Town of Barnard, Vermont

2016 Local Hazard Mitigation Plan

2016 Plan

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

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Date of Town Adoption: February 22, 2017

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Date of Final Approval by FEMA: April 26, 2017

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

FEMA

MAY 03 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 congratulate the Town of Barnard 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 Barnard, Vermont 2016 Local Hazard Mitigation Plan and determined it meets the requirements of 44 C.F.R. Pt. 201.

With this plan approval, the Town of Barnard 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 Barnard, Vermont 2016 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 April 26, 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.

MAY 03 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
February 22, 2017
TOWN OF Barnard, Vermont Selectboard
A RESOLUTION ADOPTING THE BARNARD 2016 HAZARD MITIGATION PLAN

WHEREAS, the Town of Barnard has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of the hazards profiled in the 2015 **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 Barnard has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its **2015 HAZARD MITIGATION 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 Barnard; and

WHEREAS, the **PLAN** recommends several hazard mitigation actions (projects) that will provide mitigation for specific natural hazards that impact the Town of Barnard 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 Barnard eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by Town of Barnard Selectboard:

1. The **2016 HAZARD MITIGATION PLAN** is hereby adopted as an official plan of the Town of Barnard;

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 should be presented to the Selectboard by the Emergency Management Director or Coordinator.

IN WITHNESS WHEREOF, the undersigned have affixed their signature and the corporate seal of the Town of Barnard this 22nd day of Feb 2017

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. They are not usually avoidable; 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 Barnard 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 or land treatment, (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 Barnard in identifying all hazards facing the town, ranking them, and identifying strategies to reduce risks from known priority hazards.

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

The 2016 Barnard Local Hazard Mitigation Plan is the first stand-alone mitigation plan drafted for the Town. Previously, the Town had a town-specific 2009 Annex in the Regional 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 Barnard town officials and residents who will implement the hazard mitigation strategies in the future.

III. Community Profile

The Town of Barnard, consisting of approximately 49 square miles, is nestled around Silver Lake along Vermont Route 12. Barnard is quite rural, with several brooks and streams, such as Barnard Brook, Broad Brook, and Locust Stream. Barnard has no major rivers. The majority of the Town lies within the White River watershed, however there is a small portion of southeast Barnard that drains into the Ottauquechee River. The Chateauguay No Town Conservation area comprises approximately 55,000 acres of largely uninhabited forestland in the towns of Barnard, Stockbridge, Killington and Bridgewater, 16,209.8 acres of which are located in Barnard. This land is located in the southwest corner of Barnard, though no town roads serve the area.

According to the 2010 Census, the population of Barnard was 947, which was a decrease of 11 residents over the previous decade. There were a total of 708 houses or manufactured homes; 268 units were vacation residences and 413 units were year-round dwellings. The overall market price for homes is high in Barnard, and the trend will continue to change the socio-economic mix in the Town. Over the decade from 2000 to 2010, there was an average of 8.7 dwellings added per year to the Town's housing stock. Two-family permanent dwellings are prohibited.

The Town lies within the service area of Green Mountain Power (GMP), which supplies electrical power to all sections of town.

The Town is served by the Barnard Volunteer Fire Department and the Broad Brook Fire Department, which respond to fires and other emergencies in Barnard and neighboring towns. Neighboring communities' departments are called in on large fires requiring outside resources. The Town plans to build a joint Fire Station and Emergency Management Center in the next several years.

Appointed constables provide limited police security and traffic control services when needed. All other police functions are performed by the Windsor County Sheriff or Vermont State Police, Troop "D" which is located at the Bethel Station in Royalton.

Essential services are adequately available except for emergency medical services. Ambulance services are available in Barnard through the Woodstock and White River Ambulance Services as well as through DART. Although once medical doctors practiced in Barnard, this is no longer the case.

IV. The Planning Process

A. Plan Developers

Samantha Holcomb and Ellie Ray, both Land Use Planners at the Two Rivers-Ottauquechee Regional Commission (TRORC), originally assisted the Town of Barnard with updating its Hazard Mitigation Plan. Michael Storace, a planner, continued with Barnard Hazard Mitigation planning. 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
David Green	School Board	On 01/19/2014, Samantha Holcomb and Ellie Ray (TRORC staff) reached out to the Barnard Selectboard and the EMD/EMCs (Mike Manning, Steve Cota). TRORC staff coordinated with Barnard town officials to set up an introductory meeting. The first meeting was scheduled for 9/14/2015. TRORC's staff attended that meeting, followed by many more meetings in which participants revised and developed the HMP. See below for more meeting-specific details.
Preston Bristow	Zoning Administrator	
Jeff Tracey	Road Foreman	
Jerry Fredrickson	TRORC Board Member	
Scott Mills	Fire Warden	
Mike Manning	Emergency Management Director	
Tom Morse	Selectboard Member	

B. Plan Development Process

The 2009 Barnard 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 Barnard 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 Barnard 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 Barnard 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, 2009 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 Spill, Extreme Cold/Snow/Ice Storm, and Flash Flood/Flood/Fluvial Erosion remain on the list of "top hazards;"
  - Severe Summer Weather (Thunderstorm, Lightning, High Wind, Hail, and Flooding) have been added to the list of "top hazards;"
  - 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 Barnard depicting critical facilities, town infrastructure, and the NFIP designated floodway and 100-year floodplain has been added.

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

- **Activities**
  - 9/14/2015: TRORC staff met with Barnard HMP committee members to introduce the update/plan development process, reviewed Barnard's existing Hazard Mitigation Plan (adopted in January 2009), considered the status of various mitigation actions, potential hazards, and the data collection/research process. During this meeting, the Barnard committee also discussed and ranked hazards to determine the "Top Hazards" in the Town. Staff member explained to the committee what the next steps in the process are (draft plan and schedule a meeting to review and discuss it). This meeting was open to the public and was warned according to Open Meeting Law. No comments from the public were received.

- 3/30/2016: TRORC staff met with Barnard HMP committee members to rank hazards that pose the greatest risk to the Town, to discuss the status of previously identified mitigation strategies, and to discuss the Town's existing capabilities and programs to mitigate hazards. This meeting was open to the public and was warned according to Open Meeting Law. No comments from the public were received.
- 5/24/2016: TRORC staff met with HMP committee to identify hazard mitigation strategies and to discuss first draft. The entire draft was reviewed in detail, with TRORC staff making note of any comments or errors. This meeting was open to the public and was warned according to Open Meeting Law. No comments from the public were received.

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

***Note: The meetings listed below were public sessions.*

- 9/14/2015: TRORC staff met with Barnard HMP committee members to introduce the update/plan development process, reviewed Barnard's existing Hazard Mitigation Plan (adopted in January 2009), considered the status of various mitigation actions, potential hazards, and the data collection/research process. During this meeting, the Barnard committee also discussed and ranked hazards to determine the "Top Hazards" in the Town. Explained to the committee what the next steps in the process are (draft plan, and then schedule a meeting to review and discuss it). This meeting was open to the public and was warned according to Open Meeting Law. No comments from the public were received. No comments from the public were received.
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- 5/24/2016: TRORC staff met with HMP committee to identify hazard mitigation strategies and to discuss first draft. The entire draft was reviewed in detail, with TRORC staff making note of any comments or errors. This meeting was open to the public and was warned according to Open Meeting Law. No comments from the public were received.

- **Governmental participation and involvement** *(44 CFR 201.6(b)(2)*)
  - 5/27/2016: TRORC sent the revised draft to Planning Commission Chair, Steve Cota. No comments were received.
  - 5/27/2016: TRORC sent the revised draft to Selectboard Chair, Rock Webster. No comments were received.
  - 5/27/2016: TRORC sent the revised draft to Division of Emergency Management and Homeland Security. Comments were received and the Plan was edited to reflect these comments.
- **Neighboring community participation and involvement** *(44 CFR 201.6(b)(2)*)

- December 2015: A notice was placed in the Two Rivers-Ottauquechee Regional Commission Newsletter alerting recipients that Barnard was engaging in hazard mitigation planning and updating their Hazard Mitigation Plan. No comments from the public were received.
- October 2016: A notice was placed in the Two Rivers-Ottauquechee Regional Commission Newsletter alerting recipients that Barnard was engaging in hazard mitigation planning and updating their Hazard Mitigation Plan. No comments from the public were received.
- TRORC posted a notice in four local papers alerting the public to the Hazard Mitigation Planning process that was taking place. No comments from the public were received.
  - Valley News—ran 2/8//2016
  - The Herald of Randolph—ran2/8/2016
  - Journal Opinion—ran 2/8/2016
  - Vermont Standard—ran 2/8/2016
- 5/27/2016: TRORC sent revised draft to neighboring towns' Selectboards for comment.
  - Neighboring towns included Bethel, Bridgewater, Royalton, Pomfret, and Stockbridge. No comments from the public were received.

- **Review of existing plans, studies, reports, and technical information** (*44 CFR 201.6(b)(3)*)

  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).

  - Barnard Hazard Mitigation Plan (Adopted 01/14/2009)
    - This Plan was referenced extensively during the plan development process, especially in regard to the worst threats and mitigation action strategies identified in 2009.
  - Barnard Town Plan (Adopted 02/01/2012)
    - The Town Plan provided TRORC's staff with background information on the community, as well as more detail on their emergency services.
  - Barnard Zoning Ordinance (Adopted 11/06/2012)
    - The Zoning Bylaws were referenced for general knowledge and for Barnard's Flood Hazard Regulations.
  - Barnard Local Emergency Operations Plan (LEOP) (Adopted 4/27/2016)
    - The Barnard LEOP was referenced for general knowledge regarding the Town's emergency operations.
  - Flood Insurance Study for Windsor County, Vermont (Dated 09/28/2007)
    - The Flood Insurance Study was referenced for general knowledge of the Ottauquechee and White Rivers and peak discharge information.
    - Relevant peak discharge information for the Ottauquechee River can be found on page 24 of Volume 1, and information regarding the White River can be found on pages 26 and 27 of Volume 1.
    - This information was incorporated into the mapping/GIS components of this Plan; specifically in determining the number of structures that are vulnerable to

SFHA, and into the Flash Flood/Flood/Fluvial Erosion and Severe Weather sections of this Plan.

C. Status Update on Mitigation Actions Identified in 2009

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

The following table outlines the mitigation actions that were proposed in Barnard's 2009 All-Hazard Pre-Disaster Mitigation Plan for the Town of Barnard (adopted on January 14, 2009 as an appendix to the Two Rivers-Ottauquechee Regional Commission's multi-jurisdictional Pre-Disaster Mitigation Plan). Participants in the new Plan update process reviewed these actions and reported on the status of each:

Mitigation Action	Who (Leadership)	When (Timeframe)	How (Funding/ Support)	2016 – Status of Mitigation Actions
ALL HAZARDS 1. Ensure that RRP is current	Selectboard	Yearly	With TRORC assistance	The newest iteration of the RRP is the Local Emergency Operations Plan (LEOP). The Barnard LEOP undergoes an annual update and it was last updated and approved on 4/27/2016.
2. Set up office space for town emergency operations center with backup power.	Emergency Planning Coordinator	2008	Local resources	The Town Hall currently serves as the emergency shelter. Barnard is currently constructing a new emergency services facility. It will be the Town's emergency operations center when it is completed. This action has been carried over into this Plan.
3. Rewrite the Town Emergency Operations Plan and establish better communications among emergency responders.	Emergency Planning Coordinator	2009	With TRORC assistance	The Town's emergency operations plan was updated with this year's Local Emergency Operations Plan (LEOP). The Barnard LEOP undergoes an annual update and it was last updated and approved on The Town's Emergency Management and Road crew have a radio communication system that link together.
FLOOD 4. Continue to analyze and mitigate the flooding damage that occurs during flooding in town.	Emergency Planning Coordinator	Ongoing	Local resources	The Town's Zoning and Flood Administrator is a Certified Floodplain Manager. The Planning Commission has determined what policies and/or regulations need to be revised from a regulatory

				perspective. Finally, Town officials have discussed the flood mitigation that would result from upsizing bridges and culverts in Town. This action is ongoing and has been carried over into this Plan.
5. Continue the planned road maintenance program and update undersized culverts and ditching.	Highway Department	Ongoing	Local resources	The town continuously updates culverts that are undersized, ineffective, or damaged. The last complete culvert inventory was completed in Fall 2015. This action has been carried over into this Plan.
6. Work with FEMA to improve town flood regulations	Selectboard	2010	Local resources	The Town's Zoning Ordinance, which was last amended 11/6/2012, includes a Flood Hazard Overlay district. This district prohibits new development in the flood hazard area. A flood resiliency element is being added to the 2017 update to the Town Plan. This action has been carried over into this Plan.
<u>HAZMAT</u> 7. Pursue operations-level HAZMAT training for Fire Department	Fire Department	2009	Funded by Fire Service Training Academy	This process is ongoing. The Fire Department receives Awareness Level 1 certification every year. This action has been carried over into this Plan.
<u>FIRE</u> 8. Review the ability of the Town to mobilize emergency services due to the rural nature of the town during a severe winter storm or forest fire/wildfire.	Emergency Planning Coordinator	2009	Local resources	The town has two designated shelters and an emergency operations plan that will be utilized to mobilize emergency services in the event of a winter storm or fire. The Town is currently in the process of building a new emergency services facility that will significantly improve the Town's emergency services to respond to and handle event such as this.
9. Continue training to allow the fire department to fight wildfires safely.	Fire Department	Ongoing	Funded by Fire Service Training	This process is ongoing. The fire department receives training to fight potential

			Academy	wildfires.
<u>WINTER STORM</u> 10. Encourage utilities to continue regular tree trimming along power lines and continue town program	Emergency Planning Coordinator	Yearly	Local resources	This process is ongoing. The Town worked with Green Mountain Power and utilized Disaster Relief (DR) funding for tree trimming. This action has been carried over into the 2016 Plan.

This 2016 Barnard Local Hazard Mitigation Plan reflects several changes in priorities from the 2009 Plan. This 2016 Plan and the 2009 Plan both recognize and detail Flash Flooding and Fluvial Erosion, Hazardous material Spills, Structural Fires, and Extreme Cold/Snow/Ice Storms as the hazards that pose the greatest risk to health and property in the Town of Barnard. However, this 2016 Plan also addresses Severe Weather/Tropical Storms/Hurricanes and Landslides as hazards that present risk to health and property in the Town. The 2009 Plan did not detail these hazards. Specific vulnerabilities of the Town have changed as a result of Tropical Storm Irene, which was a recent Tropical Storm to affect the Town in 2011. This storm caused major flooding due to periods of high intensity rain and caused mass failure on an unstable bank in Town. Tropical Storm Irene revealed new vulnerabilities in Town, specifically on upstream unmapped flood zones and on Chateauguay Road, which is the site of the mass failure that occurred The Town Garage, which is located at the base of the mass failure, is recognized as a new vulnerability to the Town from flooding, fluvial erosion, and landslide, and was not recognized as such in the 2009 Plan. This 2016 Plan identifies more detailed hazard mitigation strategies to reduce the risk to health and property as a result of the hazards that post the greatest risk to the Town of Barnard. However, mitigation actions identified in the 2009 Plan and the previous chart that were not specifically completed were carried over into this 2016 Plan.

The Town of Barnard is quite rural in nature, and is considered a “bedroom community” because most of its residents travel outside of Town for their occupations. There were no new building permits issued in 2013 and 2014 in Barnard. Since 2009, when the last iteration of Barnard’s Local Hazard Mitigation Plan was approved, there have been 4 overall building permits issued. The Town’s Flood Hazard Overlay in the Town Zoning Ordinance regulates development within the SFHA, and it prohibits new residential and non-residential structures in the SFHA. No new building permits were issued for locations within the Town’s Flood Hazard Overlay. No new development is or will be permitted in mapped flood hazard areas, which are specifically vulnerable to flooding. New development, specifically the 4 building permits issued from 2010-2016 have had no change on the Town’s vulnerability. Due to the terrain and steep valleys in the Town of Barnard, future new development may be vulnerable to either flood hazards or fluvial erosion hazards. The vulnerability of any new growth would be dependent on its proximity to the Special Flood Hazard Area (SFHA), near a small stream, or on a steep hill.

D. Existing Hazard Mitigation Programs, Projects & Activities

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

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

Community Preparedness Activities

- Annual update of Barnard's Local Emergency Operations Plan (LEOP, formerly BEOP)
    - Last updated and approved on 04/24/2013
- Participation in the Local Emergency Planning Committee District 12 (LEPC 12).

Insurance Programs

- Participation in National Flood Insurance Program (NFIP)
    - The Town's initial Flood Insurance Rate Map (FIRM) was dated 9/18/85. The Town's FIRM has been updated, and the current effective map date is 9/28/07. No elevation is determined on this FIRM. The Barnard Zoning Administrator serves as the NFIP Administrator.

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

Land Use Planning

- Barnard Town Plan
    - Adopted on 02/01/2012, includes a "Flood Hazard overlay" section within the "Future Land Use" element
- Barnard Zoning Bylaws
    - Adopted on 11/13/08, includes a "Flood Hazard Overlay District" zoning district

Hazard Control & Protection of Critical Infrastructure & Facilities

- Barnard Hazard Mitigation Plan
    - Adopted on 01/14/2009
- Culvert inventory with TRORC assistance in Summer 2015.
    - Routine in-house updates occur on an on-going basis

Education/Public Outreach

- Public training related to Red Cross Shelter designation in progress

	Type of Existing Authority / Policy / Program / Action	Resources: Staffing & Funding	Ability to Expand/Improve On
Community Preparedness Activities	Program—Annual update of Barnard's Local Emergency Operations Plan (LEOP). Last updated and approved on 04/27/2016.	Updated by the Town Manager, assistance from TRORC and 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. The current program works well and there is no need to expand or improve on it.
	Completed Action- Shelters in Barnard: Barnard Academy on VT route 12 Town Hall on 115 north road	Staff time from the Town Clerk and volunteer time from other emergency management personnel.	These shelters are not Red Cross certified, do not have generators, and are not stocked with Red Cross emergency supplies. The use of this facility could be improved with Red Cross certifications, gaining access to a generator, and obtaining Red Cross supplies.
	Program— Participation/attendance in the Local Emergency Planning Committee District 12 (LEPC 12)	Volunteer time from the Barnard Selectboard Chair and emergency management personnel; meetings convened by TRORC. Funding from Vermont DEMHS.	There is no need to expand or improve on attendance, as it is satisfactory.
Insurance Programs	Authority/ Program—participation in National Flood Insurance Program (NFIP) The Town participates and complies with the NFIP through their enforcement of the "Flood Hazard Overlay District" part of the Town's Zoning Regulations, which was last adopted on 11/06/2012. [Note: This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(3)(ii).]	The Town's Floodplain Administrator, Preston Bristow is a hired individual. Assistance from TRORC and Vermont ANR. Funding from local resources—annual budget.	The Town's initial Flood Hazard Boundary Map (FHBM) was dated 11/01/1974. The Town's initial Flood Insurance Rate Map (FIRM) was dated 09/18/1985. The Town's FIRM and Flood Insurance Study (FIS) have been updated, and the current effective date for both is 09/28/07. The Zoning Bylaws are kept up-to-date and regulate new development in the Special Flood Hazard Area (SFHA).
Land Use Planning	Policy/Program— Barnard Town Plan Last adopted on 02/01/2012	Volunteer time from the Planning Commission, and assistance from TRORC and other state agencies on specific subject matter. Funding from Municipal Planning Grants.	The Barnard Town Plan is currently being updated. Normally, the Town Plan is reviewed/updated every five 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.

	Type of Existing Authority / Policy / Program / Action	Resources: Staffing & Funding	Ability to Expand/Improve On
	Completed Authority— Barnard Unified Zoning and Subdivision Regulations Last amended on 11/06/2012.	Volunteer time from the Planning Commission, and assistance from TRORC and other state agencies on specific subject matter. Funding from Municipal Planning Grants.	During the Town Plan review/update period, the Zoning Bylaws are also reviewed and updated if needed. Currently, there is no need to expand or improve on these regulations.
Hazard Control & Protection of Critical Infrastructure & Facilities	Policy/Program— Barnard Hazard Mitigation Plan Adopted on 01/21/2009.	Updated with volunteer time from local officials and assistance from TRORC and Vermont DEMHS. Funding from DEMHS/FEMA.	The 2016 Barnard Local Hazard Mitigation Plan will replace the 2009 Plan. The 2016 LHMP has greatly expanded and improved upon the 2009 Plan. Future iterations of the Town's LHMP will be updated by the Town at least every five years.
	Authority— 2013 Town Road and Bridge Standards Adopted 02/13/2013	Adopted by the Selectboard, implemented by the Road Foreman, and assistance from TRORC. Funding from VTrans and the local budget to implement.	Specifies minimum construction standards for roadway, ditches, culverts and bridges and guardrails. VTrans updates the Town Road and Bridge Standards on a fairly regular basis. The Town has the authority to require above-and-beyond what is written in the policy.
	Program—Better Backroads culvert inventory completed in fall 2015 for the Town of Barnard This inventory includes georeferenced locations and attributes for all culverts in Barnard. The Town received targeted assistance in the culvert inventory and specific priority projects were identified.	Staff time from the Barnard Road Foreman; assistance from TRORC. Funding from Better Backroads grant; local personnel time.	The Town is currently using the culvert inventory to further its culvert improvement program, and seeking funding through various sources for implementation projects. Routine in-house updates occur on an on-going basis. There is no need to expand or improve upon this program at this time.

E. Plan Maintenance

This Plan (the Barnard 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 Barnard 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. Barnard'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 Coordinator/Director will also occur within three months after every federal disaster declaration directly impacting the Town of Barnard. 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 C. The Town shall reference the Local Hazard Mitigation Plan when working on Town Plan amendments or changes to the Town's bylaws. The Town of Barnard will consider incorporating of the mitigation actions outlined in this plan into the Municipal Plan during the ongoing plan update process. The Municipal Plan update will be spearheaded by the Planning Commission, who will review the plan and determine those mitigation actions/strategies/goals that should be included in the Municipal Plan.

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 Barnard and if funding is available. If TRORC is unable to assist the Town, then Barnard's Town Clerk, Administrative Assistant, or Selectboard will update the Plan, or the Selectboard may appoint a committee of interested citizens (including the current local Emergency

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, within the municipal building, in The Valley News, and the TRORC newsletter and blog. These notices will invite 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; these include: the Woodstock Ambulance Service, VTrans, and the Vermont Agency of Natural Resources (VT ANR). VT ANR will be invited because they can provide assistance with NFIP outreach activities in the community, models for stricter floodplain and river corridor zoning regulations, delineation of fluvial erosion hazard areas, and other applicable initiatives. These efforts will be coordinated by the Town Clerk.

Updates to the Plan may include changes in community mitigation strategies; new town bylaws, zoning and planning strategies; progress on the implementation of initiatives and projects; effectiveness of implemented projects or initiatives; and evaluation of challenges and opportunities. If new actions are identified in the interim period, the plan can be amended without formal re-adoption during regularly scheduled Selectboard meetings.

Barnard shall also incorporate mitigation planning into their long-term land use and development planning documents. The 2013 Vermont Legislature passed a law requiring all towns to incorporate flood resiliency elements into their town plans for any plans adopted after July 2014. To do so, flood hazard and fluvial erosion hazards will be identified, and strategies and recommendations will be provided to mitigate risks to public safety, critical infrastructure, historic structures and public investments. This Local Hazard Mitigation Plan will help the town to comply with the new community flood resiliency requirement for town plans adopted after July 2014.

It is also recommended that the process work both ways and the Town review and incorporate elements of the Local Hazard Mitigation Plan into updates for the municipal plan, zoning regulations, and flood hazard/ River Corridor bylaws. The Barnard Planning Commission will incorporate hazard mitigation strategies developed and identified in this Local Hazard Mitigation Plan directly into goals, policies, and recommendations in future updates to the Barnard Town Plan. 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.

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?
- 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 Barnard 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 Barnard, 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 Barnard 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 hold. 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 Barnard.[1] The worst threats (bolded in the table, below) are followed 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 assumed to reflect their potential to create hazards for the town.

[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). Those hazards which were not found to pose the greatest threats to Barnard - including Drought, Avalanche Extreme Heat, Tornadoes, Hail Storms, water supply contamination, ice jams, Invasive Species Infestation, wildfires , 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. 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).

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

Hazard	Frequency of Occurrence	Warning Time	Potential Impact	Hazard Score
Flash Flood/Flood/Fluvial Erosion	**Highly Likely**	**3-6 hours**	**Moderate**	**10**
Severe 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.**	**Highly Likely**	**3-6 hours**	**Moderate**	**10**
Hazardous Material Spill	**Unlikely**	**None-Minimal**	**Major**	**9**
Extreme Cold/Snow/Ice Storm	**Highly Likely**	**6-12 hours**	**Minor**	**9**
Structural Fire	**Occasionally**	**None-Minimal**	**Minor**	**8**
Landslides/Mudslides/Rockslides	**Occasionally**	**None-Minimal**	**Minor**	**8**
Wildfire/Brushfire	Occasionally	None-Minimal	Minor	8
Ice Jams	Occasionally	6-12 Hours	Minor	6
Extreme Heat	Occasionally	12+ hours	Moderate	6
Earthquake	Unlikely	None-Minimal	Negligible	6
Tornado	Unlikely	3-6 hours	Moderate	7
Invasive Species/Infestation	Highly Likely	12+ hours	Minor	7
Drought	Occasionally	12+ hours	Negligible	4
Dam Failure	Highly Unlikely	None	Minor	6
Water Supply Contamination (There are no public water systems in Barnard.)	N/A	N/A	N/A	N/A

The Barnard HMP committee discussed the results of the hazard ranking activity and decided to focus on hazards that were *Likely* or *Highly Likely* to occur and had the potential to have a *Minor* to *Major* impact on the Town. Due to low probability of impact, small potential impact, and scarce community resources (time and money), the mitigation committee chose not to detail these hazards in this LHMP: drought, extreme heat, tornadoes, invasive species, wildfire/brushfire, avalanches, dam failure, earthquakes, and ice jams. The committee decided to group hurricanes/tropical storms and severe weather because of

the similarities they pose in exhibited weather, the risk they pose to health and property in vulnerable areas in Town, and the similar strategies that are effective in mitigating the loss of health or property in the event of their occurrence. The Barnard HMP committee decided to detail structural fire instead of wildfire in this Plan because it was determined that although both hazards received similar hazard scores, structural fire presented a larger risk to health and property of Barnard residents.

After engaging in discussions using their best available knowledge, the Town of Barnard identified the following "top hazards" that they believe their community is most vulnerable to:

- Flash Flood/Flood/Fluvial Erosion
- Severe Summer Weather (Thunderstorm, Lightning, High Wind, Hail, and Flooding) & Hurricanes/Tropical Storm
- Hazardous Material Spill
- Extreme Cold/Snow/Ice Storm
- Structural Fire
- Landslides/Mudslides/ Rockslides

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 "Top Hazards"

1. Flash Flood/Flood/Fluvial Erosion

The most frequent form of flooding in the State of Vermont and the Town of Barnard 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 Barnard's residents and infrastructure. Past instances of flooding in Barnard 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**.

The worst flood disaster to hit the Town of Barnard, 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 Barnard 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 three 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 Barnard suffered major damage to property and infrastructure during Tropical Storm Irene, although no lives were lost. It is estimated that Tropical Storm Irene dropped 5-6 inches of rain over the Town of Barnard in a very short span of time, some of the highest precipitation totals in Windsor County

(which averaged 4-7 inches over its land area). It is thought that the flooding that occurred as a result of the storm was close to being or was a full-fledged 500-year flood.

Many of Barnard's roads were damaged by the storm, including parts of: Route 12, Chateauguay Road, Green Gate Road, and Broad Brook Road. The county-wide damage for Windsor County totaled over $32.5 million. Following the flood damage, the State of Vermont and FEMA have been coordinating on the home buy-out process across the state. The Town of Barnard was spared any losses that warranted consideration as part of the FEMA buy-outs.

The most recent flooding event occurred over three weeks in late June and early to mid-July in 2013. The flooding was widespread and severe enough for a Federal Disaster Declaration, DR-4140, to be issued for Windsor and other counties in Vermont. The road and infrastructure damaged during this flooding event was located on Barnard Road/Route 12. The damage was mostly due to washouts and erosion.

Unfortunately, flooding is very common across the region, with many events impacting the Town of Barnard specifically. Flooding is one of the worst threats to Barnard's residents and infrastructure. The following list indicates the history of occurrence with regard to this hazard in Windsor County (given the small population of Barnard, town-specific data is limited); an asterisk "*" denotes the few 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 Barnard 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.

History of Occurrences:

Date	Event	Location	Extent and Impacts
06/25-07/11/2013 (DR-4140)	Severe Storms, Flooding, and Fluvial Erosion	County-wide	Severe storms caused flooding and fluvial erosion throughout the region, causing damage to some infrastructure and facilities. Barnard experienced $45,228.45 in damages according to FEMA's Public Assistance database (captures at least 70% of total damage). 7 inches of rain fell in Barnard during the disaster period. Over the disaster period 149 total Green Mountain Power customers were affected, and most outages were less than four hours in duration.
08/28/2011 (DR-4022, TS Irene)*	Tropical Storm: Flooding and Fluvial Erosion	Barnard, County-wide	Widespread flooding hit the region, striking Barnard particularly badly. Homes, businesses, and roads were flooded throughout Windsor County. Fluvial erosion occurred throughout Town, as many streams experienced high volumes of water. Barnard saw 5-7" of rainfall, which damaged homes, roads, bridges, and culverts. $1,855,451.73 in total damages occurred in Barnard according to FEMA's Public Assistance database (captures at least 70% of total damage). 200 power customers were affected, and outages lasted from 9 hours to 2 days.
04/27/2011	Flood	County-wide	Heavy rains, snowmelt from an above-normal snowpack, and high temps caused significant flooding in the region. Barnard received 1 inch of rain in 24 hours. Specific outage data for this event was unavailable.

10/01/2010	Flood	County-wide	Heavy rains from the remnants of TS Nicole hit Vermont, dumping multiple inches of rain in the White River Valley, and washing out local roads. Barnard experienced 5 inches of rain in 48 hours. 19 power customers lost power for 3.25 hours.
07/21-08/12/2008 (DR-1790)	Flooding and Fluvial Erosion	County-wide	Showers and thunderstorms produced significant rainfall across the region, causing severe flash flooding and fluvial erosion in places. Flood waters originating in Addison County traveled down the White River. Barnard experienced $15,335 in damages according to FEMA's Public Assistance database (captures at least 70% of total damage). Barnard experienced nearly 7 inches of rain during the disaster period. Significant power outages occurred in Barnard. Over the disaster period, 2,159 customers lost power, however most outages lasted less than 2 hours.
06/27/2008	Flash Flood and Fluvial Erosion	County-wide	Heavy rains brought 3-6" of accumulation to northern portions of Windsor County, and caused extensive flooding and fluvial erosion along the White River and its branches. Massive road damage and washouts were reported in nearby towns of Bethel and Rochester. $1m in county-wide damage was reported. 150 power customers lost power for 2.5 hours.
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. 6 power customers in Barnard lost power for 4.6 hours.
04/15-04/21/2007 (DR-1698)	Severe Storms, Flooding, and Fluvial Erosion	County-wide	Severe storms caused flooding and fluvial erosion throughout the region, causing damage to some infrastructure and facilities. Barnard received a period of heavy rainfall, with 1.14 inches falling in 24 hours. 231 customers lost power for 4.6 hours, 300 customers lost power for 3.5 hours, and 83 customers lost power for 18.27 hours.
05/14/2006	Flooding and Fluvial Erosion	County-wide	Rainfall totals from a large storm system brought 3-6" of precipitation to the county, leading to flooding, fluvial erosion, and minor washouts on several roads in the region and overflowing banks of streams and rivers. A total of $25k in county-wide damages was reported. Barnard experienced 3.78 inches in 72 hours, with 2.1 inches falling in a 24 hour timeframe. Significant power outages did not occur in Barnard.
01/18/2006	Flood	County-wide	A powerful storm and rising temperatures led to rainfall of 1.5-2.5" and additional snowmelt. This led to field flooding and ponding of water on area roadways in the region. $3k in damages reported for Windsor County. 1.5 inches of rain fell in Barnard in 24 hours. Only one customers lost power for 8 hours during this event.
10/07-10/09/2005	Flooding and Fluvial Erosion	County-wide	Heavy rains resulted in minor flooding throughout Windsor County, and caused $20k in property damage. 4.86 inches of rain fell in 48 hours in Barnard. 6 power customers lost power for 1 to 3 hours.
10/29/2003	Flood	County-wide	Heavy rains fell on already-heavily saturated soils, and streams and rivers, including the White River, rose rapidly.

			Low land and field flooding occurred in the watershed. Fluvial erosion occurred along stream channels of the White River. 1.78 inches of rain fell in Barnard in 48 hours. Power outage data for this event was unavailable.
07/21-08/18/2003 (DR-1488)	Severe Storms, Flooding, and Fluvial Erosion	County-wide	Severe storms caused flooding and fluvial erosion throughout the region, causing damage to some infrastructure and facilities. Barnard experienced $10,217 in damages according to FEMA's Public Assistance database (captures at least 70% of total damage). Barnard experienced 1.9 inches of rain in 24 hours during the disaster period. Power outage data for this event was unavailable.
04/13-04/14/2002	Flood	County-wide	Snowmelt and 1-3" of rainfall across the region led to flooding along the White River and its branches in Windsor County. $50k in damages was reported throughout the county. Power outage data for this event was unavailable.
07/11/2001 (DR-1715)	Flash Flood and Fluvial Erosion	County-wide	Tropical-like showers and thunderstorms caused heavy localized flooding and fluvial erosion. Rainfall exceeded 3" within a 2 hour time frame, with some areas getting nearer to 6". Many roads washed out, basements were flooded, and homes were damaged or destroyed. Power outage data for this event was unavailable.
12/17/2000	Flash Flood and Fluvial Erosion	County-wide	Small streams overflowed their banks and some roads and low lands flooded. Some stream channels were eroded as a result of large volumes of water that flowed through streams in a short period of time. The storm event caused $5k in damage throughout Windsor County. Barnard experienced 1.93 inches of rainfall in 48 hours. Power outage data for this event was unavailable.
07/31/2000	Flash Flood and Fluvial Erosion	County-wide	Heavy rainfall cased many small rivers to reach or exceed bankfull throughout the county, which caused flooding and fluvial erosion in Barnard. $10k in damage reported. Barnard experienced 3 inches of rainfall in 48 hours. Power outage data for this event was unavailable.
07/14-07/18/2000 (DR-1336)	Flash Flood and Fluvial Erosion	County-wide	Slow-moving thunderstorms resulted in heavy rainfall, particularly across mountainous portions of the region. Flooding and fluvial erosion ensued, causing a reported $500k in damage across Windsor County. Barnard received nearly 4 inches of rainfall in 48 hours. Power outage data for this event was unavailable.
04/04/2000	Flash Flood	County-wide	Steady rains and melting mountain snows resulted in many streams and rivers rising to/above bankfull conditions. Flooding was reported in some areas, including nearby East Bethel (flooding closed Rt. 14) and Rochester (flooding, mudslides). $10k in damage reported across Windsor County. Barnard experienced 1.08 inches of rainfall in 24 hours. Power outage data for this event was unavailable.
03/28/2000	Flash Flood	County-wide	Steady rains and melting snows led to rising water levels in many rivers and streams in the county. Led to a reported $5k in damages county-wide. Barnard specifically experienced 1 inch of rain in 48 hours. Power outage data for this event was unavailable.
09/16-09/21/1999	Severe Storms	County-wide	TS Floyd brought heavy rains, high winds, and flooding to the

(DR-1307)	and Flooding		region, causing extensive damage to public property. Barnard experienced $4,355 in damages according to FEMA's Public Assistance database (captures at least 70% of total damage). Barnard experienced 5.5 inches of rainfall in 24 hours. Power outage data for this event was unavailable.
07/13/1996	Flood	County-wide	Remnants of Tropical Storm Bertha moved into the region, bringing heaving rainfall and fluvial erosion that caused road washouts and mudslides in the county. $10k in damage was reported county-wide. Specific rainfall and power data for this event was unavailable.
05/11-05/12/1996	Flood	County-wide	Rain and snowmelt led to many rivers swelling and minor field flooding in places. $5k in damage reported in the county. Specific rainfall and power outage data for this event was unavailable.
01/19-01/20/1996	Flood	County-wide	A deadly storm brought above normal temperatures, strong winds, and flooding to the region. Snowmelt and rainfall hit the region, washing out numerous roads and flooding other areas. Numerous power outages were reported. $900k in damage was reported for the county. Specific rainfall and power outage data for this event was unavailable.
06/28-06/30/1973 (DR-397)	Flooding	County-wide	As much as 6 inches of rainfall fell in 24 hours in some locations. 3 deaths occurred and damage totaled $64 million.
11/02-11/04/1927 ("Flood of 1927")	Flooding	County-wide	Considered to be one of VT's most devastating events, the flood took out 1285 bridges, miles of roads and railways, and countless homes and buildings. 84 people were killed, including Lt. Gov. S. Hollister Jackson. Barnard and the nearby vicinity saw 7-8" of rainfall during the storm, following a month with 150% the typical amount.

Barnard does not have standalone flood hazard regulations. However, the Town's Zoning Bylaws severely restrict development in flood-prone areas within the designated Flood Hazard Overlay District. The Flood Hazard Overlay District prohibits development and encroachments in the floodway and prohibits new development and fill in the special flood hazard area. Mapped special flood hazard areas in Barnard include the following streams and brooks: Locust Creek, Pond Brook, Barnard Brook, Gulf Stream, and Broad Brook.

There are 34 structures in Barnard that reside in the special flood hazard area. 30 of these are characterized as residential (29 single family dwellings and 1 mobile home), and 4 are characterized as camp sites. There are no commercial/industrial/public structures or critical facilities in the 500-year floodplain. If all of the residential properties were damaged/destroyed in a severe flooding event, the damage would equal $10,237,148. The flooding that occurred as a result of Tropical Storm Irene is considered to be greater than a 100-year flood event, and likely closer to a 500-year flood event.

Additionally, there are 22 structures that reside within the River Corridor area, which was mapped by the Vermont Agency of Natural Resources. The River Corridors accurately represent the area where rivers and streams will move over time, and depict areas that are at risk of erosion due to the river or stream's lateral movement. Mapped river corridor areas in Barnard are similar to the mapped special

flood hazard areas within the Town. Mapped River Corridor areas include Locust Creek, Pond Brook, Barnard Brook, Gulf Stream and Broad Brook. The locations of these brooks and streams, river corridor areas, special flood hazard areas, and vulnerable structures located within these frequently flooded areas are illustrated in Attachment A: Map of Barnard.

Across Vermont, most child and elder care facilities are not registered with the State. Most child day care is private in-home care in Barnard, but there is also one licensed childcare facility. There are no elder care facilities in the Town of Barnard. Finally, low income housing is not registered with the State, and there are currently no mobile home parks located in Barnard that are registered with the state.

Recent studies have shown that the majority of flooding in Vermont occurs along 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 (DHCA, 1998). 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. Furthermore, precipitation trend analysis suggests that intense, local storms are occurring more frequently. Barnard will experience high intensity rain events in the future based on these trends. Due to Barnard's topography of steep slopes and narrow river valleys, fluvial erosion also has a high probability of future occurrence.

Barnard maintains an up-to-date list of culverts and culvert condition, and has engaged in culvert upgrading since the 2009 Barnard Annex was drafted. The process of upgrading culverts is currently in progress. No development projects are planned in Barnard in areas that would be vulnerable to flooding. There are no repetitive loss properties in the Town of Barnard on FEMA's NFIP list. No detailed data was available for fluvial erosion damage in Barnard in terms of numbers of acres lost during each event.

Hazard	**Location**	**Vulnerability**	**Extent**	**Observed Impact**	**Likelihood/ Probability**
Flooding and fluvial erosion	Many of Barnard's roads are vulnerable to erosional flooding due to steep terrain. Some of the most vulnerable for fluvial erosion or flooding include: Chateauguay Road and its proximity to Locust Creek; Route 12; Smith	Culverts, bridges, road infrastructure. There are 30 residential (29 single family dwellings and 1 mobile home) in the 500-year floodplain, valued cumulatively at	Tropical Storm Irene- 4-7" across county (5-7" in Barnard). No detailed data was available for fluvial erosion damage in	From TS Irene: $1,855,451.45 for Barnard from FEMA's Public Assistance database (captures at least 70% of total damage).	Highly Likely

	Hill Road; Broad Brook Road and East Barnard Road in East Barnard due to their proximity Broad Brook and East Barnard Brook; and Lime Pond Road.	$10,237,148.	Barnard in terms of numbers of acres lost during each event.		

2. Severe 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 Barnard. 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. Between 1950 and 2013, there were 698 hail events recorded in the state of Vermont, 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 (NCDC). 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 straight-line winds that can level trees in large swathes.

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 Barnard, 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, Barnard 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 is sometimes difficult to find, nevertheless, the "Remarks" section of NCDC Database helps to illuminate the impact strong winds can have on Barnard. Sizeable hail has also accompanied storms moving throughout the Town and region.

The following list indicates the history of occurrence with regard to this hazard in Windsor County (given that small population of Barnard, town-specific data is limited); an asterisk "*" denotes the 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 and Impacts
	Thunderstorm / severe storm	Flooding	Hail	High Winds	Lightning		
5/10/2015	✓			✓		County-wide	Scattered thunderstorms and intense winds caused wind damage and downed trees in Windsor County. No significant rainfall or power outage occurred in Barnard.
10/07/2013	✓			✓		County-wide	Scattered wind gusts of 50 mph or greater across portions of Vermont produced numerous downed trees or tree limbs on utility lines, and resulted in more than 25,000 customers without power at the peak. Rainfall in Barnard resulted in 1 inch in 48 hours. 13 Green Mountain Power customers lost power for 1.2 hours.
09/11/2013	✓			✓		County-wide	A weak area of low pressure traveling along a stationary front, draped across NY and VT, embedded in an unseasonably warm and unstable air mass resulted in a series of thunderstorms that moved across Vermont during the late afternoon and evening. Some of these thunderstorms produced damaging winds of downed trees and utility lines. 1.35 inches of rain fell in Barnard in 48 hours. 121 Green Mountain Power customers were affected for 32.25 hours.
Period from 6/25/2013—07/11/2013 (DR-4140 VT)	✓	✓				County-wide	Showers and thunderstorms developed on a daily basis in the summertime heat, rainfall rates as high as two to three inches in an hour were observed, and flash flooding resulted in several areas where storms remained stationary or repeatedly moved across the same area. More than 7 inches of rain fell in Barnard during the disaster period. Altogether 149 customers were affected during the disaster period, with outages ranging from less than an hour to 4 hours. Barnard experienced $45,228 in damages according to FEMA's Public Assistance database (captures at least 70% of total damage).

05/29/2012*	✓		✓	✓		Barnard, County-wide	A warm front moved across Vermont during the morning hours of May 29th, which lead to numerous thunderstorms with heavy rain, damaging lightning, and some isolated large hail and strong winds. Some of these thunderstorms deposited up to 2 inches of rainfall in portions of north-central and northeast Vermont. 1.75" hail was reported in Barnard. 23 power customers lost power for 4.75 hours in Barnard.
08/28/2011 (DR-4022, TS Irene)*	✓	✓		✓		Barnard, County-wide	Tropical Storm Irene: Widespread flooding hit the region, striking Barnard particularly badly. Homes, businesses, and roads were flooded throughout Windsor County. Barnard saw 5-7" of rainfall, which damaged homes, roads, bridges, and culverts. $1,855,451.73 in total damages occurred in Barnard according to FEMA's Public Assistance database (captures at least 70% of total damage). 200 power customers were affected, and outages lasted from 9 hours to more than 2 days.
08/21/2011	✓		✓	✓		County- and region-wide	On the afternoon of August 21st, a cold front supported by a strong mid-atmospheric disturbance moved across a unstable air mass in Vermont. Numerous showers and thunderstorms developed during the afternoon with some containing large hail and damaging winds. This storm also produced a microburst with straight line winds estimated between 70 and 90 mph, by a NWS Storm Damage team. 1.8 inches of rain fell in Barnard in 24 hours. 220 total customers were affected in Barnard, and outages ranged from 1.78 to 64.5 hours.
07/06/2011	✓			✓	✓	County-wide	In Vermont, a well-established squall line moved across the state during the afternoon with numerous reports of wind damage as well as lightning strikes. As a result of these storms, more than 15,000 customers in Vermont lost power. .42 inches of rain fell in Barnard over 24 hours. 450 people lost power from 7/6-7/9, and outages lasted from .3 hours for 113 customers, 2.68 hours for 202 customers, 7.58 hours for 101 customers, and as long as 12 hours for a few people.
5/31/2009	✓		✓	✓		County-wide	40-55 mph wind gusts and hail caused fallen trees and power outages in the

							region. Barnard experienced 1 inch of precipitation in 24 hours and 7 power customers lost power 7.2 hours.
05/08/2009	✓		✓	✓		County-wide	Severe thunderstorms and a developing squall line produced large hail up to an inch in diameter as well as damaging winds that knocked down trees and power lines to portions of central Vermont. State Police reported that thunderstorm winds downed trees. 49 power customers lost power from 1.6 to 9 hours. .64 inches of precipitation fell in Barnard in 24 hours.
7/21/2008—8/12/2008 (DR 1790 VT)	✓			✓		County-wide	Severe storms and flooding impacted Windsor and surrounding counties. Over 7 inches of rain fell in Barnard during the disaster period, including 2 inches in 24 hours on 7/24. On 7/21 616 people lost power for .6-1.85 hours, and on 8/11 234 people lost power for 5.77 hours.
07/18/2008			✓	✓		Barnard; region-wide	High winds and hail occurred in the region. Hail at .88" was reported. 1301 power customers lost power for 1.5 hours.
07/11/2007 (DR 1715 VT)	✓	✓				County-wide	Localized heavy rainfall exceeded 3 inches within a two hour time frame with some localized storm totals approaching 6 inches across a very hilly or mountainous terrain, which resulted in flash flooding of several communities. 7 power customers lost power in Barnard for 4.6 hours.
07/21/2003-08/18/2003 (DR-1488)	✓	✓		✓			Severe storms caused flooding throughout the region, causing damage to some infrastructure and facilities. Barnard experienced $10,217 in damages according to FEMA's Public Assistance database (captures at least 70% of total damage). Barnard experienced 1.9 inches of rain in 24 hours during the disaster period. Power outage data for this event was unavailable.
9/16/1999—9/21/1999 (DR 1306 VT)	✓	✓		✓		County-wide	Tropical Storm Floyd's rains and winds caused road and culvert washouts. 5.5 inches of rain fell in 24 hours in Barnard. Specific power outage data for this event was unavailable.
7/6/1973 (DR 397 VT)		✓		✓		County-wide	One of the largest flood events of the 20th century in VT. Landslides were reported in the region. Specific power

							outage data for this event was unavailable.
11/3/1927	✓	✓				Barnard, County-wide	"Great Flood of 1927." Worst recorded flood in VT. White River crested at a record of 29.30 feet. Specific power outage data for this event was unavailable.

As demonstrated in the table of previous occurrences above, high winds have caused damage in Windsor County, specifically in the Town of Barnard. Damage caused by high winds has included downed trees and power lines, and, as a result, power outages. Power outages can be particularly serious for "power critical customers" that do not have the luxury of having a generator. However, in general, high winds cause relatively minor damage on a town-wide scale.

The Town of Barnard completed a geo-referenced culvert inventory with assistance from Two Rivers-Ottauquechee Regional Commission in 2015. With the culvert inventory complete, the Town plans to maintain it independently. The Town of Barnard's work to upgrade culverts remains in process, and the culvert inventory will help the Town plan and prioritize culvert upgrade/improvement projects. A considerable number of culverts have been upgraded in the Town of Barnard as part of the Town's recovery from Tropical Storm Irene.

Hazard	**Location**	**Vulnerability**	**Extent**	**Observed Impact**	**Likelihood/ Probability**
Severe Weather	Town wide for wind, hail, high winds, lightning and thunderstorm impacts. Generally speaking, the entire Town is vulnerable to flooding but "hot spots" include Chateauguay Road, Smith Hill Road, Stage Road, Broad Brook Road, and Route 12.	Town buildings, private buildings, utilities, culverts, bridges, and road infrastructure.	Tropical Storm Irene- 4-7" across Windsor County (5" in Barnard).	From Tropical Storm Irene (DR-4022 VT): $1,855,451.73 in damages according to FEMA's Public Assistance database (captures at least 70% of the total damage). For declaration DR-4140 VT, parts of Route 12 and Chateauguay Road were damaged due to washouts and erosion.	Highly Likely

***Note*: The main hazard caused by severe weather is typically flooding (though not always). In addition, flooding is often the most expensive hazard caused by severe weather. Therefore, the Extent and Impact categories for Severe Weather will reflect the data reported in the Flash Flood/Flood/Fluvial Erosion, as it represents the higher limits of damage caused by severe weather.

3. Hazardous Material Spill

Hazardous materials include any biological, chemical, or physical substances that can harm human beings or the environment. [3] 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 is one site in town that has sufficient types and/or quantities of hazardous materials to require reporting: the Barnard Academy, which is located on Route 12 near Silver Lake in Barnard. No major interstate highways or railways run through or near Town. However, the state highway, Route 12, is highly travelled as a shorter route from Route 4 in Woodstock and Interstate-89 in Bethel. Route 12 parallels Locust Creek, Gulf Creek and Pond Brook at different points in Barnard. There are 393 residential and 29 commercial, industrial, or public buildings within 1,000 feet of a potential Hazardous Material Spill on major roads, such as Route 12. This includes the Town Clerk, and the fire department, several churches, and Barnard Academy. If 5% of these structures were damaged in a HAZMAT incident, the resulting damage would be approximately $21,409,778.

It should also be noted that the State of Vermont currently has one fully-trained HAZMAT response team, with vehicles located in Essex Junction, Brandon, and Windsor. 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.

The following data was retrieved from the Vermont Department of Environmental Conservation's Spill List and by searching the archives of local newspapers. The table below is used to illustrate the ease with which trucks, trains 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.

History of Occurrences:

Date	Event	Location	Extent and Impacts
1/6/2015	Fuel Oil Spill	1948 Mt Hunger Road	A fuel oil spill of more than two gallons of oil occurred by a bulk transport vehicle.
12/14/2014	MODF Spill	Vermont Route 12	1 quart of mineral oil dielectric fluid spilled from a 1967 transformers, and resulting testing found PCBs.
5/30/2013	Hydraulic Oil	541 Sugarhouse Hill	Hydraulic equipment failure resulted in the release of .5 gallons of hydraulic oil.
2/17/2013	Fuel Oil Spill	Vermont Route 12	Irving Oil, while filling an above ground storage tank (AST), released 1 gallon of fuel oil.
3/15/2013	Fuel Oil Spill	Barnard Elementary, Vermont Route	A underground storage tank (UST) was overfilled, causing 1 gallon of fuel oil to spill into surrounding snow and ice. Soil was not impacted.

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

		12	
4/23/2012	Gasoline Sheen	Barnard General Store, Vermont Route 12	An anonymous complaint was made about gasoline sheen on the parking lot of the Barnard General Store.
5/11/2012	Fuel Oil Spill	177 North Road	A homeowner observed 2 gallons of pooled fuel oil in her basement beside fuel tank.
8/23/2011	Fuel Oil Spill	217 Old Hill Road	During home delivery, less than 1 gallon of fuel oil spilled over.
8/31/2011	Gasoline Spill	Twin Falls Resort, Sugar Hill Road	Between 2-3 gallons of gasoline were reported as released, but the cause of the spill is unknown.
11/5/2010	Heating Oil Spill	2322 Royalton Turnpike	40 gallons of heating oil were released as a result of a leaking tank.
12/29/2005	Gasoline Spill	Vermont Route 12	AST failure resulted in the release of 172 gallons of gasoline.

While only a small number of major spills consisting of hundreds of gallons of hazardous material have occurred in the Town of Barnard, the potential for a major spill exists. Route 12 is a heavily travelled road both by residents of the Town and vehicles that travel through the town to access Bethel, Royalton, Stockbridge, and Interstate 89. Route 12 in Barnard also provides access to Vermont Route 107 and its subsequent conjunction with Vermont Route 100. Royalton Turnpike is another heavily travelled road in Town that receives high volumes of traffic.

These routes serve as the main thoroughfares for trucks and other motor vehicles transporting a wide-range of goods, including hazardous materials, within the confines of Barnard. A truck accident and a resulting hazardous material spill could be highly disastrous for the Town and its residents. The majority of Route 12 in Town of Barnard is built very close to streams in Town, such as Pond Brook, Gulf Stream, and Locust Creek, which could create additional water contamination problems if a hazardous material spill were to occur. In order to prepare for hazardous material spills in Barnard, members of the Barnard and East Barnard Fire Department are trained to the HAZMAT Awareness level 1 to the HAZMAT Operations level.

Hazard	**Location**	**Vulnerability**	**Extent**	**Impact**	**Likelihood/ Probability**
Hazardous Materials Spill	Route 12, which borders Locust Creek, Gulf Stream, and Pond Brook.	Road infrastructure, nearby structures (ex. Town Clerk's Office or fire department if fuel tank struck). Nearby streams and brook, such as Locust Creek, Gulf	Initially, local impacts only; but depending on material spilled, extent of damage may spread (ex. into groundwater)	Within 1,000 feet of Route 107, Route 100, and other Class 2 roads, there are 318 residences and 104 commercial, industrial or public buildings. In the event that 5% of these structures were	Highly Unlikely

	Royalton Turnpike and North Road	Stream, and Pond Brook.		involved in a HAZMAT incident, the estimated damage would be $21.409.778	

4. 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. 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.

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.

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**.

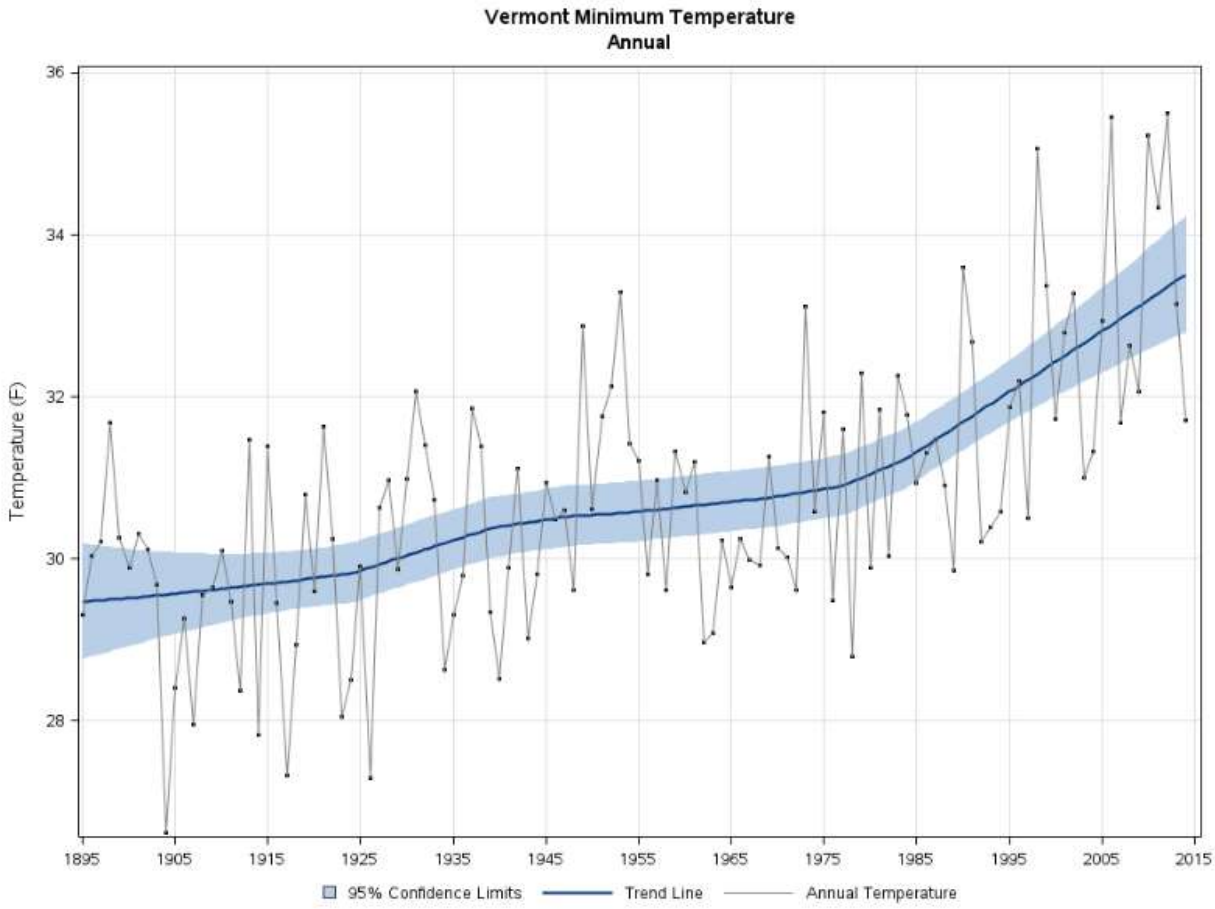
The worst winter storm in terms of damage to hit the state recently was not a snow storm, but an ice storm. In January of 1998, just the right combination of precipitation and temperature led to more than three inches of ice in spots, closing roads, downing power lines, and snapping thousands of trees. This storm was estimated as a 200-500 year event, meaning it has a .5%-.2% chance of occurring every year. Power was out up to 10 days in some areas, and 700,000 acres in of forest were damaged in Vermont. Amazingly, Vermont suffered no fatalities, unlike Quebec where 3 million people lost power and 28 were killed. The Town of Barnard was significantly impacted by this ice storm.

Over the past few winters, Barnard has received numerous snow storms that have dropped significant amounts of snow over a one 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 Barnard and in Windsor County.

Typically extent of severity for winter storms is measured on The Sperry-Piltz Ice Accumulation Index (SPIA) for ice storms and compared to annual minimum temperatures by season for Vermont. In this way the Town of Barnard can record the severity of storms and it can compare storms that have occurred in the Town's history. The Sperry Piltz Ice Accumulation Index and Vermont's minimum annual temperature are included below.

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
2/7/2015-2/8/2015	Winter Storm	County-; region-wide	A long duration winter storm resulted in a large snow event over Vermont and Northern New York. Snowfall accumulations were from 5 to 9 inches across Vermont, with 7.5 inches accumulating in Barnard. 26 power customers in Barnard were without power for .5 hours.
1/7/2015-1/8/2015	Extreme cold/wind chill	County-; region-wide	An arctic cold front pushed over Vermont and brought extremely cold temperatures and strong winds of 15-30 mph causing dangerously cold wind chills of 25-40 degrees below zero overnight.
Period from 12/09/2014—12/12/2014 (DR-4207 VT)	Winter Storm	Barnard; County-; region-wide	Heavy, wet snow brought down trees and power lines, leading to power outages. Barnard experienced 9 inches of snow accumulation that caused an estimated $30,000 in debris clean-up costs. Snow accumulations in Barnard totaled 11.1 inches. Widespread power outages occurred in Barnard that affected 1,059 total power customers. 407 customers lost power for 6 hours, 210 customers lost power for 13 hours, but the larger portion of those affected lost power for more than 50 hours.
Period from 03/12/2014—03/13/2014	Snow Storm	Barnard; 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 and school and business closures resulted due to the storm on both March 12th and 13th. 22” of snow accumulated

			in Barnard. No significant power outages occurred in Barnard.
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 Windsor county was 12 to 20+ inches. No significant power outage occurred in Barnard.
02/05/2014	Snow Storm	County-; region-wide	Snowfall was at its peak during both the morning and afternoon/evening commutes causing hazardous travel. 8 to 12 inches of snow fell across Windsor county. No significant power outage occurred in Barnard.
Period from 12/29/2013—12/30/2013	Winter Storm	County-; region-wide	A wet, heavy 6 to 10 inches of snow fell across Windsor county. No significant power outages occurred in Barnard.
Period from 12/14/2013—12/15/2013	Snow Storm	County-; region-wide	As this was the first storm of the 2013-2014 winter season, it resulted in numerous vehicle accidents. A widespread 10 to 15 inches of snow fell across Windsor county. No significant power outages occurred in Barnard.
Period from 03/18/2013—03/19/2013	Snow Storm	County-; region-wide	8 to 14 inches of snow fell across the county, with smaller amounts falling in the valleys and larger amounts accumulating above 1000 feet. Numerous vehicle accidents occurred, some involving tractor trailers. No significant power outages occurred in Barnard.
Period from 12/26/2012—12/27/2012	Winter Storm	County-; region-wide	Snowfall totals of 6 to 12 inches were common in Windsor county. No significant power outages occurred in Barnard.
Period from 04/28/2012—04/30/2012	Frost/ Freeze	County-; region-wide	Several consecutive days of sub-freezing temperatures from the morning of April 28th to the morning of April 30th lead to damaging and possibly devastating killing freezes for various fruit-bearing crops in Vermont. Although these temperatures may not be seasonably uncommon, the preceding record breaking late winter and early spring warmth accelerated bud development in fruit crops by 2-3 weeks. However, minimum temperatures in the teens and lower 20s likely impacted other regions as well. Fruit crop damage estimates may exceed 25 percent of normal harvest. No significant power outages occurred in Barnard.
Period from 11/22/2011—11/23/2011	Winter Storm	County-; region-wide	6 to 12 inches of a heavy, wet snow mixed with rain and sleet at times fell across Windsor county. 2 power customers were affected for about 4 hours.
Period from 03/06/2011—03/07/2011	Winter Storm	Barnard; County-; region-wide	Snowfall amounts of 4 to 16 inches were reported in Windsor county with the largest totals in the northwest and lesser amounts in the southeast. In addition 1/4 to 1/2 inch of ice occurred as well with the greatest totals in the southeast. 12” accumulated in Barnard. 9 power customers in Barnard were affected for 2.75 hours.
Period from 02/05/2011—02/06/2011	Winter Weather	County-; region-wide	A heavy wet snow quickly changed to a prolonged period of sleet and freezing rain as well as some thunderstorms. Combined snow and sleet accumulations were 3 to 6 inches. The weight of this additional snow, sleet and freezing rain contributed to several roof barn collapses in Windsor County. No significant power outages occurred in Barnard.
2/19/2011	Extreme Cold/Strong wind	County-; region-wide	A strong cold front moved across Vermont causing strong winds of 20-30 mph. Winds resulted in tree damage and widespread power outages. 1,619 power customers lost power in Barnard for 2.5 hours.
01/12/2011	Winter Storm	Barnard; County-; region-wide	Generally, 8 to 15 inches of snow fell across Windsor county. 11” accumulated in Barnard. No significant power outages occurred in Barnard.
Period from 12/26/2010—12/27/2010	Winter Storm	County-; region-wide	Snowfall totals of 6 to 15 inches with localized higher amounts occurred as well as considerable blowing and drifting of the snow due to north winds of 15 to 25 mph with gusts approaching 40 mph. No significant power outages occurred in Barnard.

Period from 12/28/2009—12/29/2009	Winter Weather	County-; region-wide	Rapidly falling single digit temperatures along with falling and blowing snow on the morning of December 29th caused roads to flash freeze. Numerous vehicle accidents occurred, especially along Interstate 89 between Montpelier and St. Albans. No significant power outages occurred in Barnard.
Period from 02/08/2008—02/09/2008	Winter Storm	County-; region-wide	This snowfall event was a two-part system across Vermont. The first part was largely confined to the northern half of Vermont and occurred during the morning and afternoon hours of February 8th. The second event was a large, powerful Nor'easter that moved south of Long Island and Cape Cod during the night of February 8th. 8 to 16 inches of snow fell across Windsor county. No significant power outages occurred in Barnard.

The Town of Barnard is no stranger to winter weather and the hazards that it brings. Depending on the event, the amount and weight of snow, or the amount of ice, electricity may be knocked out for a few hours or days. The utility company currently serving the Town of Barnard, Green Mountain Power, has followed a regular tree-trimming schedule. Barnard 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 shelter at the Barnard Academy.

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 the 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, not including the loss of livestock

In general, winter weather is most hazardous to travelers. Icy and snow-covered roads present multiple types of dangerous driving conditions and situations. In Barnard, 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. Damages to vehicles as a result of poor driving conditions may vary from minimal damage to a totaled vehicle. Health impacts could vary significantly.

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.	Snow fall has varied, from a few inches to over a foot or more. Heavy snow and wind has downed trees and power lines. Snow/ice contributed to hazardous driving conditions.	From the December 2014 storm (DR-4207 VT), an estimated $30,000 in damages, mostly from debris clean-up costs.	Highly likely

5. 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 Barnard 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 12 and Royalton Turnpike; 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 Barnard 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
8/19/2015	Structural Fire	Sugar	A gas grill on a deck started a fire that burnt the side of a home

		House Hill Road	on Sugar House Hill. The fire was contained to the deck and the exterior of the building.
2/10/2015	Structural Fire	1024 Broad Brook Road	A mobile home was burned to the ground despite response by Barnard Fire Department, Broad Brook Fire Department, and Bethel Fire Department. The fire resulted in a total loss of the structure.
3/15/2015	Structural Fire	Grove Road	A 30 foot by 40 foot ranch on Grove Road, which borders Silver Lake, burned. The fire resulted in a total loss of the home.
2/11/2011	Structural Fire	Old Route 12	A 35 foot by 40 foot barn on Route 12 burned, and the fire resulted in a total loss of the structure.
1/27/2009	Structural Fire	North Road	An extensive fire burned a 30 foot by 50 foot ranch on North Road to the ground. There was one fatality and the home was a total loss.
1/21/2009	Structural Fire	West Road	A 30 foot by 30 foot home located on West Road burned extensively and resulted in a total loss.

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).

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

6. Landslide, Rockslide, and Mudslide

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 **Landslides/Mudslides/Rockslides**.

The movement of a mass of rock, debris or earth down a slope by force of gravity is considered a landslide. A landslide occurs when the slope or soil stability changes from stable to unstable due to an outside force, such as an earthquake, a severe storm, erosion, fire or a human-induced activity. Slopes greater than 10 degrees and slopes where the height from the top of the slope to its toe is greater than 40 feet are more likely to slide. A lack of vegetative cover and/or soils with high water content contribute to the slope's vulnerability to fail.

In simple terms, the two factors needed to trigger a landslide are gravity and precipitation. Therefore, because much of Vermont is mountainous and receives relatively high levels of precipitation, the land areas in Vermont have certain predisposition towards landslides. Heavy winter snows combined with

spring snow melt and heavy rains in the spring, summer and fall all contribute to high water content in the soil. The majority of landslides within Vermont involve a small quantity of rock and soil materials, but they frequently occur without any warning. Over 200 years ago (1783), landslides in Vermont were made famous in newspaper accounts that chronicled devastating spring flooding events. It is important to highlight the connection between precipitation, flooding and landslides in Vermont.

History of Occurrences:

Date	Event	Location	Extent and Impacts
08/28/2011 (DR-4022, TS Irene)*	Landslide	Barnard	During Tropical Storm Irene, the bank upslope of Locust Creek and Chateauguay Road experienced the mobilization of a material. In order to alleviate the effects of the landslides and to protect Mt Hunger Road, a town maintained road, and the Town Garage, a critical facility, the riverbank above Locust Creek will need to be fortified and stabilized. These efforts will mitigate erosion threats to adjoining properties and municipal infrastructure adjacent to the project site. Armoring of the slope will be keyed into the river bed; heavy riprap will be placed at the base of the failed slope to prevent future undermining; the bank will be regraded to a gentler slope; upper bank areas will be stabilized with loam, seed, and erosion fabric; and removal of accumulated debris. The landslide consisted of two major sections: one section upstream that was 150 feet long and 50 feet wide and another section downstream that was 600 feet long and 25 feet wide. The stabilization of the banks of Locust Creek to protect Chateauguay Road and the Town Garage will cost $300,000.

Landslides, mudslides and rockslides within the Town of Barnard are likely to be associated with heavy precipitation, flooding, erosion and/or snow melt. With the anticipated increase in precipitation events, this particular hazard may become more prevalent in the future. Because there is a great deal of steep terrain in the Town of Barnard, there are areas that are currently vulnerable to landslides, mudslides and rockslides. These areas include Chateauguay Road, with the Town Garage being particularly vulnerable. The Town is currently taking action to address this specific vulnerability.

Hazard	Location	Vulnerability	Extent	Anticipated Impact	Likelihood/ Probability
Landslides/ Mudslides/ Rockslides	Chateauguay Road and other steep mountainous slopes with loose material.	Road infrastructure and public and private property. The Barnard Town Garage, a critical facility, is specifically vulnerable to future landslides due to its location at the base of an historic landslide.	The landslide that occurred in 2011 consisted of two major sections: one section upstream	$300,000 to stabilize banks to prevent landslides on Chateauguay Road	Occasionally

			that was 150 feet long and 50 feet wide and another section downstream that was 600 feet long and 25 feet wide..		

C. Vulnerability Summary

As a result of the above profiled hazards, the Town believes the following vulnerabilities to be of highest concern due to their potentially severe consequences and likelihood of occurrence:

- **Flash Flood/Flood/Fluvial Erosion:** One of the worst threats, flooding impacts roads and the village center, especially facilities for children, elders, and community emergency shelters. Under-sized bridges and culverts factor into the threat, with Barnard being home to many roads that border surface water. Specifically vulnerable roads include Route 12, Chateauguay Road, Smith Hill Road, Broad Brook Road, East Barnard Road, and Lime Pond Road. Out-dated flood hazard mapping for Windsor County also compounds existing threats. 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. In addition, numerous homes are located in the 500-year floodplain and could be impaired by a major flood event.
- **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. Vulnerable roads to
- **Hazardous Material Spill:** Hazardous material spills, particularly along major roadways like Route 12, could pose a serious harm to the Town. A hazardous material spill on Route 12 would likely contaminate Silver Lake, and drainage could affect the Ottauquechee or White Rivers, as well as local brooks and stream.
- **Extreme Cold/Snow/Ice Storms:** 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).
- **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.
- **Landslide/Rockslide/Mudslide:** Road infrastructure and public and private property. The Barnard Town Garage, a critical facility, is specifically vulnerable to future landslides due to its location at the base of an historic landslide

VI. Mitigation

A. Mitigation Goals

- To reduce injury and losses, including loss of life and to infrastructure, structures and businesses, from the hazard of structural fire.
- 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 severe weather.
- 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.

A. Excerpted Town Plan Goals & Objectives Supporting Local Hazard Mitigation

- To discourage development in undeveloped farmlands, forest lands and especially the Barnard Chateauguay Conservation Area. Such tracts are intended to remain predominately as undeveloped or limited development areas for the purposes of conserving existing resource values (p. 9).
- To insure the future of and protect the following: forestry under sound silvicultural guidelines, wildlife habitat, unique plant or animal habitats, clean air and the ability to see the night sky without the interference of bright lights. Wetlands and watercourses in general are afforded protection under Federal and State rules but should be given special consideration in the Town's regulations (p. 9).
- To protect the environmental integrity of forests, fields, wetlands, floodplains and surface waters (p. 11).
- Maintain a pace of development that Town institutions and our road system can sustain (p. 11).
- Protect steep slopes and ridgelines from inappropriately sited development (p. 11).
- Minimize lake-side development and retain a naturally vegetated shoreline (p. 14).
- Abide by the Clean Water Standards and Water Safety Recommendations recommended by the State of Vermont (p. 14).
- To prevent flood damage and retain flood storage capacity (p. 15).
- Preserve floodplains and associated risk areas in a state where they can handle flood flows without damage to property (p. 15).
- To protect critical natural areas from environmental damage (p. 16).
- To ensure the town and the public do not incur costs associated with development in unsuitable areas (p. 16).
- Develop regulatory and non-regulatory ways to protect the special qualities of critical natural areas (p. 16).
- Consider the creation of steep slope standards (p. 16).
- Regulate development on areas with shallow/wet soils so that they are safe and do not harm water quality (p. 18).

- Protect and enhance water quality through development standards (p. 19).
- To preserve the important habitat and water quality functions of wetlands (p. 19).
- Consider the creation of wetland buffer standards in the Zoning Bylaws (p. 19).
- To promote and maintain a transportation system that is safe, efficient and complements the other goals and planning principles of this Plan (p. 23).
- Growth and development shall not exceed the capacity of local and regional facilities and services (p. 36).
- Increase community awareness of where and how emergency services can be obtained (p. 36).
- Continue support of local emergency services (p. 36).

The Barnard Town Plan was updated and adopted on 08/24/2016, and has a 8 year lifespan.

B. 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, Barnard'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. A range of mitigation strategies were vetted by the committee, and those that were determined to be feasible (economically, politically, environmentally, etc.) 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 Barnard 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 Hazard Mitigation Plan as well.

The following strategies will be incorporated into the Town of Barnard'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. Specifically the Barnard Planning Commission will incorporate mitigation strategies included in this Plan directly into Barnard's Town Plan's goals, policies, and recommendations. 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.

Hazards Mitigated	Mitigation Action	Local Leadership	Prioritization (Mitigation Project Status)	Possible Resources*	Time Frame
All Hazards	*Ensure that new Barnard Emergency Services building is in a location that minimizes vulnerability to hazards. The location should be located in areas that are not vulnerable to potential flooding and fluvial erosion. The location of the new emergency services building shall be outside of Special Flood Hazard Areas and mapped River Corridors. (Mitigation)*	Selectboard	High (New)	Local resources	Spring 2017-Fall 2017
	Ensure that new Barnard Emergency Services building has a generator that will provide backup power that will (Mitigation)	Selectboard	Medium (Action #2 of 10 in 2009 Plan)	Local resources	Fall 2019-Winter 2019
Landslide	*Bank stabilization of landslide on Chateauguay Road to protect Town Garage, a critical facility, and road infrastructure. (Mitigation)*	Selectboard	High (New)	CDBG-DR2	Fall 2016–Fall 2018
Structural Fire	*Install a dry hydrant on Old Mountain Hunger Road to reduce the loss of life and*	Fire Chief/Fire Department	Low (New)	Local resources. VT Dry Hydrant Grant Program	Summer 2021-Fall 2021

	infrastructure from structure fires. (Mitigation)				
Extreme Cold/Snow/Ice Storm	*Clear and maintain Town road rights-of-way to protect town and utility infrastructure and to prevent the damage to health of residents from downed branches during storm events. (Mitigation)*	Highway Department/Selectboard	Medium (Action #5 of 10 in 2009 Plan).	Local resources	Fall 2019-Winter 2019 and continued annually
	Formally request that Green Mountain Power annually clear and maintain utility corridors, which will protect town and utility infrastructure. (Mitigation)	Emergency Management Coordinator	Medium (Action #10 of 10 in 2009 Plan).	Green mountain power, Local Resources	Summer 2019-Fall 2019 and continued annually
Flood/Fluvial Erosion/Sever Weather	*Develop a schedule and capital budgeting program to replace undersized culverts to allow for greater volumes of water to be cleared, therefore protecting town infrastructure. (Mitigation)*	Selectboard, Road Foreman	Medium (Action #4 and #5 of 10 in 2009 Plan)	Local resources; VTrans	Spring 2020-Fall 2020
	Upgrade three culverts on Lime Pond Road to allow for greater volumes of water to be cleared from flooding of natural pond. (Mitigation)	Selectboard, Road Foreman	Medium Action #4 and 5 of 10 in 2009 Plan)	Local resources; VTrans Structures Grant	Summer 2029-Fall 2019
	Upsize squashed	Selectboard, Road	Medium	Local Resources,	Summer

	culvert on Broad Brook Road to a Bridge, which will allow more water quality to be cleared and will protect road and building infrastructure. (Mitigation)	Foreman (Action #4 and 5 in 2009 Plan).	Action #4 and 5 of 10 in 2009 Plan)	Structures Grant	2020-Fall 2020
	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)	Planning Commission	Low Action #6 in 2009 Plan).	Local Resources; TRORC; Municipal Planning Grant; Vermont Agency of Natural Resources	Spring 2022-Spring 2023
	Request an updated flood map from FEMA that more accurately identifies areas that are subject to flooding, therefore diminishing the loss of health and property from development in these areas. (Mitigation)	Town Zoning Administrator	Medium Action #6 of 10 in 2009 Plan)	Local resources; FEMA	Spring 2020-Fall 2020
	Prohibit the removal of natural vegetation along streambanks. Riparian vegetation improves stream floodplains and also reduces the damaging effects	Selectboard	Medium (New)	Local Resources; TRORC; Vermont Agency of Natural Resources	Spring 2019-Spring 2020

	of stream channel erosion on town and private infrastructure. (Mitigation)				
	Elevate existing buildings in Special Flood Hazard Areas in Barnard so that they are 1 foot above base flood elevations. Elevation of structures located in areas vulnerable to flooding will reduce the risk to flooding and will reduce the loss of private infrastructure (Mitigation).	Selectboard	Low (New)	Local resources; Hazard Mitigation Grant Program	Summer 2021-Summer 2025
	Require residents to clean and maintain driveway culverts, or contract with residents to have Town maintain driveway culverts. Proper maintenance of driveway culverts will improve long-term town road maintenance costs and will also properly handle flood levels. (Mitigation)	Selectboard; Road Crew	Low (New)	Local resources	Summer 2022-Summer 2025
	Conduct a road erosion road inventory to determine projects for stormwater improvement to reduce erosion sources from town	Selectboard; Road Crew	High (New)	Better Roads Grant	Summer 2018-Fall 2018

	road infrastructure. Proper road erosion reduction will reduce erosion and its damaging effects on public and private infrastructure. (Mitigation)				

Hazards Mitigated	Ongoing Actions to Support Mitigation and Preparedness Actions	Local Leadership	Prioritization (Mitigation Project Status)	Possible Resources*	Time Frame
All Hazards	*Stock emergency operations materials, such as blankets MRE (meals ready to eat), cots, and water bottles in a box trailer to be held onsite at new emergency operations building to protect the health of Barnard residents during the event of a disaster. (Preparedness)*	Selectboard, Emergency Management Coordinator	Low	Local Resources, the Red Cross	Spring 2021
	Ensure that Barnard's Local Emergency Operations Plan (LEOP) is kept up-to-date and identifies vulnerable areas and references this Plan. (Preparedness)	Selectboard/Emergency Management Director	High (Action #1 and #3 of 10 in 2009 Plan).	Local resources; TRORC; Vermont Department of Emergency Management & Homeland Security (DEMHS)	Spring 2017 and occurring yearly.
	Alert residents to upcoming hazards, bad weather, and	Selectboard, Town Clerk	High	Local resources	Summer 2017

	potentially treacherous travel conditions by means of Barnard Listerv. This town-wide notification system will reduce the loss of life during a hazard. (Preparedness)				
	Create Barnard Town website, to 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)	Selectboard, Town Clerk	High	Local resources	Summer 2017
Flood/Flash Flood/Fluvial Erosion	*Keep up-to-date with Vermont Road and Bridge Standards, which will help Barnard design structures that mitigate flood damage. (Mitigation)*	Road foreman/ Selectboard	Medium (Action #4 and #5 in 2009 Plan)	Local resources	Spring 2017 (or when they are updated by VTrans)
Structural Fire	*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.
	Maintain existing dry hydrants, by checking, servicing, flushing, and opening them annually. Proper	Fire Chief/Fire Department	High	Local Resources	Ongoing and occurs yearly.

	maintenance of hydrants will reduce the loss of life and infrastructure from structure fires. (Mitigation)				
	Enlist statewide fire education trailer for use at Barnard Academy and at community events, which will help residents identify fire hazards in their homes. (Ongoing mitigation)	Fire Chief/Fire Department	Medium	Local Resources, Vermont Division of Public Safety: Division of Fire Safety	Ongoing
Extreme Cold/Snow/Ice Storm	*Plan for, budget, and maintain roads for safe winter travel. (Ongoing mitigation)*	Selectboard	High (Action #5 of 10 in 2009 Plan).	Local resources	Ongoing and occurs yearly.
	Distribute safe winter driving informational materials to residents by means of Barnard listserv. Safe winter driving mitigates the loss to human health. (Preparedness)	Selectboard, Town Clerk	High	Local Resources	Winter 2017
	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	Selectboard, Emergency Management Coordinator	Medium	Local resources	Ongoing and occurs yearly.

	vulnerable populations will be protected. (Ongoing mitigation)				
Hazardous Material Spills	*Ensure that fire department update and maintain HAZMAT Awareness training at a minimum. (Preparedness)*	Fire Department/ Emergency Management Coordinator	High Action #7 in 2009 Plan).	Local resources	Ongoing/ Fall 2017

CERTIFICATE OF ADOPTION
<<DATE>>
TOWN OF Barnard, Vermont Selectboard
A RESOLUTION ADOPTING THE Barnard 2016 HAZARD MITIGATION PLAN

WHEREAS, the Town of Barnard has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of the hazards profiled in the 2016 **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 Barnard has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its **2016 HAZARD MITIGATION 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 Barnard; and

WHEREAS, the **PLAN** recommends several hazard mitigation actions (projects) that will provide mitigation for specific natural hazards that impact the Town of Barnard 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 Barnard eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by Town of Barnard Selectboard:

1. The **2016 HAZARD MITIGATION PLAN** is hereby adopted as an official plan of the Town of Barnard;

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 should be presented to the Selectboard by the Emergency Management Director or Coordinator.

IN WITHNESS WHEREOF, the undersigned have affixed their signature and the corporate seal of the Town of Barnard this ____ day of _____ 201__

_____
Selectboard Chair

_____
Selectboard Member

ATTEST

_____
Town Clerk

Appendices

Appendix A: Hazard Ranking Methodology

Frequency of Occurrence Probability	Warning Time Amount of time generally given to alert people to hazard	Potential Impact Severity and extent of damage and disruption
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

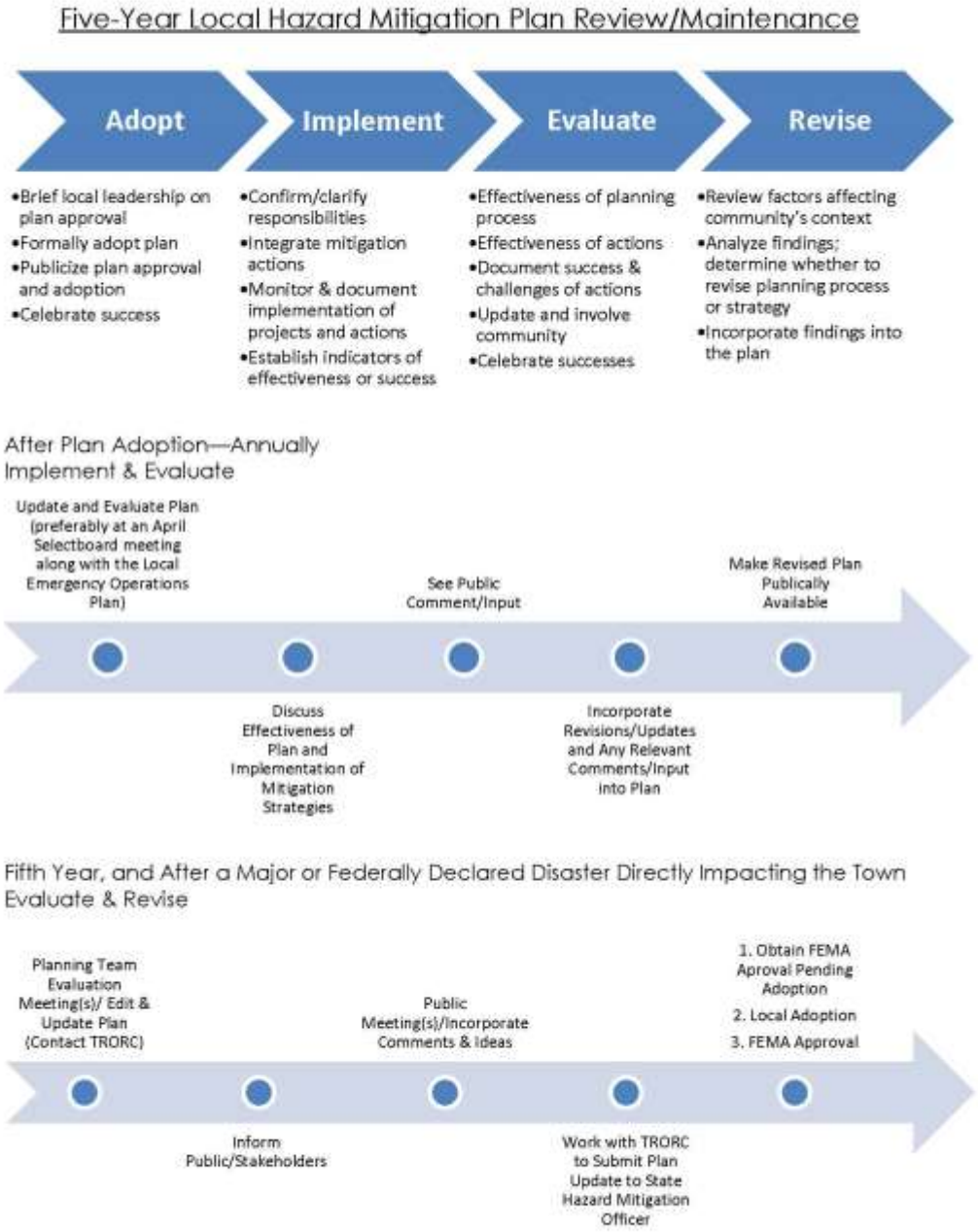
Critical crossings group one includes stream crossing structures on town highways that cross third order streams or larger. Headwater streams generally include first through third order. Third order was included as these headwater streams will have larger drainage areas and may have larger structures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

Local ID	Road Name	Latitutude	Longitude	Birdge/Cul Type	Span/Width	Height	Length	Bankfull Width	Openness
426	LIME POND RD	43.705440843	-72.576437991	30	48	48	40	12.40	0.1613
564	LAKOTA RD	43.680327523	-72.596277287	30	96	96	60	25.80	0.3101
447	LIME POND RD	43.726918183	-72.558593286	30	12	12	40	13.77	0.8715
451	ASHLEY RD	43.727159241	-72.559390058	30	36	36	30	13.30	0.2256
1	DAVIS RD	43.733030202	-72.623570639	30	72	72	40	17.50	0.3429
558	LEVASSEUR RD	43.755611041	-72.570027410	32	42	36	40	13.36	0.2620
566	E BARNARD RD	43.754646087	-72.569258370	30	120	120	42	18.53	0.5397
425	LIME POND RD	43.704355080	-72.576646408	32	66	48	40	17.77	0.3107
570	CHATEAUGUAY RD	43.733723040	-72.642921489	30	1	1	1	15.89	unknown
568	E BARNARD RD	43.749316666	-72.551132460	30	144	144	56	26.29	0.4564
197	SMITH HL	43.733446670	-72.654021261	30	15	15	30	0.06	20.8000
0259	CHATEAUGUAY RD	43.753851131	-72.637167083	3	60			21.0	0.2381
0277	CHATEAUGUAY RD	43.724855901	-72.643191517	5	192			17.0	0.9412
0284	CHATEAUGUAY RD	43.713455811	-72.646084298	3	360			9.0	3.3333
0272	CHATEAUGUAY RD	43.733709534	-72.642868587	5	144			16.0	0.7500
0090	STAGE RD	43.700496212	-72.576479208	1	unknown			13.0	unknown
0125	LIME POND RD	43.725841522	-72.553989245	1	unknown			14.1	unknown
0285	CHATEAUGUAY RD	43.710969974	-72.646084564	2	360			16.0	1.8750
0241	WEST RD	43.736007529	-72.642223563	3	26			10.0	0.2167
0179	E BARNARD RD	43.745982541	-72.544702249	1	20			27.0	0.0617
0085	STAGE RD	43.707408523	-72.580429376	1	unknown			18.0	unknown

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.

Local ID	Road Name	Latitutude	Longitude	Birdge/Cu	Span/Wid	Height	Length	Bankfull V	Openness
426	LIME POND RD	43.705440843	-72.576437991	30	48	48	40	12.40	0.1613
564	LAKOTA RD	43.680327523	-72.596277287	30	96	96	60	25.80	0.3101
451	ASHLEY RD	43.727159241	-72.559390058	30	36	36	30	13.30	0.2256
1	DAVIS RD	43.733030202	-72.623570639	30	72	72	40	17.50	0.3429
558	LEVASSEUR RD	43.755611041	-72.570027410	32	42	36	40	13.36	0.2620
566	E BARNARD RD	43.754646087	-72.569258370	30	120	120	42	18.53	0.5397
425	LIME POND RD	43.704355080	-72.576646408	32	66	48	40	17.77	0.3107
570	CHATEAUGUAY RD	43.733723040	-72.642921489	30	1	1	1	15.89	unknown
568	E BARNARD RD	43.749316666	-72.551132460	30	144	144	56	26.29	0.4564
0259	CHATEAUGUAY RD	43.753851131	-72.637167083	3	60			21.0	0.2381
0090	STAGE RD	43.700496212	-72.576479208	1	unknown			13.0	unknown
0125	LIME POND RD	43.725841522	-72.553989245	1	unknown			14.1	unknown
0241	WEST RD	43.736007529	-72.642223563	3	26			10.0	0.2167
0179	E BARNARD RD	43.745982541	-72.544702249	1	20			27.0	0.0617
0085	STAGE RD	43.707408523	-72.580429376	1	unknown			18.0	unknown

Appendix C: Five-Year Review and Maintenance Plan



Attachments

Attachment A: Map of Barnard


White River
STOCKBRIDGE
ROYALTON
POMFRET
BRIDGEWATER
OLD ROUTE 12
ROUSSEAU RD
RHOADES HL
MASTERSON RD
OX HILL LN
STACK POLE RD
GILLS RD
OLD HILL RD
BARBE LN
MOUNTAIN LN
DANIELS LN
MAPLE LN
OLD MOUNT HUNGER RD
FORT DEFIANCE HL
COWDREY OUTLOOK
AMSDEN RD
Barnard Town Garage
FERNDALE DR
HARLOW LN
FRANCIS RD
BOWMAN RD
TOWN HWY 17
LEVASSEUR RD
NORTH RD
MOUNT HUNGER RD
N RIDGE DR
E BARNARD RD
ELLIS FARM RD
Broad Brook
BROAD BROOK RD
WALKER HILL RD
ALLEN HILL RD
ROYALTON TPKE
BLACKMER RD
Locust Creek
Pond Brook
TOWER RD
Broad Brook Fire Department
WEST RD
DAVIS RD
Barnard Town Hall
SAYER RD
ASHLEY RD
SMITH HL
Barnard Fire Department
LILLEN
GROVE RD
HICKEY LN
SUGAR HOUSE HL N
WEBSTER HILL RD
PORTER RD
Barnard Academy
COURTYARD RD
LIME POND RD
BENNETT RD
COTTAGE RD
ANGELL RD
VT ROUTE 12
GARNET HL
Line Pond
STAGE RD
TURKEY HOLLOW LN
TOWN HWY 48
MORGAN RD
N PERRY RD
TOWN HWY 49
EASTMAN RD
GRAY CAMP RD
CHATEAUGUAY RD
GULF RD
S PERRY RD
Lakota Lake
LAKOTA RD
Gulf Stream
SCHOOLHOUSE HILL RD
MIDSOMER MEADOWS LN
GREEN GATE RD
Barnard Brook
N
Legend
Flood Hazard Area
River Corridors
HYDRANTS
Flood Sites
Sites in Flood Hazard Area
Sites in River Corridor
Critical Facilities
Barnard Culverts
Condition
Critical
Poor
Chateauguay No Town Conservation Project
Conserved Land
0 0.225 0.45 0.9 1.35 1.8
Miles
TRORC
Two Rivers-Ottauquechee
REGIONAL COMMISSION
trorc.org
5/17/2016
T:\EM\HazMitPLANS\PDM 2013 - 2016\Towns\Barnard\barnard_LHMP.mx