and Emily Pryer. None of these facilities are located within the mapped special flood hazard area. However,

the residence of Emily Pryer, located on Rabbit Track Road, is within the mapped ANR River Corridor, is within .5 miles of Roaring Brook, and is at a moderate risk of flood damage. Finally, low income housing is not registered with the State. There is currently 1 mobile home park located in Bradford, Whistle Stop Mobile Home Park, located on Whistle Stop Way, which is off of Waits River Road behind Farmway.

Recent studies have shown that the majority of flooding in Vermont occursalong upland streams, as well as along road drainage systems that fail to convey the amount of water they are receiving. These areas are often not recognized as being flood prone, and property owners in these areas are not typically required to have flood insurance. It should be noted that, while small, mountainous streams may not be mapped by FEMA in NFIP FIRMs (Flood Insurance Rate Maps), flooding along these streams is possible, and should be expected and planned for. Flash flooding in these reaches can be extremely erosive, causing damage to road infrastructure and to topographic features including stream beds and the sides of hills and mountains. The presence of undersized or blocked culverts can lead to further erosion and stream bank/mountainside undercutting.

Bradford has mapped River Corridor Areas[3] for Roaring Brook, Mill Pond Brook, Meadow Brook, Chase Brook, the Waits River, and the South Branch of the Waits River. According to the Vermont Agency of Natural Resources' mapped River Corridor Area, there are 60 total properties that are within the mapped River Corridor but are *not* located in the Special Flood Hazard Area. These consist of 37 single-family residences, 7 multi-family residences, 5 camps 3 mobile homes, 4 industrial properties, and 3 commercial properties. If all of these properties were destroyed in a flood, the resulting damage would equal $10,119,112.

Furthermore, precipitation trend analysis suggests that intense, local storms are occurring more frequently, which indicates that Bradford will experience high intensity rainfall and flooding events in the future. Due to Bradford's topography of steep slopes and narrow river valleys, fluvial erosion also has a high probability of future occurrence.

The Bradford Road Foreman is proactive in his road budgeting and upgrading. He readily replaces culverts and improves ditches. In 2016, during the development of this plan, the Bradford Road Foreman improved bank stabilization, ditch improvement, and replaced several culverts on Rowell Brook Road, which is an area of the Town that has exhibited historic flooding and is vulnerable to future flooding.

Finally, in an effort to help reduce the Town's vulnerabilities to flooding and protect structures and road infrastructure, it is important to restore floodplain and increase the number of areas for retention wherever possible. Equally important to reducing flood vulnerabilities is the process of stabilizing river

[3] River corridors encompass an area around the present channel for fluvial erosion, channel evolution and down-valley meander migration are most likely to occur. River corridor widths are calculated to represent the narrowest band of valley bottom and riparian land to accommodate the least erosive channel and floodplain geometry (i.e. equilibrium conditions) that would be created and maintained naturally within a given valley setting. Vermont DEC Flood Hazard Area and River Corridor Protection Procedures; Draft October 06, 2014; pages 6-7.

banks in areas that are vulnerable to slides and/or have the potential to damage critical or important infrastructure.

Hazard	Location	Vulnerability	Extent	Observed Impact	Likelihood/ Probability
Flash Flood/ Flood/ Fluvial Erosion and Ice Jams	Many of Bradford's roads are vulnerable to erosional flooding due to steep terrain. Some of the most vulnerable for fluvial erosion or flooding include: Vermont 25, Rowell Brook Road, and Old Creamery Road. Old Creamery is specifically vulnerable to ice jams.	Culverts, bridges, road infrastructure, public and private infrastructure are vulnerable to flooding. There are 24 total properties that are located within the special flood hazard areas. These consist of 10 single-family residences, 4 government buildings, 2 industrial properties, and 8 commercial properties. If all of these properties were destroyed in a flood, the resulting damage would equal $6,483,224.	Tropical Storm Irene—4-7" across county (5.7" in Bradford).	$15,080.21 in damage total for Bradford according to FEMA's Public Assistance database (captures at least 70% of total damage).	Likely

2. Hazardous Material Spill

Hazardous materials include any biological, chemical, or physical substances that can harm human beings or the environment. [4] These materials can be released in a variety of different ways to varying degrees of severity. When hazardous materials are released, response is required in order to minimize the extent of contamination and to reduce the impact on human health and property.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Hazardous Materials Spill**.

Based on available VT Tier II data, there are 19 sites in town that have sufficient types and/or quantities of hazardous materials to require reporting. These sites include the local businesses, Perry's Oil Service, Carroll Concrete, ARC Mechanical Contractors, and T. Copeland and Sons, along with government buildings such as, the VTrans District Garage, Bradford Town Garage, and the Vermont State Police Station. The Village of Bradford is predominantly located along Vermont Route 5. The Waits River, which is impounded by the Waits River Dam and the Smith Hydropower Station, flows underneath Route 5, and therefore presents a risk to contamination in the event of spill. A railroad parallels Route 5 and the Connecticut River throughout the Town. Interstate 91 runs through the Bradford lengthwise from North to South. There are 28 critical facilities in the Town of Bradford, including 12 hazardous material storage facilities.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Hazardous Materials Spill**.

There are 934 total structures located within 1,000 feet of a potential HAZMAT spill on major roads, such as Route 5, Route 25, Route 25B, Interstate 91, and all railroads. This includes 723 residential structures and 121 commercial properties. Government buildings that are vulnerable to HAZMAT incidents include the Bradford Fire Department, Oxbow High School, Bradford Elementary School, the Bradford Town Clerk, and the Bradford Post Office. In the event that 5% of these structures were involved in a HAZMAT incident, the estimated damage would be $9,072,700.

The State of Vermont currently has one fully-trained HAZMAT response team, with vehicles located in Lyndonville, Essex Junction, Brandon, and Putney. The HAZMAT crew chief is available within minutes of a call for the team but on-scene response would be a matter of hours. In the event of a serious accident in Town, there would be little time for evacuation and response would be difficult. Two members of the HAZMAT response team reside in Bradford.

The following data was retrieved from the Vermont Department of Environmental Conservation's Spill List and by searching the archives of local newspapers. The online database of spills consists of those that have been reported. It is difficult to encompass the hazardous material spills that were not reported, and those are not reflected in the table. The table is used to illustrate the ease with which trucks and the day-to-day activities in the Town have the potential to create a hazardous material spill and dangerous conditions for emergency responders and town residents.

[4] Tufts University. (2016). *Hazardous materials spill.* Office of Emergency Management. Retrieved from http://emergency.tufts.edu/guide/hazardous-spill/

History of Occurrences:

Date	Event	Location	Extent and Impacts
10/26/2016	Fuel Oil Spill	155 Upper Plain Road	Dead River conducted a inspection and discovered broken vent pipe and contents of UST were being displaced. Rainwater infiltrated an Underground Storage Tank, causing the release of #2 fuel oil via a vent pipe.
4/5/2016	MODF Spill	GMP Substation 55 Falls View Rd	A mounted transformer leaking pad released 5-10 gallons of mineral oil dielectric fluid to spill.
9/22/2014	Hydraulic Oil	Farm Way: 286 Waits River Road	A blown hydraulic hose occurred while emptying dumpster and resulted in 15 gallons of spilled hydraulic oil.
1/31/2015	Transmission Oil	Route 25	4 gallons of Lube/gear/transmission oil were released on Route 25 near the Bradford VTrans garage.
3/27/2012	#2 Fuel Oil Spill	Clark Residence: 4229 Waits River Road	During a house fire the above ground storage tank in basement was removed and set on the ground. Once the house was restored, petroleum was noted in the drinking water well. It was determined that 50 gallons of #2 fuel oil were spilled.
5/5/2011	Diesel Oil Spill	Route 25	A Perry's Oil propane truck crashed and caused the release of 2-4 gallons of diesel fuel oil. Bradford and Corinth Fire Departments responded to the scene to oversee the loading and righting of propane. Bradford Fire Department cleaned up fluids released with pads speedi-dri.
10/30/2011	Hydraulic Oil Spill	Route 5	A hose blew on a VTrans plow truck during plowing from the junction of Route 25 and Fairground Road and I-91. 10-15 gallons of hydraulic oil spilled and were not recovered.
4/22/2010	Grease spill	Depot Road	1 steel drum labeled "methanol" was found and estimated release was 55 gallons. Drum was later tested and found to contain food-grade grease.
12/29/2010	Hydraulic Line Failure	Route 25	A Vermont Agency of Transportation hydraulic line failure caused 19 gallons to leak from Topsham to Bradford. Recovery was not possible.
9/8/2009	Fuel line leak	Demars Residence : 138 Upper Plain Road	A brass line ruptured in the basement of residence and led to the release of 50-60 gallons.
12/10/2009	Blown Line	I-91 northbound	A blown line caused 5 gallons of released fuel line.
9/2/2009	Blown Hydraulic Hose	Route 25	A leak began at the Vermont Agency of Transportation garage on Fairground Road. The culprit truck continued through Bradford Village, up Route 25 to 25, proceeded west on Route 25 to Flanders Brook Road. Altogether 25 gallons were released.
2/2/2008	Plow Truck line failure	I-91 Northbound	A Vermont Agency of Transportation truck blew its main hose and continued to plow over many miles. The blown hose was not noticed until the plow wouldn't list. Overall release was estimated at 30 gallons.
1/3/2005	Diesel Oil Spill	57 Fairground Road	While refueling at the Bradford Agency of Transportation garage, 10 gallons of diesel oil were released on frozen gravel surface. AOT cleaned with sorbent.
5/13/2004	Diesel Oil Spill	Bradford Armory	A leaking fuel tank was noted during safety inspection and determined that 25 gallons of diesel oil had been released. Soil was excavated and removed.
11/16/2004	Diesel Oil Spill	Interstate 91	A log truck rolled over on the interstate and caused the release of 50 gallons of diesel fuel oil. Soils were excavated and removed.

7/28/2000	Diesel Oil Spill	Bradford Mini Mark: Route 25 and Route 5	A diesel spill resulted in the release of 35 gallons of diesel oil.
11/17/1998	Hydraulic leak from a forklift	Twin State Fertilizer	A hydraulic leak from a forklift caused the release of 20 gallons of material.
8/14/1996	Leaking fuel line	Fairground Road	A leaking fuel line led to the release of 100 gallons of diesel fuel oil. 30 yards of soil was excavated and removed.
1982-1993	PCE contamination	Depot Street	The Former Maska, a hockey apparel manufacturing operation, used and did not properly dispose of PCE (perchloroethylene/tetrachloroethylene) during a ten year period. The site is currently under active site management. The plume of hazardous material was maintained with an institutional control so that there is no migration of substance or threat to human health.

The Town of Bradford has experienced hazardous material spills in the past, and the potential for a major spill exists in the future. Interstate 91 runs through the town, which provides a significant hazardous material spill threat. Major state highways in Bradford include Route 5 and Route 25, and these routes witness considerable truck traffic. A truck accident and a resulting hazardous material spill could be exceedingly disastrous for the Town and its residents, as these two routes intersect in the southeast portion of the Town. These routes serve as the main thoroughfares for trucks and other motor vehicles transporting a wide-range of goods, including a wide range of hazardous materials, within the confines of Bradford. Route 5 follows the Connecticut River through Bradford, and, as a result, additional water contamination issues could be created if a hazardous material spill were to occur along either of these major routes. Depot Street, which is located off of Route 5 north of the Bradford Village area, contains businesses that use or store hazardous materials.

A hazardous material spill in the Bradford, in addition to impacting residents, businesses and surface waters, may also impact the water supply. There is one major public water supply in Bradford, which is located on Route 25 and services the Bradford village area .The source protection area of the public water supply is close to Interstate-91, and could be impacted by a hazardous material spill near the exit. Contamination of the water sources is possible from hazardous material spills.

In order to prepare for hazardous material spills in Bradford, most members of the Bradford Fire Department are trained to the HAZMAT Awareness level.

Hazard	**Location**	**Vulnerability**	**Extent**	**Impact**	**Likelihood/ Probability**
Hazardous Materials Spill	Vermont Routes 25, Route 5, and Interstate 91	Road infrastructure, nearby structures (Bradford Fire Department, Oxbow High School, Bradford Elementary School, the Bradford Town Clerk, and the Bradford Post Office), the Waits River, and the	Initially, local impacts only; but depending on material spilled, extent of damage may spread (ex. into groundwater).	There are 934 total structures within 1,000 feet of a potential HAZMAT spill on major roads (Vermont Interstate-91, Route 5, and Route 25). This includes 723 residential structures and 121 commercial properties. n the event that 5% of these	Likely

		Connecticut River.		structures were involved in a HAZMAT incident, the estimated damage would be $9,072,700.	

3. Extreme Cold/Snow/Ice Storm

Winter storms are a regular occurrence in Vermont. They can consist of extremely low temperatures, intense wind chills, high snow accumulation levels, and/or ice accumulation. Severe winter storms can cause serious damage, including collapse of buildings due to overloading with snow or ice, brutal wind chills, downed trees and power lines, and stranded vehicles. People can be at risk of freezing in extended power outages if they lack wood heat or backup power, and individuals shoveling large accumulations of snow can also be at risk from frostbite, hypothermia, and heart attacks caused by cold and overexertion. While snow removal from the transportation system is standard fare in Vermont winters, extreme snow or ice can close rail and road systems, further jeopardizing any stranded persons that are in danger of freezing or needing medical assistance. Extreme cold in the Town of Bradford is defined as below zero degrees Fahrenheit for two or more consecutive days.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Extreme Cold/Snow/Ice Storm**.

Severe winter storms include a blizzard on February 15-17 in 1958, which dumped over 30 inches and resulted in 26 deaths in New England. On December 26-27 in 1969, another blizzard left 18-36 inches of snow in northwestern Vermont and a whopping 45 inches in nearby Waitsfield. A string of storms in March 2001 hit the state, beginning with 15-30 inches on March 5-6th (later declared a federal disaster), 10-30 inches on the 22nd, and 10-20 inches on the 30th. Recent years have seen wet snow storms that have toppled trees and caused widespread power outages.

The worst winter storm in terms of damage to hit the state recently was not a snow storm, but an ice storm. In January of 1998, just the right combination of precipitation and temperature led to more than three inches of ice in spots, closing roads, downing power lines, and snapping thousands of trees. This storm was estimated as a 200-500 year event. Power was out up to 10 days in some areas, and 700,000 acres in of forest were damaged in Vermont. Amazingly, there were no fatalities in Vermont, unlike Quebec where 3 million people lost power and 28 were killed. The Town of Bradford was impacted by this ice storm.

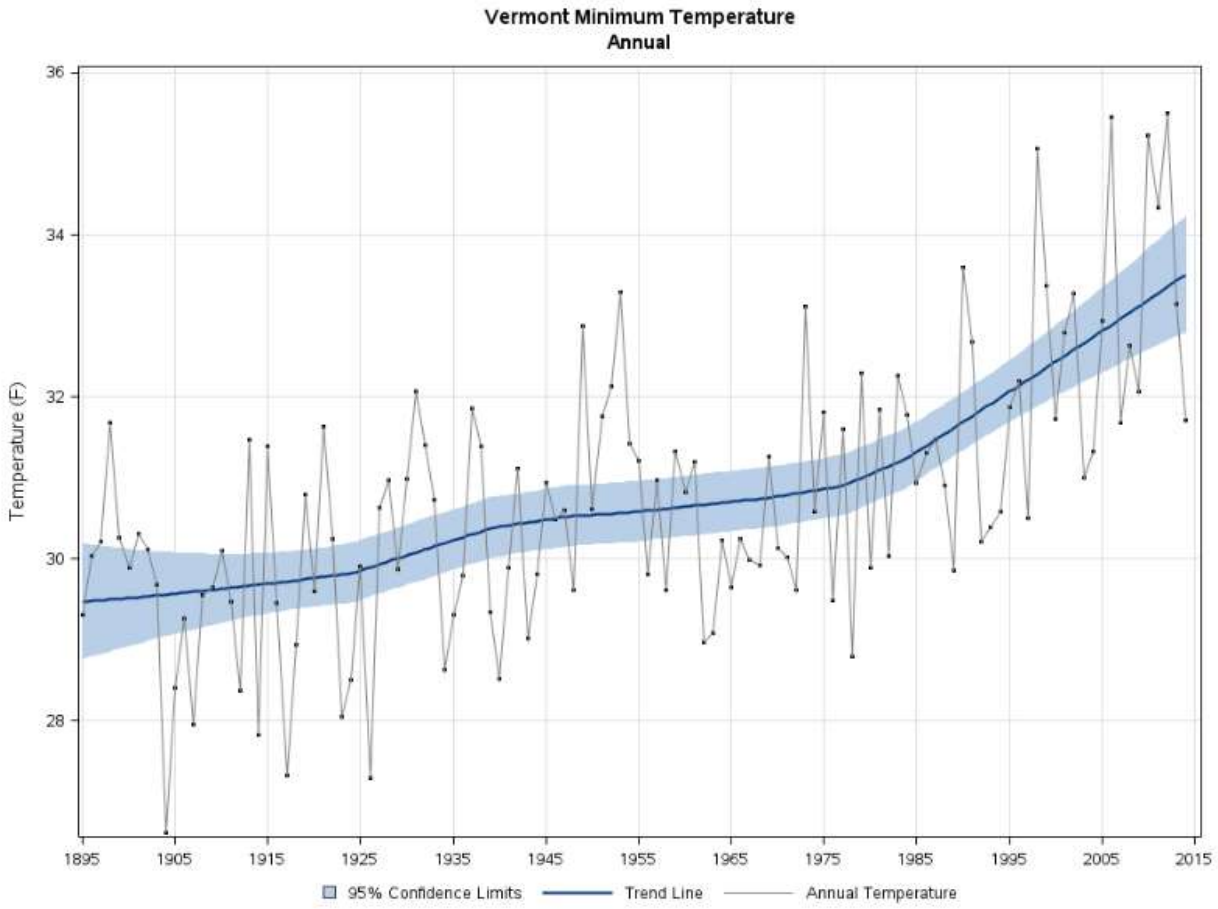
The most recent severe winter storm to hit Vermont began on December 9th, 2014 and lasted until December 11th, 2014. During this period of time, much of the state of Vermont was hit with heavy, wet snow that ranged from accumulation totals anywhere from a few inches to almost two feet along parts of the Green Mountains. The heavy, wet snow stuck to tree limbs and power lines which led to widespread power outages and significant damage to the state's power infrastructure. Over 100,000 customers were without power statewide, some for multiple days, and the damage to power infrastructure caused by the storm surpassed that which was incurred as a result of the 1998 ice storm or Tropical Storm Irene. In addition to damage to power infrastructure, towns hit by the storm had significant amounts of debris clean up and removal to contend with in the spring of 2015.

Over the past few winters, Bradford has received numerous snow storms that have dropped significant amounts of snow over a day or two day period. However, the details of these events and the damage they caused are overshadowed by winter weather events of the past. This is not to say such extreme events will not repeat themselves. It should be assumed that extreme winter weather events will occur

at some point in the future. The following table documents the occurrence of extreme cold/snow/ice storms in the Town of Bradford and in Orange County.

ICE DAMAGE INDEX	DAMAGE AND IMPACT DESCRIPTIONS
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
4	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

(Sperry-Piltz Ice Accumulation Index (SPIA), 2009).



History of Occurrences:

Date	Event	Location	Extent and Impacts
1/7/2015-1/8/2015	Extreme Cold	Bradford; County Wide; State-wide	An arctic cold front pushed across Vermont with plummeting temperatures and brisk strong winds of 15-30 mph caused dangerously cold wind chills of 25-40 degrees below zero during the evening of January 7 and morning of January 8. Temperatures in the morning of January 8 were 15-25 degrees below zero on the morning of January 8 in Orange County. The neighboring Town of Newbury registered 22 degrees below zero.
2/1/2015-2/28/2015	Cold/Wind Chill	County-State-wide	A persistent deep could trough settled across the northeast United States for the month of February, which registered the coldest month on Vermont record since December 1989 or January 1994. Many towns recorded 15 to 20 days below zero in the month, and several days with dangerously cold wind chills of 30 below zero or colder.
Period from 12/09/2014—12/12/2014 (DR-4207 VT)	Snow/ Winter Storm	Bradford; County-; region-wide	A powerful prolonged heavy, wet snow event from December 9th through December 11th. Snowfall totals ranged from a few inches to almost 2' near Warren, VT. The snow to liquid ratios ranged from 5-7" of snow to 1" of rain, which lead to the snow sticking to trees and power lines. Approximately 6 inches of snow and 1.89 inches of ice fell in Bradford. 3 Green Mountain Power customers were affected for 20 hours.

Period from 03/12/2014—03/13/2014	Snow Storm	County-; region-wide	A major snowstorm with near blizzard conditions at times impacted portions of northern New York on March 12th and lingered into the morning hours of March 13th. Numerous motor vehicle accidents, school and business closures resulted due to the storm on both March 12th and 13th. Snowfall totals across Orange county were generally 15 to 20+ inches. Significant power outages occurred in Bradford. On 3/14 147 GMP customers lost power for 1.5 hours and 413 GMP customers lost power for 1.2 hours/ Nearby Corinth received 16.2 inches of snow and 1.46 inches of ice.
Period from 02/13/2014—02/14/2014	Winter Storm	County-; region-wide	A Winter storm, responsible for record ice and snow across the southeast United States on February 12th, moved and redeveloped off the southeast United states coastline on February 13th. Snowfall across Orange county was 12 to 18 inches. Bradford received 17.6 inches of snow and 1.32 inches of ice. Significant power outages did not occur in Bradford during this winter storm.
02/05/2014	Snow Storm	County-; region-wide	Snowfall was at its peak during both the morning and afternoon/evening commutes causing hazardous travel. Eight to twelve inches of snow fell across Orange county. Bradford received 11.5 inches of snow and .7 inches of ice. Significant power outages did not occur in Bradford.
Period from 12/29/2014—12/30/2014	Winter Storm	County-; region-wide	Snow mixed with rain developed across southern Vermont during the late afternoon and changed to snow during the evening hours of December 29th. A wet, heavy 5 to 10 inches of snow fell across Orange county. 7.8 inches of snow and .72 inches of ice fell in Bradford. Significant power outages did not occur in Bradford..
Period from 12/14/2013—12/15/2013	Snow Storm	County-; region-wide	This was the first widespread snowfall of the 2013-14 winter season. The typical impacts associated with this storm were the numerous vehicle accidents, especially being the first storm of the season. Bradford received A widespread 10 to 15 inches of snow fell across Orange county, and Bradford received 10 inches. No power outages occurred in Bradford.
12/29/2013-12/30/2013	Winter Storm	County; region wide; Bradford	Low pressure across the southeast United States moved rapidly northeast from 12/29 through 12/30 causing snow mixed with rain to develop across eastern Vermont. Mixed snow and rain transitioned to snow during the evening hours of 12/29 and ended in the morning of 12/30. A heavy and wet 5 to 10 inches of snow fell across Orange County and Bradford. Widespread outages occurred in Bradford. On 12/29 186 GMP customers lost power for 2.13 hours and on 12/30 185 GMP customers lost power for 2.32 hours.
12/29/2012	Winter Storm	County; Region-wide	Snow overspread Vermont from south to north between 8pm and midnight of December 26th and fell heavily at times with a snowfall rate of 1-2 inches per hour throughout the day before diminishing during the evening hours. Snowfall accumulations of 12 to 18 inches were common across Vermont. Bradford and the Upper Connecticut River Valley experienced 6 to 10 inches of snow.9 GMP customers lost power for 1.6 hours.
2/19/2011	Cold Front; Strong Winds	County; region-wide	A strong cold front associated with a powerful storm across Canada moved across Vermont the night of February 18th into the early morning of February 19th. Strong west to northwest winds of 20 to 30 mph and gusts of 40-50 mph caused numerous power outages. Power outage data was unavailable for this event. Specific temperature and duration data was unavailable for this event.
12/1/2010	Ice Storm	Bradford	Sleet and frozen rain precipitation caused significant power outages in Bradford. 1.5 inches of sleep/frozen rain precipitation occurred. Power outage data was unavailable for this event.
Period from 11/27/2009-11/28/2009	Winter Storm	County; region-wide	A strong area of low pressure combined with a cold upper atmospheric low moved across Vermont causing snow and strong gusty winds. Snowfall occurred heavily on the eastern slope of the Green Mountains and wind gusts occurred in excess of 40 mph. Bradford did not experience heavy precipitation. Power outage data was

			unavailable for this event.
Period from 2/22/2009-2/23/2009	Winter Storm	County; region-wide	Light snow overspread Vermont during the morning of February 22nd and became moderate to heavy across much of central and eastern Vermont during the evening hours to early morning on 2/23. Snowfall totals ranged from 10 to 18 inches in central and eastern Vermont. The nearby Town of Corinth received 13 inches of snow. Power outage data was unavailable for this event.
Period from 02/26/2008—02/28/2008	Snow Storm	County-wide; statewide	Snow overspread over Vermont during the morning of February 26th and continued through the afternoon hours of the 27th before tapering to scattered snow showers in the evening. Storm totals ranged from 3 to 6 inches in the St. Lawrence River Valley, 5 to 10 inches across northern New York and 6 to 12 inches across Vermont with the heaviest along those favored northwest slopes of the northern Green Mountains as well as some higher elevations in south central Vermont. 10 inches were reported in the neighboring town of Corinth. Bradford did not experience significant power outages.
02/01/2008	"Mixed" Winter Storm	County-wide; statewide	This storm system transported a great deal of moisture and milder air above a surface that had a cold, dry airmass established across the region. This resulted in a significant wintery mix of snow, sleet, and freezing rain across north central and northeast Vermont. Snow began late morning February 125 in Vermont and changed to sleet and freezing rain during the afternoon and continued into the night. The precipitation turned back to snow shower during the night and continued into the morning of February 2nd. Snowfall reports were generally 2 to 5 inches with localized amounts up to 7 inches. In addition, one quarter to one half of ice accumulation (accretion) occurred as well. Finally, strong south to southeast winds around 3000 feet and above transferred to a few hilltops along the western slopes and produced wind gusts in excess of 50 mph. Numerous reports of motor vehicle accidents throughout the region. Bradford received 3.5 inches of new snow and about 1.2 inches of ice/sleet. Significant power outages did not occur in Bradford..
12/31/2007	Snow Storm	County-wide; statewide	Snow began to overspread New York and Vermont around Midnight Monday (31st) with snowfall rates rapidly increasing to near an inch per hour at times, but this was a quick-hit storm with steady accumulating snowfall ending across much of Vermont and northern New York by mid-morning. The storm contributed to Burlington's 4th snowiest December. 6 inches were reported in neighboring Town of Corinth. Power outage data was unavailable for this event.
Period from 12/16/2007—12/17/2007	Snow Storm with Freezing Rain	County-wide; statewide	Snowfall totals from this pre-winter storm ranged from 6 to 12 inches in southern Vermont, where a prolonged period of sleet and/or freezing rain occurred, to a rather uniform 12 to 18 inches across the rest of Vermont and northern New York. 9.1 inches of snow and 1.07 inches of rain/sleet were reported in Bradford. Significant power outages did not occur in Bradford.
Period from 04/15/2007—04/16/2007	Winter/ Snow Storm	County-wide; statewide	A powerful Nor'easter drifted east of New England and caused a mixture of snow and rain over Vermont. The storm started a mixture in the morning on the 15th and changed over to snow in the afternoon, continuing into mid-morning on the 16th. Snowfall totals were generally 4 to 7 inches in the valleys with locally up to a foot along the east-facing slopes of the higher elevations of the Green mountains. This was a heavy, wet snow that caused numerous power outages, as well as extremely slick and treacherous roads that resulted in numerous vehicle accidents. 7.5 inches of snow and .73 of rain/sleet occurred in Bradford. Power outage data was unavailable for this event.
Period from 04/04/2007—04/05/2007	Snow Storm	County-wide; statewide	Rain mixed with and then changed to sleet and snow across Vermont during the afternoon of the 4th and continued through midday on the 5th.|Combined snow and sleet accumulations ranged from 4 to 12 inches with the higher amounts in the higher elevations. This caused some hazardous travel as well as some scattered power outages due to fallen tree limbs and branches. Significant power outages did

			not occur in Bradford. 7.58 inches of precipitation were reported in nearby Chelsea.
03/17/2007	Snow Storm	County-wide; statewide	Heavy snow started in southern Vermont by late evening and reached the rest of the region by Midnight Saturday (17th) with snowfall rates of 1 to 2 inches per hour at times. 10 inches of snow were reported in Bradford. Significant power outages did not occur in Bradford.
02/14/2007	Snow Storm	County-wide; statewide	Low pressure developed over the central Appalachians and pushed north into Vermont at around midnight on the 14th. Snow fell through the night into the morning and was very heavy at times, and continued into the afternoon and evening. Snowfall rates as heavy as 2 to 4 inches per hour and brisk winds of 15 to 25 mph caused whiteout conditions, blowing and drifting snows, and impassible roads. Snowfall totals ranged from 15 to 25 inches in the Connecticut River valley. 19 inches were reported in neighboring Chelsea. Power outage data was unavailable for this event.
12/15/2003	Snow Storm	County-wide; statewide	Snow developed Sunday afternoon, December 14th, and became heavy Sunday night into Monday morning, December 15th. 10 inches were reported in nearby Chelsea. Power outage data was not available for this event.
01/03/2003	Snow Storm	County-; state-wide	A storm system over Virginia Friday morning (1/3/03) moved to coastal New Jersey Friday evening and then to near Cape Cod Saturday morning (1/4/03). Snow spread across the area late Friday afternoon, and became heavy at times late Friday night into Saturday morning. 8.2 inches were reported on 1/4 and another 3.3 inches were reported on 1/5 in nearby Chelsea. Power outage data was not available for this event.

The Town of Bradford is no stranger to winter weather and the hazards that it brings. Depending on the event, though especially with heavy, wet snow or ice, and sometimes in combination with high winds, electricity may be knocked out for a few hours or days. The utility companies currently serving the Town of Bradford, Green Mountain Power and Washington Electric Coop, have followed a regular tree-trimming schedule. Bradford town officials believe this is satisfactory to mitigate damage and the power outages caused by downed trees and tree limbs during a heavy, wet snow or ice event. In the event of an extended power outage, the Town would open its emergency shelters. More often, those without power would seek accommodations with friends or relatives. Bradford does not experience significant power outages due to the diligent tree trimming of utility corridors and fast response time by maintenance units.

Another complication of falling utility poles is the potential loss of the telephone line. If the landlines are impacted, the possibility presents itself that there is no reliable means of communication in the affected parts of Town as cell reception can be spotty. If the power is out, an internet connection is unlikely to be available.

Heavy, wet snow or large quantities of snow may also leave structures vulnerable to roof collapse. Roof collapse occurs when the structural components of a roof can no longer hold the weight of snow. Flat roofs are most vulnerable to collapse because they do not drain well and the snow on the roof soaks up water like a sponge, increasing the weight that the roof must bear. More common, it seems, is the collapse of barns commonly used for livestock sheltering and other agricultural purposes. Unfortunately, livestock in the barn are often killed, and equipment stored in the barn may be damaged or ruined. It is difficult to determine whether a residential structure or a barn would be rebuilt after a

roof collapse because the decision to rebuild would likely depend on the extent of damage. The collapse of a barn roof is likely to be a total loss, and the collapse of a house roof may be a 50% loss.

In general, winter weather is most hazardous to travelers. Icy and snow-covered roads present multiple examples of dangerous driving conditions and situations. In Bradford, the mountainous terrain, steep slopes, and remoteness of some roads further complicate travel. The Town relies on Travel Advisories issued by the State of Vermont Department of Emergency Management Homeland Security and the National Weather Service to alert residents of dangerous travel weather. Despite this, it is difficult to prohibit people from driving during winter weather events. As a result, emergency services personnel must always be prepared to provide assistance to stranded drivers or to those who have been in an accident.

Hazard	Location	Vulnerability	Extent	Observed Impact	Likelihood/ Probability
Extreme Cold/ Snow/ Ice Storm	Town wide	The entire Town is vulnerable, including road infrastructure, town and privately owned buildings, and utility infrastructure.	Sno fall has varied, from a few inches to over a foot or more. Heavy snow and wind downed trees and power lines. Snow/ice contributed to hazardous driving conditions.	For roof collapse, monetary damages will depend on each structure, but collapse of barn roof is often a total loss. This does not include the loss of livestock. Collapse of a house roof may be a 50% loss. For car crashes due to poor driving conditions, minimal damage to vehicle to totaled vehicle and operator injury. Health impacts could vary significantly.	Highly likely

4. Structural Fire

Vermont has one of the highest per capita death rates from fire in the nation. This is, in fact, the deadliest form of disaster throughout the state. In 2010, there were 1,956 reported structural fires in the state, which included 5 fatalities and over $18 million dollars in damage. Although there have been requirements for smoke detectors in rental housing for over 20 years, and requirements for smoke detectors in single-family dwellings since 1994, there was only one building involved in the fatal fires in 2012 that had evidence of working smoke alarms.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Structure Fire**.

Structure fires may occur at any point, and are typically initiated within a single fuel object. Smoke produced by the burning object forms a smoke plume and rises, creating a layer of smoke while also transporting heat to the smoke layer. Fire then spreads quickly by radiation from the flames, or from the smoke layer. Once other objects are engulfed, more smoke plumes are formed and heat radiates to other objects. Fire burns and moves across different materials depending on the material's composition, orientation, surface-to-mass ratio, and air supply in the structure/room.

The Town of Bradford is quite rural in nature, and it consists of primarily single-family residences that are spread out across Town. Some growth is structured around main roads, such as Route 5, Route 25, and Route 25B; however much of it is also relatively difficult to access in a quick and timely manner by fire departments. A review of the fires listed in the "History of Occurrences" chart below demonstrates the potential for structures located in the rural Town of Bradford to be completely or severely destroyed by fire.

The following occurrences were reported by the Committee or obtained from local sources. It is reasonable to assume that more structural fires have occurred in the period of time between the entries listed below, and that such fires have caused varying extents of property damage.

History of Occurrences:

Date	Event	Location	Extent and Impacts
1/9/2017	Structural Fire	307 South Main St	Bradford Fire Department responded for report of smoke in building and discovered fire in boiler room, Fire extinguished and minor damage occurred.
2/23/2016	Structural Fire of a multifamily dwelling	38 Bank St	Fire reported as a grease fire and patient was brought to the fire for treatment of burns.
5/22/2015	Structural fire of family dwellings	172 South Main St	Bradford Fire Department responded to structure fire and extinguished fire.
4/18/2015	Structural Fire	Tarbox Rd	Fire Department responded and extinguished fire.
2/18/2015	Structural Fire	74 Cross Rd	Structure fire resulted in trapped animals in building. Fire department extinguished fire and secured the building.
4/13/2014	Structural Fire of Barn	22 Appleton Dr	Structural fire of barn resulted in extensive damage, 75-100% damage, due to dysfunctional smoke detector. Electric fence determined to be source of fire. Property damage was $100,000 and content lost to fire were valued at $50,000,.

4/8/2014	Structural Fire	Main St	$4,000 in damage resulted from a small fire outside of a grocery store.
1/20/2014	Structural Fire	2565 Goshen Rd	$100,000 in damage resulted from a chimney fire.
4/30/2012	Debris Fire	Bradford	A debris fire caused the burning of .12 acres
4/21/2012	Unregulated Fire	Bradford	Children burned railroad ties and caused the burning of .5 acres.
1/26/2011	Structural Fire	4229 Waits River Rd	A structural fire of a family dwelling unit led to the extensive damages. $250,000 in damages occurred to the property, and $100,000 in damages occurred to the contents of the building.
9/3/2010	Debris Fire	Bradford	A debris fire caused the burning of .45 acres.
9/20/2009	Fireworks	Bradford	Unregulated fireworks caused the burning of 3 acres
4/15/2006	Permitted Burn	Bradford	A permitted burn exceeded established burn permit and caused the burning of .25 acres.
4/12/2006	Rubbish Barrel	Bradford	A rubbish barrel caused the burning of .13 acres.

As noted, recognized fire protection problems for the community include the following: development in areas distant from the village center of the Town, development on class 3 and 4 roads, distance from water sources (rivers, hydrants and/or fire ponds), inaccessibility to fires that may spread from the forest, and inadequate snow removal (for building access).

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Hazard	Location	Vulnerability	Extent	Observed Impact	Likelihood/ Probability
Structural Fire	Town-wide	All housing, municipal buildings, retail/commercial sites.	Depends on the location and severity of the fire.	Varies depending on the location and extent of the fire.	Occasionally

5. Severe Summer Weather, Hurricanes, and Tropical Storms

Severe weather consists of thunderstorms, lightning, hail, and intense winds. Often it consists of multiple events that combine to create hazardous conditions that pose a threat to communities in the State of Vermont and the Town of Bradford. Severe weather can be incredibly unpredictable. More common than hurricanes or tropical storms are severe thunderstorms (usually in the summer), which can cause flooding as noted above, and are associated with lightning, high winds, hail and tornadoes. Hailstorms have occurred in Vermont, usually during the summer months. While local in nature, these storms are especially significant to area farmers, who can lose entire fields of crops in a single hailstorm. Large hail is also capable of property damage. 382 hail events were recorded between 1950 and 2008 in the state, making hail an annual occurrence in some part of the state. Most of these events had hail measuring .75 inches, but many had hail at least 1.5 inches in size. The largest hail during the period was 3-inch hail that fell in Chittenden County in 1968. Tennis ball-sized hail was reported in the town of Chittenden during a storm in the summer of 2001. Thunderstorms can generate high winds, such as hit the region on July 6, 1999, downing hundreds of large trees in a few minutes.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Severe Weather**.

In Bradford, severe weather is quite common, typically in the late spring and summer months when the region experiences high temperatures. Severe thunderstorms tend to bring other hazards such as high winds, hail, lightning, and flooding, and these hazards are often experienced in combinations which create many unique weather and emergency management situations. Over the years, Bradford has been hit with high winds that have downed and uprooted numerous trees, and knocked out electricity to residents in the Town. Town specific wind data could not be found, but the "Remarks" section of NCDC Database helps to illuminate the impact strong winds can have on Bradford. Sizeable hail has also accompanied storms moving through the Town and region.

While hurricanes (storms with sustained winds greater than 74 mph) and tropical storms rarely reach as far inland as Vermont, they can be as or more destructive than a more commonly occurring severe weather event. Typically, they will manifest themselves in Vermont as tropical storms. In either case, the high winds, heavy rains, and large affected areas from hurricanes or tropical storms can make these rare events major disasters. The most infamous example of this was the disastrous hurricane of 1938. On September 21, 1938 a very fast moving hurricane hit Vermont in the early evening, but was moving so fast that wind damage was more severe than damage from rain in places. However, there was severe flooding, as over 4 inches of rain accompanied the storm and followed upon the heels of preceding storms that had saturated the ground and raised river levels. Buildings were lost, power lines were downed, and many trees were felled. Tropical Storm Floyd in September 1999 caused flooding and wind damage in parts of Vermont, as well as one fatality, and resulted in a federal disaster declaration.

The most recent flood that devastated Vermont, Orange County, and Bradford was the result of Tropical Storm Irene, which occurred on August 28, 2011. Record flooding was reported across the state and was responsible for several deaths, and millions of dollars of home, road and infrastructure damage. Due to the strong winds, 50,000 were without power initially, and many did not have power restored for over a week. Despite the damage wrought, the flooding caused by Tropical Storm Irene is considered to

be the second greatest natural disaster in 20th and 21st century Vermont, second only to the Flood of 1927.

The following list indicates the history of occurrence with regard to this hazard in Orange County (given that small population of Bradford, town-specific data is limited); an asterisk "*" denotes the few instances in which town-specific data is available, and federal disaster numbers are listed when appropriate. In an attempt to capture the individual hazards that may arise, and the different circumstances caused by the hazards in concert, the separate hazards are documented in the table below.

History of Occurrences:

Severe Weather Date	**Event**					**Location**	**Extent**
	Thunderstorm / severe storm	Flooding	Hail	High Winds	Lightning		
7/18/2016	✓	✓	✓	✓		Bradford; County-wide	Several rounds of thunderstorm developed ahead of a cold front and intensified when they reached Vermont. There were reports of wind damage to trees and utility lines. 1.5 inch in diameter hailstones were exhibited. Rainfall accumulation was not severe. Significant power outages did not occur in Bradford.
6/2/2013 – 6/3/2013*	✓		✓	✓		Bradford; County-wide	A very warm and humid air mass was located across Vermont. A strong mid-atmospheric disturbance, ahead of a cold front, moved across portions of Vermont and triggered widespread thunderstorms with pockets of damaging winds and large hail. Event caused tree damage and widespread power outage. At its peak, roughly 20k customers lost power. Bradford received .61 inches of rain in 24 hours. 119 total GMP lost power on 6/2 from durations lasting from 6 hours to 12 hours. On 6/3 23 GMP customers lost power for 2 hours.
6/25/2013-7/11/2013* (DR-4140 VT)	✓	✓	✓	✓		County-wide	Severe storms over a nearly one month period. Rains caused flooding in the region, winds downed trees, power outages were reported. On 6/24, 194 GMP customers lost power for 2 hours. Another outage occurred on 6/28 when 56 GMP customers lost power

							for .7 hours Overall during the disaster period, Bradford received 7.94 inches of rain.
9/11/2013*	✓			✓	✓	Bradford, County-wide	A weak area of low pressure embedded in an unseasonably warm and unstable air mass resulted in thunderstorms that moved across Vermont. Thunderstorms and high winds caused downed trees and utility lines. Bradford received 1.86 inches of rain in 96 hours. Widespread power outages occurred in Bradford. On 9/11, 120 GMP customers lost power for 9.4 hours, 45 customers lost power for 27.5 hours, 83 customers lost power for 11.8 hours, and 1 customer lost power for 15 hours. On 9/12, 3 GMP customers lost power for 11 hours and 1 GMP customer lost power for 8.4 hours.
7/4/2012*	✓			✓	✓	Bradford, County-wide	A moderately strong upper level disturbance ahead of a surface cold front moved through Vermont on July 4. Storm caused widespread wind damage and frequent lighting. Several trees were downed along Route 5. Hailstones estimated at 1.5 inches in diameter fell. Bradford received .3 inches of rain in 24 hours. 52 GMP customers lost power for 2.43 to 4.7 hours.
8/28/2011 (DR-4022 VT) Tropical Storm Irene	✓	✓		✓		Bradford; County-wide; Vermont	Tropical Storm Irene prompted wide-spread, devastating flooding throughout the region. Frequent wind gusts of 35 to 50 mph, especially in higher terrains, along with saturated soils caused widespread downed and uprooted trees. Bradford received 6.79 inches of rain in 48 hours. Bradford had $3,420.00 in damages. Only minimal power outages occurred in Bradford with isolated incidents affecting singular GMP customers for short durations.
06/09/2011	✓		✓	✓		County-wide	Scattered thunderstorms and a few isolated reports of damaging winds and large hail were reported. Power outage data was unavailable for this event.
05/26/2011-	✓	✓		✓		County-	Region struck by severe storms and

05/27/2011 (DR-4001 VT)						wide	flooding. Minimal damage occurred in Bradford. Bradford received .3 inches of rain in 24 hours. Power outage data was unavailable for this event.
07/21/2010	✓		✓	✓		Bradford, County-wide	Thunderstorms hit the area along with high winds, developing into supercells that caused widespread damage to trees, power poles and structures. Golf ball-sized hail fell in Bradford. Thunderstorm winds damaged trees and utility poles. No significant precipitation and power outages occurred in Bradford.
5/31/2009	✓		✓	✓		County-wide	40-55mph wind gusts and hail caused fallen trees and power outages in the region. Winds caused fallen trees, downed power lines, and property damage Power outage data was unavailable for this event.. Bradford received 21.21 inches of rain in 24 hours.
7/21/2008-8/12/2008 (DR-1790 VT)*	✓		✓	✓		County-wide	Thunderstorms with heavy rainfall in a moist atmosphere moved through central and southern Vermont during the afternoon and evening hours. A few thunderstorms produced hail that ranged from .5 to .25 inches in diameter. Bradford received 2.6 inches of rain in 24 hours with an additional 1.22 inches of rain in the previous 24 hours. No significant power outages occurred.
9/12/2008	✓	✓					Bradford reported $15,808.21 in damages. Detailed storm history was unavailable.
07/09/2007-07/11/2007 (DR-1715 VT)	✓		✓	✓	✓	Bradford; County-wide	An area of low pressure moved across Canada and south to Vermont causing thunderstorms, hail, winds, and lighting. Bradford experienced 1.65 inches of rain in 24 hours, but significant power outages did not occur.
8/30/2007	✓		✓	✓		Bradford; County-wide	A cold front moved through a warm and unstable arimass across southern and eastern Vermont. A few widely scattered thunderstorms moved across the region with nickel sized hail in neighboring Town of Newbury.
6/7/2007	✓		✓	✓			A backdoor cold front and mid-level disturbance moved into a moderately unstable airmass during the afternoon, which moved into Vermont. Some

							severe thunderstorms produced damaging winds. Winds in Bradford caused the total collapse of a tin bar and downed trees on many roads. Some severe storms produced large hail .75 inches in diameter. Bradford received .9 inches of precipitation. Outage?
04/15/2007-04/21/2007 (DR-1698 VT)	✓	✓		✓		County-wide	Severe storms and flooding impacted Orange and surrounding counties. 7.5 inches of wet heavy snow mixed with warming temperatures led to flooding. Power outage data was unavailable for this event.
7/18/2006	✓			✓		County-wide	A strong mid-level atmospheric disturbance moved into a marginally unstable airmass across Vermont to cause severe thunderstorms. The thunderstorm knocked down trees along Interstate 91 in neighboring Newbury. Power outage data was unavailable for this event. Specific precipitation data was unavailable for this event.
8/2/2006	✓			✓	✓	County-wide	A mid-atmospheric disturbance moved into a very warm, humid and unstable airmass across Vermont during the afternoon of the 2nd, which lead to the development of scattered thunderstorms. Some of these thunderstorms were locally severe and produced damaging winds that knocked down trees, powerlines and a tree on a mobile home along Route 5 in neighboring Newbury. Power outage data was unavailable for this event..
07/21/2003-08/18/2003 (DR-1488 VT)	✓	✓		✓		County-wide	Severe storms and flooding impacted Orange and surrounding counties. Specific precipitation and outage data was unavailable for this event. Bradford reported $5,710.12 in damages.
07/14/2000-07/18/2000 (DR-1336 VT)	✓	✓		✓		County-wide	Severe storms and flooding impacted Orange and surrounding counties. Specific precipitation and outage data was unavailable for this event.
9/16/1999-9/21/1999 (DR-1307 VT)	✓	✓		✓		County-wide	Tropical Storm Floyd's rains and winds caused road and culvert washouts. Specific precipitation and outage data was unavailable for this event.

7/6/1973 (DR-397 VT)		✓		✓		County-wide	One of the largest flood events of the 20th century in VT. Landslides reported in the region.
11/3/1927	✓	✓				County-wide	"Great Flood of 1927." Worst recorded flood in VT. The White River crested at a record of 29.30 feet.

The Town of Bradford is very prone to strong winds, particularly microburst events that sweep through the region. Power outages are the most common occurrence in the wake of such wind events, usually occurring as a result of tree limbs falling on local power lines.

The other main hazard caused by severe weather throughout the Town is flooding. The most recent major flooding event to occur in the region was in the summer of 2013. Severe storms brought heavy rain and strong winds over a three week period in late June and early to mid-July. The flooding was widespread and severe enough for a federal Disaster Declaration, DR-4140 VT, to be issued for Orange and other counties in Vermont. The Town of Bradford was impacted by this event, and sustained power outages and heavy rainfall

There are 850 acres of mapped floodplain in the Town of Bradford, 81 of which are floodway, the deepest fasting flowing area in a flood. 4% of the land area of the Town is the floodplain. There are 10 residences, 8 commercial buildings, 4 government buildings, and 2 industrial properties in the Special Flood Hazard Area, which would equal $6,483,224 if all properties were severely damaged/destroyed in a severe flooding event. Vermont Route 25, Vermont Route 25B, Rowell Brook Road, and Old Creamery Roads, Road are regularly or sometimes (depending on weather event and track of weather event) impacted by flooding. There are no repetitive loss structures in the Town of Bradford on FEMA's NFIP list.

Hazard	Location	Vulnerability	Extent	Observed Impact	Likelihood/ Probability
Severe Weather	Town wide for wind, hail, high winds, lightning and thunderstorm impacts. The entire Town is vulnerable to flooding but “hot spots” include Vermont Route 25, Route 5 bridge, Rowell Brook Road, and Old Creamery Road,	Town and private buildings, and utilities; culverts, bridges, road infrastructure are vulnerable to severe weather. There are 24 total properties that are located within the special flood hazard areas. These consist of 10 single-family residences, 4 government buildings, 2 industrial properties, and 8 commercial properties. If all of these properties were destroyed in a flood, the resulting damage would equal approximately $6,483,224.	During Tropical Storm Irene- 5-6” of rainfall in Bradford.	$49,074.88 in damage total for Bradford according to FEMA’s Public Assistance database (captures at least 70% of total damage).	Highly likely

C. Vulnerability Summary

As a result of the above profile of hazards, the town believes the following vulnerabilities to be of highest concern because of their potentially severe consequences and potential likelihood:

- **Flooding**: One of the worst threats, flooding impacts roads and the village, especially facilities for children, elders, and low income housing. Under-sized bridges and culverts factor into the threat, as do outdated flood hazard mapping for Orange County. Furthermore, flood hazard mapping (Special Flood Hazard Areas) does not adequately encompass all areas that could be flooded, thus potentially making some residents too complacent in regard to the threat. There are numerous homes, public facilities, and commercial facilities are located in the 500 year floodplain and could be impaired in a major flooding event. The entire Town is vulnerable to flooding but "hot spots" include Vermont Route 25, the Route 5 bridge, Rowell Brook Road, and Old Creamery Road, Vulnerable structures to flooding include the Bradford Golf Club, the North Country Organics, ARC Mechanical Contractors, and the Oxbow Veterinary Clinic, and many residential structures, which are located within the mapped Vermont River Corridor.
- **Hazardous Materials**: A truck traffic accident on Route 25, Route 25B, Route 5, or Interstate 91 could cause a hazardous materials spill. Railroad accident could also present a major spill and hazard to Bradford. The Waits River and the Connecticut River are vulnerable to contamination due their close proximity to these roads and railroads.
- **Extreme Cold/Snow/Ice Storm:** Lack of access to power and telecommunication services throughout the Town could severely impede response efforts, and could be especially harmful to vulnerable populations (e.g., the elderly and disabled).
- **Severe Summer Weather, Hurricanes, & Tropical Storms**: Damage to public and private property and municipal infrastructure can be extensive during severe weather events. Prolonged power outages and downed cellular communications can greatly hamper public and business services for indeterminate periods of time. There are numerous homes, public facilities, and commercial facilities are located in the 500 year floodplain and could be impaired in a major severe weather event. The entire Town is vulnerable to flooding but "hot spots" include Vermont Route 25, the Route 5 Bridge Rowell Brook Road, and Old Creamery Roads, Vulnerable structures to flooding and severe weather include the Bradford Golf Club, the North Country Organics, ARC Mechanical Contractors, and the Oxbow Veterinary Clinic, and many residential structures, which are located within the mapped Vermont River Corridor..
- **Structural Fire**: All housing, municipal buildings, and retail/commercial sites are vulnerable to fires. However, members of the hazard mitigation committee specifically identified single family households as lacking sufficiently working smoke and carbon dioxide detection devices, therefore magnifying their vulnerability

VI. Mitigation

A. Mitigation Goals

- To reduce injury and losses, including loss of life and to infrastructure, structures and businesses, from the natural hazard of ice jams.
- To reduce injury and losses, including loss of life and to infrastructure, structures and businesses, from the hazard of hazardous material spill(s).
- To reduce injury and losses, including loss of life and to infrastructure, structures and businesses, from the natural hazard of flash flooding, flooding and fluvial erosion
- To reduce injury and losses, including loss of life and to infrastructure, structures and businesses, from the natural hazard of extreme cold/snow/ice storms.

B. Excerpted Town Plan Goals & Recommendations Supporting Local Hazard Mitigation

- To support the continued economic vitality of Bradford's Downtown (page 13).
- To preserve, promote and enhance the cultural and recreational values of the Town in order to encourage the use of these resources by the local population and visitors to Bradford (page 33).
- The Town should adopt a Capital Budget and Program in order to plan for anticipated infrastructure maintenance and improvement (page 33).
- All Bradford residents should be served by well-equipped and well trained emergency service personnel (police, fire, and EMS) (page 37).
- The town should explore whether the Fast Squad should officially become part of the town government (page 37).
- All emergency response personnel should be trained in the NIMS system (page 37).
- To encourage patterns of land use and development that use energy most efficiently, and that do not increase the use of non-renewable energy (page 53).
- Hydropower development should not diminish water quality, habitat, or recreational opportunities. Run of the river projects are preferred to projects that require impoundments with low or minimum flows (page 54).
- It is the policy of the town to review, monitor, and carefully control and land use activities that may potentially threaten groundwater quality to prevent undue loss of groundwater quality (page 59).
- It is the policy of the Town to prohibit high-risk uses within the source protection area. These include sanitary landfills, car washes, metal plating shops, salt stockpiles, motor vehicle repairs, and similar type uses which involve the manufacture, storage, use, or transportation of toxic chemicals and pollutants (page 59).
- To enhance and maintain use of flood hazard areas as open space, greenways, non-commercial recreation and/or agricultural land (page 64).
- To maintain large tracts of non-fragmented upland forest to slow, absorb, and clean rainwater and stormwater runoff before it reaches the valley below (page 64).
- To ensure no net loss of flood storage capacity (page 64).

- To maintain accurate flood hazard maps to assist in appropriate land use decisions (page 64).
- To identify and map unstable river and steep streams at risk of flood erosion (page 64).
- It is the policy of the Town that preferred uses for flood hazard areas shall be open space, greenbelts, and non-commercial recreation or agriculture (page 64).
- It is the policy of the Town to prohibit any land use activity (filling or removal of earth or rock) within flood hazard areas which would result in net loss of flood storage, increased diverted flood levels, or increased risk to adjacent areas (page 64).
- It is the policy of the Town to extend the limits of the flood hazard area in the Bradford Zoning Bylaws to areas identified as at risk to flood erosion (page 65).
- It is the policy of the Town to discourage development and placement of fill within the limits of the 100-year floodplain. Where careful planning at the local level accepts development within the floodplain, the development should be designed to achieve no-net-fill, and so located that it will not impede the floodwaters and endanger the health, safety, and welfare of the public. No structural development, except bridges, should be located within the limits of a floodway (page 65).
- It is the policy of the Town to encourage natural areas, non-structural outdoor recreational and agricultural uses as the preferred land uses within floodplains. Commercial, industrial, and residential uses are discouraged, except as noted above (page 65).
- . It is the policy of the Town to prohibit new building in the 100-year floodplain, or the special flood hazard areas in order to protect citizens and businesses from damage, to avoid adding to flooding of their downstream neighbors, and to reduce the public cost of disaster relief (page 65).
- The Planning Commission should work with the Regional Commission and Vermont Emergency Management to ensure that their current flood hazard area requirements meet national standards (page 66).
- When revising Bradford's flood hazard area requirements, the Planning Commission should strongly consider excluding all new building within the 100-year flood plain or special flood hazard area (page 66).
- Town and State highway crews should take steps in a timely manner to correct or replace undersized water passageways or culverts that are at risk of flooding or limit fish and amphibian passage (page 66).
- Town and State highway crews should take steps in a timely manner to reinforce stream banks adjacent to roadways at risk of significant erosion from seasonal flooding (page 66).
- The town should consider creating and adopting an ordinance to control the storage of junk, garbage, or other materials which could be hazardous during a flood event, in areas identified as special flood hazard (page 66).
- Road crews should take care when ditch cleaning to minimize the spread of invasive species such as Japanese Knotweed, Wild Chervil, Wild Parsnip and Purple Loosestrife (page 68).
- The Bradford Planning Commission should consider designating "conservation areas" within the Bradford Zoning Bylaws to ensure that large tracts of forest located on steep slopes have minimal development (page 69).

- It is the policy of the Town to discourage development on slopes exceeding 15% (Page 74).
- It is the policy of the Town to employ strict erosion control plans when development is considered in areas in excess of 10% slope (page 74).
- The Town should continue to update and maintain a culvert inventory in Bradford in order to ensure that the 90%/10% grant match offered by VTrans is available to the Town. Additionally, the Town should develop a program for evaluating roads and bridges. The Town should work with VTrans to identify potential traffic calming options in the Downtown (page 85).
- Bradford's emergency services, wastewater treatment plants, power substations, and municipal buildings shall not be built in the Special Flood Hazard Areas unless flood-proofed or elevated to at least 2 feet above the base flood elevation and designed to withstand erosion risk (page 91)..
- New buildings within Bradford's mapped floodways shall be prohibited (page 91).
- Commercial, industrial, and residential uses within ANR's mapped river corridor areas are strongly discouraged outside of Bradford's village and town centers (page 91).
- Natural areas, non-structural outdoor recreational and agricultural uses are the preferred land uses within Bradford's river corridor areas due to the dangerous erosive nature of these areas (page 91).
- Bradford should work with the Regional Planning Commission to strengthen the Town's Flood Hazard Bylaws in order to mitigate risks to public safety, critical infrastructure, historic structures and municipal investments from inundation and erosion (page 91).
- Bradford should work with VTrans and the Regional Planning Commission on advocating for and improving the flood capabilities of state or Town-owned transportation infrastructure (page 91).
- Bradford should continue working to develop mitigation plans, and emergency preparedness and recovery procedures from flooding (page 91).
- Existing homes and businesses at serious risk of flood damage in Bradford should be identified and prioritized in concert with the ANR River Management Section and the Regional Planning Commission for mitigation actions such as elevation/relocation or purchase and demolition (91).
- Areas not designated in either FEMA's maps or in VT ANR's maps, but which are flooded during a weather event should be added to local flood regulations (page 92).
- Watershed-level planning should be done by towns with assistance from the Regional Commission to evaluate natural and constructed flood storage options upstream of existing areas of concentrated development that are at risk of flooding (page 92).
- Bradford will work with ANR, the Regional Planning Commission and landowners to lessen flood risk by restoring natural channel functions through berm or dam removal or intentional lowering of streambanks (page 92).
- Bradford should adopt road and bridge standards to the 50 or 100 year storm level for identified critical transportation routes (page 92).
- The Planning Commission should revise the Flood Hazard Bylaw to include restrictions on development in mapped River Corridor Areas as well as 50 feet within unmapped upland streams (page 92).

The Bradford Municipal Plan was updated and adopted on 01/28/2016, and has an 8 year lifespan. The 2010 Bradford Annex, the previous version of this Local Hazard Mitigation Plan for the Town of Bradford, provided guidance in the development of the Bradford Municipal Plan, including directing goals, policies, and recommendations towards mitigating the effects of future hazards on health and property in the Town.

C. Hazard Mitigation Strategies: Programs, Projects & Activities

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(3)(ii), 201.6(c)(3)(iii) and 201.6(c)(3)(iv).

Vermont's Division of Emergency Management & Homeland Security encourages a collaborative approach to achieving mitigation at the local level through partnerships with Vermont Agency of Natural Resources, VTrans, Vermont Agency of Commerce and Community Development, Regional Planning Commissions, FEMA Region 1 and others. That said, these agencies and organizations can work together to provide assistance and resources to towns interested in pursuing hazard mitigation projects.

With each mitigation strategy, general details about the following are provided: local leadership, possible resources, implementation tools, and prioritization. The prioritization category is based upon the economic impact of the action, Bradford's need to address the issue, the cost of implementing the strategy, and the availability of potential funding. The cost of the strategy was evaluated in relation to its benefit as outlined in the STAPLEE guidelines (includes economic, political, environmental, technical, social, administrative, and legal criteria). A range of mitigation strategies was vetted by the committee, and those that were determined to be feasible are included in the table below.

Strategies given a "High" prioritization indicate they are either critical or potential funding is readily available, and should have a timeframe of implementation of less than two years. A "Medium" prioritization indicates that a strategy is less critical or the potential funding is not readily available, and has a timeframe for implementation of more than two years but less than four. A "Low" prioritization indicates that the timeframe for implementation of the action, given the action's cost, availability of funding, and the community's need to address the issue, is more than four years.

The Town of Bradford understands that, in order to apply for FEMA funding for mitigation projects, a project must meet more formal FEMA benefit cost criteria. A project seeking FEMA funds would undergo a full benefit-cost assessment in the FEMA-approved format. The Town must have a FEMA-approved Local Hazard Mitigation Plan as well.

The following strategies will be incorporated into the Town of Bradford's long-term land use and development planning documents. In addition, the Town will review and incorporate elements of this Local Hazard Mitigation Plan into updates for the municipal plan, zoning regulations, and flood hazard/ river corridor bylaws. The incorporation of the goals and strategies listed in the Local Hazard Mitigation Plan into the municipal plan, zoning regulations and flood hazard/river corridor bylaws will also be considered after declared or local disasters. The Town shall also consider reviewing any future TRORC planning documents for ideas on future mitigation projects and hazard areas.

Hazard(s) Mitigated	Hazard Mitigation Actions	Local Leadership	Prioritization (Mitigation Plan Status)**	Possible Resources*	Time Frame
All Hazards	*Promote the active use of the Code Red communication system, called iPAWS or Integrated Public Alert and Warning System, which will assist in alerting residents to hazards when they occur. (Mitigation)*	Emergency Management Director	High (New)	Local resources	Winter 2018-Spring 2018
Structural Fire	*Shorten dry hydrant located at juncture of Route 25 and Kenyon Rd by shortening it to improve functionality. (Mitigation).*	Bradford Fire Department	Medium (Action #8 of 11 in 2010 Plan).	Local resources; VT Dry Hydrant Grant Program	Summer 2019- Fall 2019
	Remove dilapidated dry hydrant on Flanders Brook Road to eliminate confusion of emergency responders in their efforts to reduce the loss of life and infrastructure to structural fire. (Mitigation).	Bradford Fire Department	Low (New)	Local resources; VT Dry Hydrant Grant Program	Summer 2022-Summer 2023
	Develop and implement easement for hydrant on Goshen Road East to reduce the loss of infrastructure from structural fire. (Mitigation).	Bradford Fire Department	Medium (New)	Local resources; VT Dry Hydrant Grant Program	Summer 2020-Summer 2021
	Encourage businesses located in the two main blocks in Bradford Village to utilize tax benefits from Bradford Village designation to install sprinkler systems which will reduce the loss of life and infrastructure in the event of a block fire. (Mitigation)	Selectboard, Planning Commission, Emergency Management Director	Medium (New)	Local resources; private investment; HMGP Grant Program	Spring 2019-Fall 2019

Hazard(s) Mitigated	Hazard Mitigation Actions	Local Leadership	Prioritization (Mitigation Plan Status)**	Possible Resources*	Time Frame
	Remove wooden stairway in-between Colatina Exit and Bliss Village Store. Removal of this portion of existing structure will diminish the extent of potential conflagrations and will reduce the loss of life and infrastructure from block fires. (Mitigation)	Selectboard, Emergency Management Director	Medium (New)	Local resources; HMGP Grant Program	Spring 2019-Fall 2019
	Consider implementing a cement firewall in the village blocks in Bradford Village to limit the spread and reduce the loss of life and property in the event of a block fire. (Mitigation)	Selectboard, Emergency Management Director	Medium (New)	Local resources; HMGP Grant Program	Spring 2020-Fall 2020
Flash Flood/Flood/ Fluvial Erosion/ Severe Summer Weather/ Tropical Storm	*Upgrade culverts on Hackett Hill Road. Upgraded culverts appropriately handle the hydraulic capacity of streams and therefore protect town infrastructure from flooding. (Mitigation)*	Selectboard	High (Action #2 of 11 in 2010 Plan).	VTrans; local resources; Better Roads Grant Program; HMGP Repetitive Loss Grant	Spring 2017-Fall 2018
	Upgrade culverts on Mink Hill Road. Upgraded culverts appropriately handle the hydraulic capacity of streams and therefore protect town infrastructure from flooding. (Mitigation)	Selectboard	High (Action #2 of 11 in 2010 Plan).	VTrans; local resources; Better Roads Grant Program; HMGP Repetitive Loss Grant	Spring 2019-Fall 2020
	Upgrade culverts on Fairground Road. Upgraded culverts appropriately handle the hydraulic capacity of streams and therefore protect town infrastructure from flooding. (Mitigation)	Selectboard	High (Action #2 of 11 in 2010 Plan).	VTrans; local resources; Better Roads Grant Program; HMGP Repetitive Loss Grant	Spring 2017-Fall 2018

Hazard(s) Mitigated	Hazard Mitigation Actions	Local Leadership	Prioritization (Mitigation Plan Status)**	Possible Resources*	Time Frame
	Upgrade culverts on Goshen Road East. Upgraded culverts appropriately handle the hydraulic capacity of streams and therefore protect town infrastructure from flooding. (Mitigation)	Selectboard	High (Action #2 of 11 in 2010 Plan).	VTrans; local resources; Better Roads Grant Program; HMGP Repetitive Loss Grant	Spring 2017-Fall 2018
	Conduct a road erosion inventory to document erosion sections on Town road infrastructure to prepare for Municipal Roads General Permit and to improve infrastructure to ensure long term mitigation of damage to town owned property from flood waters. (Mitigation)	Selectboard	High Action #5 of 11 in 2010 Plan).	VTrans; Better Roads Grant Program; local resources	Summer 2018-Fall 2019
	Communicate with Depot Street Businesses, ARC Contractors, North Country Organics, Carroll Concrete, and Oxbow Veterinary Clinic, about elevating structures and hazardous materials. (Mitigation)	Selectboard	Medium (New)	Local structures	Fall 2020-Winter 2020
	Develop a schedule and capital budgeting program to replace undersized culverts. Upgraded culverts appropriately handle the hydraulic capacity of streams and therefore protect town infrastructure from flooding. (Mitigation)	Selectboard/ Road Foreman	High (Action #2 and #5 of 11 in 2010 Plan).	TRORC; local resources	Fall 2018-Spring 2019
	Update Bradford's flood hazard area regulations to ensure that they are compliant and consistent with state and federal guidelines and statutes. (Mitigation)	Planning Commission	Low (Action #3 of 11 in 2010 Plan).	Municipal Planning Grant; TRORC; local resources	Fall 2021-Fall 2022

Hazard(s) Mitigated	Hazard Mitigation Actions	Local Leadership	Prioritization (Mitigation Plan Status)**	Possible Resources*	Time Frame
	Consider adopting river corridor regulations, which will incorporate VT ANR's river corridor maps, helping residents and planners know what land is necessary for riparian functions and to prevent the threat to current and future development. (Mitigation)	Selectboard	Low (Action #3 and 4 of 11 in 2010 Plan).	ANR; MPG; local resources	Fall 2022-Fall 2023
	Support projects to protect or restore, including riparian plantings, strategic areas of floodplain to provide areas for flood storage, which will help alleviate peak flood flows and reduce the loss of property during a flood. (Mitigation)	Selectboard/ Planning Commission	Medium (New)	Upper Valley Land Trust; Upper Valley Trout Unlimited; local resources	Spring 2021-Fall 2021
	Keep up-to-date with Vermont Road and Bridge Standards, which will help Bradford design structures that mitigate flood damage to Town Infrastructure. (Mitigation)	Road foreman/ Selectboard	High (New)	Local resources	Spring 2018-Summer 2018 (or when they are updated by VTrans)
	Request an updated flood map from FEMA, which will more accurately represent frequently flooded areas and will allow the town to properly monitor and restrict the construction of infrastructure in areas that are vulnerable to flooding and severe weather. (Mitigation)	Town Zoning Administrator	Medium (New)	Local resources; FEMA	Fall 2020-Winter 2021
Extreme Cold/Snow/ Ice Storm	*Clear and maintain town road rights-of-way to protect town infrastructure. (Mitigation)*	Highway Department/Selectboard	Medium (New).	Local resources	Summer 2020-Fall 2020

Hazard(s) Mitigated	Hazard Mitigation Actions	Local Leadership	Prioritization (Mitigation Plan Status)**	Possible Resources*	Time Frame
	Encourage Green Mountain Power to clear and maintain utility corridors, which will protect town and utility infrastructure. (Mitigation)	Emergency Management Director	High (Action #11 of 11 in 2010 Plan).	Green Mountain Power; local resources	Fall 2017-Fall 2018

Hazard(s) Mitigated	Ongoing Actions to Support Mitigation and Preparedness Actions	Local Leadership	Prioritization (Mitigation Plan Status)**	Possible Resources*	Time Frame
All Hazards	*Ensure that Bradford's Local Emergency Operations Plan (LEOP) is kept up-to-date and identifies vulnerable areas and references this Plan. (Preparedness)*	Emergency Management Director/ Selectboard	High (Action #1 of 11 in 2010 Plan).	Vermont Division of Emergency Management and Homeland Security (VT DEMHS); TRORC; local resources	Yearly
	Alert residents to upcoming hazards, bad weather, and potentially treacherous travel conditions by posting the VTrans Live Update Road Condition webpage on the Town Website. These resources will be used to give residents important information about upcoming hazards and potentially treacherous travel conditions. This town-wide notification system will reduce the loss of life during a hazard. (Preparedness)	Emergency Management Director / Selectboard	High Action #10 of 11 in 2010 Plan).	Vermont Division of Emergency Management and Homeland Security (VT DEMHS); TRORC; local resources	Fall 2017-Winter 2018
	Develop a methodology to consistently document infrastructure damage after weather events. (Preparedness)	Road Foreman/ Town Clerk	Medium (Action #5 of 11 in 2010 Plan).	TRORC; local resources; National Weather Service; VTrans	Fall 2020
	Continue to submit Emergency management, public safety commission, highway, fire department, fast squad, and police chief reports in the annual Town Report. (Preparedness)	Selectboard	High (New)	Local resources	Ongoing
	Require Bradford employees to become Incident Command System (ICS) 100 and 200 certified. (Preparedness).	Emergency Management Director	High (New)	Local Resources	Ongoing

Hazard(s) Mitigated	Ongoing Actions to Support Mitigation and Preparedness Actions	Local Leadership	Prioritization (Mitigation Plan Status)**	Possible Resources*	Time Frame
	Organize Shelter in Place Drills at the Valley Vista Center and Oxbow High School. (Preparedness)	Emergency Management Director/Select board	Medium (New)	Local Resources	Ongoing
	Maintain highway and fire mutual aid agreements. (Preparedness)	Highway/Fire Department	High (New)	Local resources and with assistance from TRORC	Yearly
	Distribute Vermont Division of Emergency Management & Homeland Security: Family Emergency Preparedness booklet at Town Meeting Day. (Preparedness)	Selectboard/ Emergency Management Director	High (New)	Local resources	Ongoing and occurs yearly
	Ensure Red Cross Shelters, United Congregational Church Bradford Elementary School and Evangelical Church, are stocked with cots, blankets, and MRE (Meals Ready to Eat) (Preparedness)	Emergency Management Director	High	Vermont Division of Emergency Management and Homeland Security (VT DEMHS); VT Alert; local resources	Yearly
	Continuously stock gear to help contain small spills when they occur (booms, absorbent materials, etc.). (Preparedness)	Bradford Fire Department	High	Bradford Fire Department resources	Yearly
	Maintain existing dry hydrants, by checking, servicing, flushing, and opening them annually. Proper maintenance of hydrants will reduce the loss of life and infrastructure from structure fires. (Preparedness)	Fire Chief/Fire Department	High (Action #8 of 11 in 2010 Plan).	Local Resources	Ongoing and occurs yearly.
	Enlist statewide fire education trailer for use at Bradford Elementary School and at community events, which will help residents identify fire hazards in their homes. (Preparedness)	Fire Chief/Fire Department	Medium	Local Resources, Vermont Division of Public Safety: Division of Fire Safety	Ongoing

Hazard(s) Mitigated	Ongoing Actions to Support Mitigation and Preparedness Actions	Local Leadership	Prioritization (Mitigation Plan Status)**	Possible Resources*	Time Frame
	Distribute fire prevention fliers at the school to protect young residents from loss of life during fires. (Preparedness)	Fire Chief/Fire Department	High	Local resources	Ongoing. Occurs once per year in the fall.
Hazardous Material Spill	*Ensure that all emergency response and management personnel continue to receive HAZMAT Awareness training at a minimum. (Preparedness)*	Bradford Fire Department	High (Action #7 of 11 in 2010 Plan).	Bradford Fire Department resources	Yearly
Flash Flood/ Flood/ Fluvial Erosion	Plan for, budget, and maintain roads for safe winter travel. (*Preparedness*)	Selectboard	High (Action #2 of 11 in 2010 Plan).	Local resources	Ongoing and occurs yearly.
	Continue efforts throughout Town to maintain and improve ditching in rights-of-way of Town maintained roads. (Mitigation).	Road Foreman	High	Local Resources; Better Roads Grant Program	Ongoing
Extreme Cold/Snow/ Ice Storm	*Develop a periodic program to clear tree limbs and maintain town road rights-of-way, and work with local utilities to ensure that utility corridors are cleared and maintained. (Preparedness)*	Selectboard	Medium (new)	Green Mountain Power; local resources	Fall 2021
	Update and maintain existing list of populations that are vulnerable to extreme cold and other hazards. Call and visit vulnerable residents, if necessary, in the event that a hazard occurs. By maintaining this list, the health of vulnerable populations will be protected. (Preparedness)	Selectboard, Emergency Management Director	Medium	Local resources	Ongoing and occurs yearly.

Hazard(s) Mitigated	Ongoing Actions to Support Mitigation and Preparedness Actions	Local Leadership	Prioritization (Mitigation Plan Status)**	Possible Resources*	Time Frame
	Distribute safe winter driving informational materials to residents by means of Pomfret listserv. Safe winter driving mitigates the loss to human health. (Preparedness)	Selectboard, Town Clerk	Low (Action #10 of 11 in 2010 Plan).	Local Resources	Year

*Depending on the mitigation action, local resources may include the following: personnel/staff time; volunteer time; budget line items, donations, cash from capital campaigns, among others.

Appendices

Appendix A: Hazard Ranking Methodology

Frequency of Occurrence Probability	Warning Time Amount of time generally given to alert people to hazard	Potential Impact Note: Severity of damage and disruption generally correlates with magnitude (extent) of event
1 = *Unlikely* <1% probability of occurrence in the next 100 years 2 = *Occasionally* 1–10% probability of occurrence per year, or at least one chance in next 100 years 3 = *Likely* >10% but <100% probability per year, at least 1 chance in next 10 years 4 = *Highly Likely* 100% probable in a year	1 = More than 12 hours 2 = 6–12 hours 3 = 3–6 hours 4 = None–Minimal	1 = *Negligible* Isolated occurrences of minor property damage, minor disruption of critical facilities and infrastructure, and potential for minor injuries 2 = *Minor* Isolated occurrences of moderate to severe property damage, brief disruption of critical facilities and infrastructure, and potential for injuries 3 = *Moderate* Severe property damage on a neighborhood scale, temporary shutdown of critical facilities, and/or injuries or fatalities 4 = *Major* Severe property damage on a metropolitan or regional scale, shutdown of critical facilities, and/or multiple injuries or fatalities

Appendix B: Critical Stream Crossings

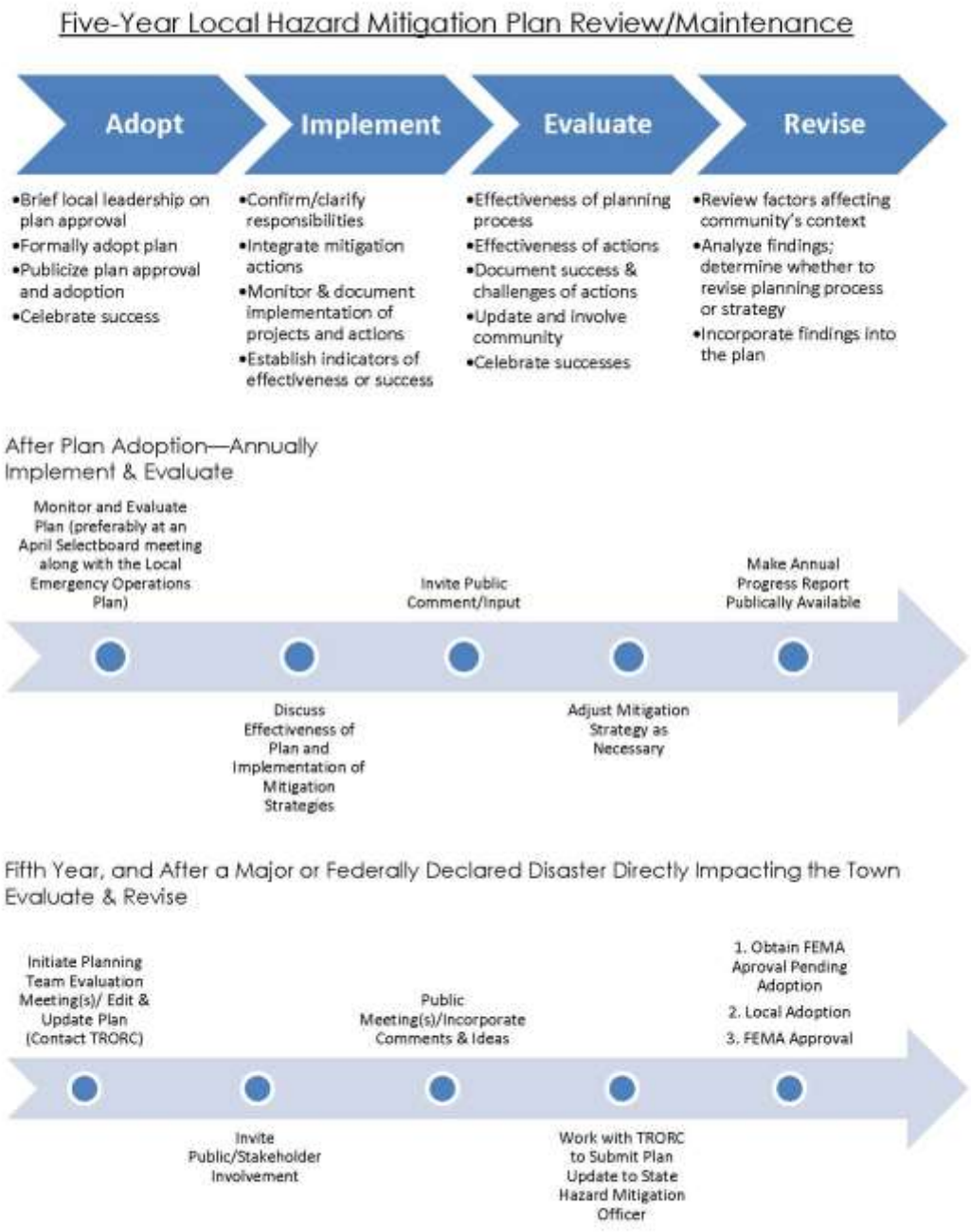
Critical crossings group one includes stream crossing structures on town highways that cross third order streams or larger. Headwater streams generally include first through third order. Third order was included as these headwater streams will have larger drainage areas and may have larger structures that are more difficult to replace and have a larger impact on the road network. Most of these are bridges.

local_id	location	label	cul_type	cul_matl	height	width	length	oa_cond
0387	UNDERWOOD RD	BRADFORD	30	10	36	36	28	6
0328	BRUSHWOOD RD	BRADFORD	30	10	96	96	56	6
0325	ROWELL BROOK RD	BRADFORD	30	0	60	60	10	6
B10	FLANDERS BROOK RD	BRADFORD						
B16	RABBIT TRAK	BRADFORD						
B4	ROWELL BROOK RD	BRADFORD						
B13	ROWELL BROOK RD	BRADFORD						
B7	GOSHEN RD	BRADFORD						
B2	ROWELL BROOK RD	BRADFORD						
B12	HACKETT HILL RD	BRADFORD						
B3	ROWELL BROOK RD	BRADFORD						
B21	ROGERS HILL RD	BRADFORD						
B18	FAIRGROUND RD	BRADFORD						
B11	SOUTH RD	BRADFORD						
0005B	S. BR. WAITS RIVER	BRADFORD	200192005B09012	ROLLED BEAM			000099	
00006	WAITS RIVER	BRADFORD	200192000609012	2 SP CONT WLD PL GIR			000118	
00022	WAITS RIVER	BRADFORD	100901002209011	STEEL PONY TRUSS			000109	
00023	MILL POND BROOK	BRADFORD	100901002309011	CONCRETE T-BEAM			000033	

Critical crossings group two includes significantly undersized structures, usually culverts, were identified from the ANR-DEC stream geomorphic assessment survey with openness ratios less than 50%. This measure refers to when structure's width is less than half of the stream bankfull width. Several of these structures may have been damaged during TS Irene or other events and may have been replaced. The town, at some point, should look at these sites and assess their status and need for repair/upgrades.

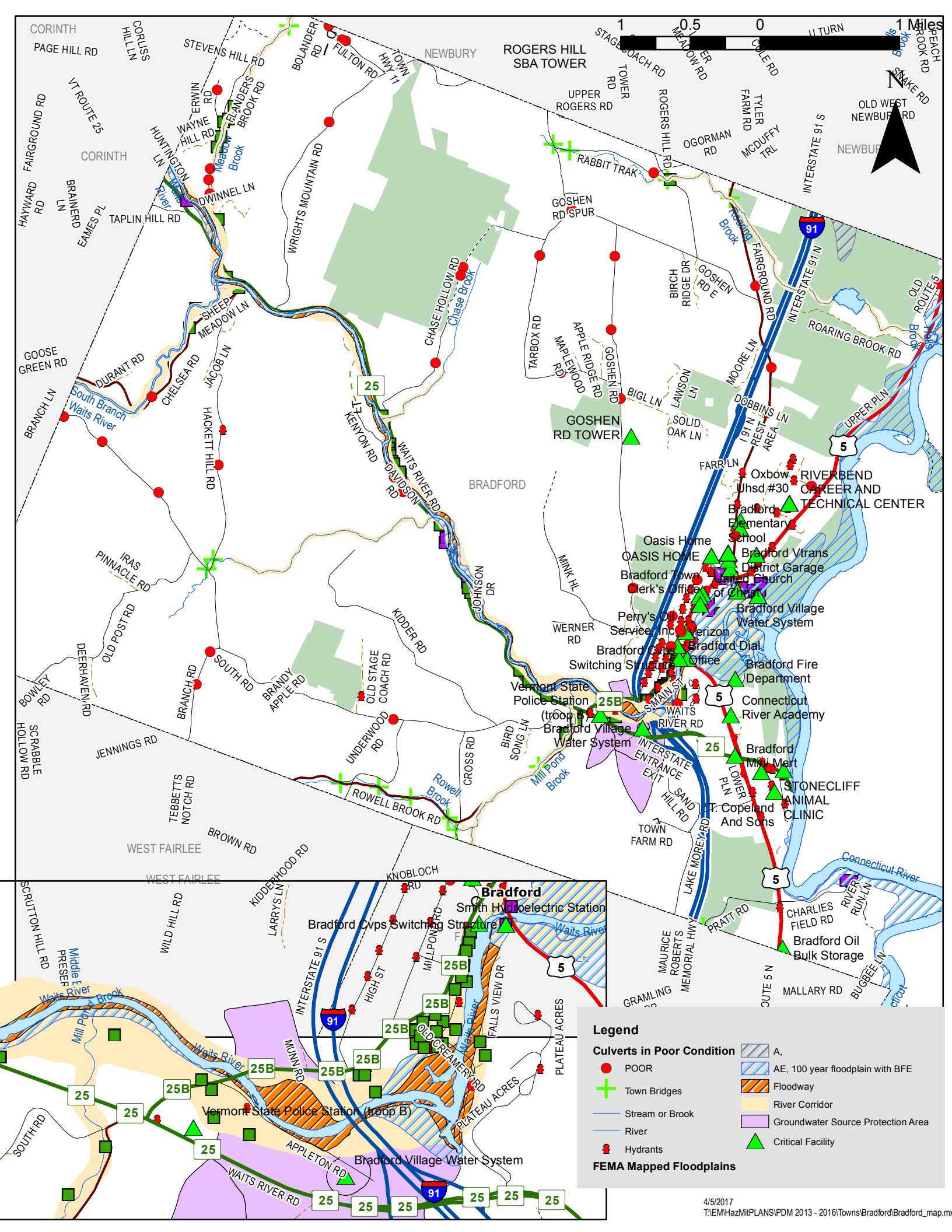
BankfullWidthPercent	CompatabilitySum	IceDebrisJam	OpennesssRatio	AOPCourseScreen	RetrofitPotential	StructureType	Town	Location	GisRoadName	StreamName	ChannelWidth	StructureLength	StructureHeight	StructureWidth
20.9	5	1	0%	Green	Missing Data	Culvert	Bradford	First crossing on I-91-N, north of Fairground Road overpass			11		2	2.3
76	5	1	0%		Missing Data	Bridge	Bradford	.1 MI S JCT VT 25B	LOWER PLAIN	Waits	121	29		92
99.4	5		0%		Missing Data	Bridge	Bradford	.4 MI JCT TH27 + VT25	OLD CREAMERY RD	Waits River	119.7	15.8		119
30	4	1	6%	Gray	LLL	Culvert	Bradford	1.5 Mi S old W Newbury Rd.		Roaring Brook	25	1000	7.5	7.5
50	4	1	6%	Red	MML	Culvert	Bradford	500 Ft up Birch Ridge Dr off Goshen Rd. E		Unnamed	3	40	1.5	1.5
35	5	1	7%	Gray	MLL	Culvert	Bradford	Dobbins Lane	FAIRGROUND RD	Unnamed	4	30	1.4	1.4
15.4	4	1	8%	Gray	LLL	Culvert	Bradford	By driveway #2566	FAIRGROUND RD	Unnamed	13	50	2	2
53.3	3	1	8%	Red	LLL	Culvert	Bradford	200 ft downhill from Dobbins Lane on Fairgrounds		Unnamed	3	32	1.6	1.6
40	5	1	9%	Gray	MLL	Culvert	Bradford	1 driveway south of Dobbins Lane off Fairgrounds Rd.		Unnamed	4	30	1.6	1.6
35.1	4	1	9%	Red	MLL	Culvert	Bradford	At mailbox #1118	WRIGHTS MOUNTAIN RD	Trib to Waits River	5.7	43	2	2
114	3	0	11%	Gray	LLL	Culvert	Bradford	At the interstate		Trib to Waits River	5.7	393	6.5	6.5
26.7	4	1	11%	Red	LLL	Culvert	Bradford	By House #949	GOSHEN RD	Unnamed	7.5	35	2	2
46.5	3	1	12%	Gray	LLL	Culvert	Bradford	After sharp right turn	SOUTH RD	Trib to Waits River	4.3	34	2	2
70	4	1	13%	Red	MML	Culvert	Bradford	South of Lake Morey Road 200'	LOWER PLAIN	Trib to CT River	5	80	3	3.5
23.5	4	1	13%	Gray	LLL	Culvert	Bradford	.5 MI W Rogers Hill rd.		Unnamed	8.5	30	2	2
28.6	5	1	13%	Gray	LLL	Culvert	Bradford			Roaring Brook	28	480	8	8
27.4	3	1	14%	Gray	LLL	Culvert	Bradford	Small pull off on upstream side	CHASE HOLLOW RD	Trib to Chase Brook	7.3	29	2	2
29.4	5	1	16%	Gray	LLL	Culvert	Bradford	By House #2264	FAIRGROUND RD	Unnamed	8.5	40	2.5	2.5
33.6	4	1	16%	Gray	MLL	Culvert	Bradford	North of Route 5 & Pratt Road jct	LOWER PLAIN	Trib to CT	11	96	4.2	3.7
46.2	5	1	18%	Gray	MLL	Culvert	Bradford	At intersection with dirt road	WAITS RIVER RD	Trib to Waits River	6.5	51	3	3
7.3	5	1	20%	Gray	LLL	Culvert	Bradford	farm access road just south of Old Rte 5	UPPER PLAIN	Unnamed	55	80	4	4
52.6	1	1	29%	Red	MML	Culvert	Bradford	Near intersection with Rowell Hill Road	UNDERWOOD RD	Trib to Rowell Brook	5.7	31	3	3
58.1	4	1	33%	Red	MML	Culvert	Bradford	Elevation 840	CHASE HOLLOW RD	Trib to Chase Brook	4.3	19	2.5	2.5
39.3	3	1	34%	Red	MLL	Culvert	Bradford	At intersection with Depot Road	N MAIN ST	Trib to Waits River	15	102	5.9	5.9
43.8	3	1	37%	Red	MLL	Culvert	Bradford	At mailbox # 642	WRIGHTS MOUNTAIN RD	Trib to Waits River	8	33	3.5	3.5
64.9	3	1	37%	Red	LLL	Culvert	Bradford	@ intersection with Goshen Road	N PLEASANT ST	Trib to Waits River	7.7	67	5	5
79.2	3	1	47%	Red	HHM	Culvert	Bradford	At intersection with HIgh Street	GOSHEN RD	Trib to Waits River	7.7	80	6.1	6.1

Appendix C: Five-Year Review and Maintenance Plan



Attachments

Attachment A: Map of the Town of Bradford


1 0.5 0 1 Miles
N
CORINTH
PAGE HILL RD
CORLISS HILL LN
STEVENS HILL RD
BOLANDER RD
FULTON RD
TOWN HWY 11
NEWBURY
ROGERS HILL SBA TOWER
STAGECOACH RD
MEADOW RD
COLE RD
U TURN
PEACH BROOK RD
SMOKE RD
OLD WEST NEWBURY RD
NEWBURY
UPPER ROGERS RD
TOWER RD
ROGERS HILL RD
TYLER FARM RD
OGORMAN RD
MCDUFFY TRL
INTERSTATE 91 S
FAIRGROUND RD
VT ROUTE 25
ERWIN RD
WAYNE HILL RD
FLANDERS BROOK RD
HUNTINGTON LN
Meadow Brook
CORINTH
HAYWARD RD
BRAINERD LN
EAMES PL
TAPLIN HILL RD
DWINNEL LN
Waits River
WRIGHTS MOUNTAIN RD
RABBIT TRAK
GOSHEN RD SPUR
Roaring Brook
FAIRGROUND RD
INTERSTATE 91 N
91
OLD ROUTE 5
Nelson Brook
ROARING BROOK RD
CHASE HOLLOW RD
Chase Brook
BIRCH RIDGE DR
GOSHEN RD E
GOOSE GREEN RD
SHEEP MEADOW LN
DURANT RD
CHELSEA RD
JACOB LN
South Branch Waits River
BRANCH LN
25
TARBOX RD
APPLE RIDGE RD
MAPLEWOOD RD
GOSHEN RD
BIGL LN
LAWSON LN
MOORE LN
DOBBINS LN
UPPER PLN
GOSHEN RD TOWER
SOLID OAK LN
191 N REST AREA
5
FARR LN
KENYON RD
WAITS RIVER RD
DAVIDSON RD
BRADFORD
Oxbow Uhsd #30
RIVERBEND CAREER AND TECHNICAL CENTER
Bradford Elementary School
Oasis Home
OASIS HOME
Bradford Vtrans District Garage
Bradford Town Clerk's Office
United Church of Christ
Bradford Village Water System
IRAS PINNACLE RD
OLD POST RD
HACKETT HILL RD
KIDDER RD
JOHNSON DR
MINK HL
WERNER RD
Perry's Oil Service Inc
Verizon
Bradford Dial Office
Bradford Cvps Switching Structure
Bradford Fire Department
DEERHAVEN RD
BOWLEY RD
SOUTH RD
BRANCH RD
BRANDY APPLE RD
OLD STAGE COACH RD
Vermont State Police Station (troop B)
25B
MAIN ST
WAITS RIVER RD
Connecticut River Academy
SCRABBLE HOLLOW RD
JENNINGS RD
UNDERWOOD RD
CROSS RD
BIRD SONG LN
Mill Pond Brook
INTERSTATE ENTRANCE EXIT
25
Bradford Mini Mart
LOWER PLN
SAND HILL RD
STONECLIFF ANIMAL CLINIC
T. Copeland And Sons
TOWN FARM RD
TEBBETTS NOTCH RD
Rowell Brook
ROWELL BROOK RD
BROWN RD
WEST FAIRLEE
LAKE MOREY RD
Connecticut River
5
CHARLIES FIELD RD
RIVER RUN LN
PRATT RD
Bradford Oil Bulk Storage
MAURICE ROBERTS MEMORIAL HWY
MALLARY RD
BUGBEE LN
GRAMLING
KNOBLOCH RD
KIDDERHOOD RD
LARRYS LN
WILD HILL RD
SCRUTTON HILL RD
Bradford
Smith Hydroelectric Station
Bradford Cvps Switching Structure
Waits River
MILLPOND RD
HIGH ST
INTERSTATE 91 S
91
25B
FALLS VIEW DR
OLD CREAMERY RD
Wells River
PLATEAU ACRES
MUNN RD
APPLETON RD
Bradford Village Water System
WAITS RIVER RD
SOUTH RD
Middle Branch
Mill Pond Brook
Legend
Culverts in Poor Condition
POOR
Town Bridges
Stream or Brook
River
Hydrants
FEMA Mapped Floodplains
A,
AE, 100 year floodplain with BFE
Floodway
River Corridor
Groundwater Source Protection Area
Critical Facility
4/5/2017
T:\EM\HazMitPLANS\PDM 2013 - 2016\Towns\Bradford\Bradford_map.mx