

*Adopted by the Town of Granby Selectboard on August 27<sup>th</sup>, 2019*

## **Town of Granby, Vermont**



## **All-Hazards Mitigation Plan**

**Town of Granby  
Selectboard  
PO Box 56  
Granby, VT 05840  
(802) 328-3611  
Public Assistance Applicant #: 009-29125-00**

**Prepared by:**

**Town of Granby, Vermont**

**CERTIFICATE OF LOCAL ADOPTION**

Town of Granby, Vermont

**A Resolution Adopting the All-Hazards Mitigation Plan**

WHEREAS, the Town of Granby has worked with its residents and stakeholders to identify its hazards and vulnerabilities, analyze past and potential future losses due to natural and human-caused hazards, and identify strategies for mitigating future losses; and ...

WHEREAS, the Town of Granby All-Hazards Mitigation Plan contains recommendations, potential actions and future projects to mitigate damage from disasters in Granby; and

WHEREAS, the Town of Granby and the respective officials will pursue implementation of the strategy and follow the maintenance process described in this plan to assure that the plan stays up to date and compliant; and...

WHEREAS, a meeting was held by the Town of Granby Selectboard to formally approve and adopt the Town of Granby All Hazards Mitigation Plan.

NOW, THEREFORE BE IT RESOLVED that the Town of Granby adopts this All-Hazards Mitigation Plan for the town.

8/27/19  
Date

Robert C. Bates  
Selectboard Chair

Robert C. Bates  
Selectman

David Brunel  
Selectman

[Signature]  
Selectman

Debbie Jetha  
Attested to by Town Clerk

# Executive Summary

In 2018, the Town of Granby began to develop the Town of Granby’s Local All-Hazard Mitigation Plan. The local annex to the 2005 multi-jurisdictional; NVDA Caledonia, Essex and Orleans Counties VT Regional All-Hazards Mitigation Plan was drafted but never adopted. This plan is a first time plan and represents the collaborative efforts of the Town of Granby Hazard Mitigation Planning Team and associated residents, towns and agencies that contributed to the development of this plan. As hazard mitigation is a sustained effort to permanently reduce or eliminate long-term risks to people and property from the effects of reasonably predictable hazards, the town has communicated its efforts related to developing this plan to its residents and surrounding municipalities, providing a formal opportunity to provide input and review relevant sections of the plan. Along these lines, the town has documented the planning process so that future updates can follow an efficient pattern in addition to capturing this important component as means of establishing institutional memory. In realization that eligibility to receive federal hazard mitigation grants and optimize state-level reimburse or “match” dollars during a federally declared disaster is dependent on a federally approved plan, the town remains committed to sustaining its mitigation efforts and by developing this plan, will have a guide for action that will foster enhanced emphasis on mitigation in the years to come. The town realizes the importance of mitigation inherent to its own resilience as well as means to establishing strong partnerships with regional support agencies and associations, state government and FEMA. As the town moves towards formally adopting this Local All-Hazards Mitigation Plan, the purpose of this plan is to:

- Identify specific natural, technological and societal hazards that impact the Town of Granby
- Prioritize hazards for mitigation planning
- Recommend town-level goals and strategies to reduce losses from those hazards
- Establish a coordinated process to implement goals and their associated strategies by taking advantage of available resources and creating achievable action steps

This plan is organized into 5 Sections:

**Section 1: Introduction and Purpose** explains the purpose, benefits, implications and goals of this plan. This section also describes demographics and characteristics specific to Granby and describes the planning process used to develop this plan.

**Section 2: Hazard Identification** expands on the hazard identification in the Granby Town Plan (2012) with specific municipal-level details on selected hazards.

**Section 3: Risk Assessment** discusses identified hazard areas in the town and reviews previous federally-declared disasters to identify what risks are likely in the future. This section presents a hazard risk assessment for the municipality, identifying the most significant and most likely hazards which merit mitigation activity. The most significant hazards for Granby have been profiled and are introduced in the grid below:

Severe winter/Ice storm	High Winds	Flooding
Extreme Cold		

**Section 4: Vulnerability Assessment** discusses buildings, critical facilities and infrastructure in designated hazard areas and estimates potential losses.

**Section 5: Mitigation Strategies** begins with an overview of goals and policies in the most recent Town Plan that support hazard mitigation and utilizes a current road inventory to formulate a work plan around major infrastructure projects. An analysis of existing municipal actions that support hazard mitigation, such as planning, emergency services and actions of the highway department are also included. The following all-hazards mitigation goals are summarized below: Reduce at a minimum, and prevent to the maximum extent possible, the loss of life and injury resulting from all hazards.

- 1) Reduce at a minimum, and prevent to the maximum extent possible, the loss of life and injury resulting from all hazards.
- 2) Mitigate financial losses and environmental degradation incurred by municipal, educational, residential, commercial, industrial and agricultural establishments due to various hazards.
- 3) Maintain and increase awareness amongst the town's residents and businesses of the damages caused by previous and potential future hazard events as identified specifically in this Local All-Hazards Mitigation Plan.
- 4) Recognize the linkages between the relative frequency and severity of disaster events and the design, development, use and maintenance of infrastructure such as roads, utilities and storm water management and the planning and development of various land uses.
- 5) Maintain existing municipal plans, programs and ordinances that directly or indirectly support hazard mitigation.
- 6) Develop a mechanism for formal incorporation of this Local All-Hazards Mitigation Plan into the municipal comprehensive plan as described in 24 VSA, Section 4403(5). This mechanism will be developed by the Planning Commission, Selectboard and NVDA and integrate the strategies into the existing town plan as annexes until the next formal update occurs, where a section devoted to mitigation planning will be integrated into the plan.
- 7) Develop a mechanism for formal incorporation of this Local All-Hazards Mitigation Plan particularly the recommended mitigation actions, into the municipal/town operating and capital plans & programs as they relate to public facilities and infrastructure. With the development of the road erosion site inventory, the town will begin a process that incorporates the budgetary requirements of the defined mitigation strategies into its formal budgeting paradigm. The Planning Commission will review the LHMP and use language/actions from it to inform the integration and update process. Town Meeting Day will serve as the formal time that mitigation strategy budgetary considerations will be approved and incorporated into the town budget.

Section 5 also identifies and provides a detailed discussion on the following mitigation actions:

- Action #1: Reduce flood-related impacts through infrastructure upgrades, improvement projects and floodplain management activities.
- Action #2: Improve resilience to severe winter storms
- Action #3: Reduce impact of extreme cold durations
- Action #4: Raise public awareness of hazards and hazard mitigation actions

Action #5: Reduce impact of high wind events

Action #6: Continue fluvial geomorphology assessments in collaboration with DEC and develop strategies and regulatory actions in response to identified risk

In conclusion, Section 5 provides an Implementation Matrix to aid the municipality in implementing the outlined mitigation actions with an annual evaluation process to be coordinated and administered by the Granby Planning Commission.

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## SECTION 1: INTRODUCTION AND PURPOSE

### 1.1 Purpose and Scope of this Plan

The purpose of this Local All-Hazards Mitigation Plan is to assist this municipality in identifying all hazards facing their community and in identifying strategies to begin to reduce the impacts of those hazards. The plan also seeks to better integrate and consolidate efforts of the municipality with those outlined in the Town Plan as well as efforts of NVDA, Vermont State agencies, FEMA and the State Hazard Mitigation Plan. The town is aware that community planning can aid significantly in reducing the impact of expected, but unpredictable natural and human-caused events. This document constitutes an All-Hazards Mitigation Plan for the Town of Granby. Community planning can aid significantly in reducing the impact of expected, but unpredictable natural and human-caused events. The goal of this plan is to provide hazard mitigation strategies to aid in creating disaster resistant communities throughout Essex County.

### 1.2 Hazard Mitigation

The Vermont State All-Hazards Mitigation Plan of 2013 defines hazard mitigation as:

*“Any sustained action that reduces or eliminates long-term risk to people and property from natural and human-caused hazards and their effects. The Federal Emergency Management Agency (FEMA) and state agencies recognize that it is less expensive to prevent disaster or mitigate its effects than to repeatedly repair damage after a disaster has struck. This plan recognizes that communities have opportunities to identify mitigation strategies and measures during all of the other phases of Emergency Management—Preparedness, Response and Recovery. Hazards cannot be eliminated, but it is possible to determine what the hazards are, where they are, where they are most severe and to identify actions that can reduce the severity of the hazard.”*

Hazard mitigation strategies and measures can reduce or eliminate the frequency of a specific hazard, lessen the impact of a hazard, modify standards and structures to adapt to a hazard, or limit development in identified hazardous areas. This plan aligns and/or benefits from the 5 goals accomplished as a State since 2010 and as referenced in Section 5 of the State’s 2013 Hazard Mitigation Plan and as part of the newly created Emergency Relief Assistance Funding (ERAF) requirements. With enhanced emphasis on community resiliency, many state agencies and local organizations have an increased awareness of the importance of mitigation planning and have produced plans and resources that towns can use to support their planning efforts. This plan will reference, when relevant, pertinent tools and resources that can be used to enhance mitigation strategies.

### 1.3 Hazard Mitigation Planning Required by the Disaster Mitigation Act of 2000

Hazard mitigation planning is the process that analyzes a community’s risk from natural hazards, coordinates available resources, and implements actions to reduce risks. Per *44 CFR Part 201: Hazard Mitigation Planning*, this planning process establishes criteria for State and local hazard mitigation planning authorized by Section 322 of the Stafford Act as amended by Section 104 of the *Disaster Mitigation Act of 2000*. Effective November 1, 2003, local governments now must have an approved local mitigation plan prior to the approval of a local mitigation project funded through federal Pre-Disaster Mitigation funds. Furthermore, the State of Vermont is required to

adopt a State Pre-Disaster Mitigation Plan for Pre-Disaster Mitigation funds or grants to be released for either a state or local mitigation project after November 1, 2004.

There are several implications if the plan is not adopted:

- After November 1, 2004, Flood Mitigation Assistance Grant Program (FMAGP) funds will be available only to communities that have adopted a local Plan
- For disasters declared after November 1, 2004, a community without a plan is not eligible for HMGP project grants but may apply for planning grants under the 7% of HMGP available for planning
- For the Pre-Disaster Mitigation (PDM) program, a community may apply for PDM funding but must have an approved plan to receive a PDM project grant
- For disasters declared after October 14<sup>th</sup>, 2014, a community without a plan will be required to meet a greater state match when public assistance is awarded under the ERAF requirements (Emergency Relief Assistance Funding)

## **1.4 Benefits**

Adoption and maintenance of this Hazard Mitigation Plan will:

- Make certain funding sources available to complete the identified mitigation initiatives that would not otherwise be available if the plan was not in place
- Lessen the receipt of post-disaster state and federal funding because the list of mitigation initiatives is already identified
- Support effective pre-and post-disaster decision making efforts
- Lessen each local government's vulnerability to disasters by focusing limited financial resources to specifically identified initiatives whose importance have been ranked
- Connect hazard mitigation planning to community planning where possible

## **1.5 All-Hazards Mitigation Plan Goals**

This All-Hazards Mitigation Plan establishes the following general goals for the town and its residents:

- 1) Reduce at a minimum, and prevent to the maximum extent possible, the loss of life and injury resulting from all hazards.
- 2) Mitigate financial losses and environmental degradation incurred by municipal, educational, residential, commercial, industrial and agricultural establishments due to various hazards.
- 3) Maintain and increase awareness amongst the town's residents and businesses of the damages caused by previous and potential future hazard events as identified specifically in this Local All-Hazards Mitigation Plan.
- 4) Recognize the linkages between the relative frequency and severity of disaster events and the design, development, use and maintenance of infrastructure such as roads, utilities and storm water management and the planning and development of various land uses.

- 5) Maintain existing municipal plans, programs and ordinances that directly or indirectly support hazard mitigation.
- 6) Develop a mechanism for formal incorporation of this Local All-Hazards Mitigation Plan into the municipal comprehensive plan as described in 24 VSA, Section 4403(5). This mechanism will be developed by the Planning Commission, Selectboard and NVDA and integrate the strategies into the existing town plan as annexes until the next formal update occurs, where a section devoted to mitigation planning will be integrated into the plan.
- 7) Develop a mechanism for formal incorporation of this Local All-Hazards Mitigation Plan particularly the recommended mitigation actions, into the municipal/town operating and capital plans & programs as they relate to public facilities and infrastructure. With the development of the road erosion site inventory, the town will begin a process that incorporates the budgetary requirements of the defined mitigation strategies into its formal budgeting paradigm. The Planning Commission will review the LHMP and use language/actions from it to inform the integration and update process. Town Meeting Day will serve as the formal time that mitigation strategy budgetary considerations will be approved and incorporated into the town budget.

## **1.6 Town of Granby Population and Characteristics**

The Town of Granby is historically and presently 97% forested, with the majority of the dwellings clustered in the small village center along the main town road. Since its founding in the 1760s by a few farming families, the population of Granby has varied greatly. “Through the Woods...,” the town history, reports that there were only three families left in Granby during the severely and unseasonably cold summer of 1816. The town was reorganized in 1822. Granby’s population peaked at the height of the logging days in the 1890s. There are currently 88 residents in the Town. (U.S. Census, 2010) The Town of Granby is a small rural community in northeastern Vermont. All roads in and out are dirt and during many times of the year are impassable due to weather or other conditions. Granby and its closest neighbor may be considered the most isolated communities in all of Vermont. Power can be out for days at a time due to downed power lines from storms and the fact that Granby is so remote. Residents have several days’ worth of supplies and are well prepared for isolation. Granby sits up at a higher elevation and water drains away from the community. Flooding is not a typical problem. The majority of land in Granby is owned by the International Paper Company and is used for timber production. There is no other industry or commercial activity in town although there are some home-based occupations. There is a one-room schoolhouse. Middle level through high school students attend schools in surrounding towns and some choose private residential schools. There are designated shelters at the school, the town offices and the local church, although none have a generator or are well-equipped to handle the entire community for extended periods. All residents are on private wells and use on-site septic systems. There are no municipal services in Granby, and even the road repairs are contracted out.

### **Housing:**

For most of its early history, the population of the Town was concentrated on the ridge tops, especially along the Porrell Road. In recent years, most of the Town’s population has been

concentrated in the valleys and along the hillsides. The entire population of Granby is housed, with an estimated income of \$52,397 and median housing value of \$137,251. Electric power is provided by Central Vermont Public Service. Telephone service is provided by Fair Point. Granby offers no municipal water or sewage services. The State 2015 Grand List shows that there are 145 parcels in Granby, 133 are taxable. There are 38 residential parcels in Granby, 15 of which are on lots that are six acres or larger. There are 11 mobile home parcels, two of which are unlanded. There are 50 seasonal homes, half of which are on lots that are six acres or larger. Three parcels are owned by utility companies. Just over 20% of all parcels are owned by Granby residents. *Source: Vermont Department of Taxes*

## 1.7 Summary of Planning Process

Beginning in 2018, a local technical support consultant assisted the town in preparing the plan for submission. The planning team consisted of the following individuals:

Reginald Bunnell	Planning Board
Robert Peters	Selectboard Chair, Road Foreman
Larry Brown	Selectman
Heather Robinson	Essex County Natural Resources Conservation district
Nellie Noble	Town Clerk
Bruce Melendy	Emergency Planner, NVDA

The planning team was established in the summer of 2018. The kick-off meeting was held on June 26<sup>th</sup>, 2018. This was a warned public meeting, however given the small population size, only members of the planning team were present. The planning team reviewed disaster history and town hazards and problem areas of road. The technical consultant met individually with the road foreman on June 27<sup>th</sup> to further discuss what has been accomplished with the road infrastructure and specific, state-led data that identifies priority projects for the future. The team represented the community as best as possible, including the school, long-standing residents, town staff, planners and community-based organizations. In selectboard meetings and in correspondence with the NVDA and consultant, the planning team discussed the planning process and facts related to the town. Additionally, a survey was drafted asking for community input and made available through the town's standard public notification process. The survey introduced the importance and informational needs of a LHMP and asked for more town-specific concerns the residents and/or business owner had. One response was obtained, and it included concerns about the financial implications of a town-wide disaster, the general isolation of the town along with limited town-level resources. Suggestions included a town-wide communication system for emergencies and an emergency committee. On August 28<sup>th</sup>, a warned, public meeting was held to review hazards and perform a risk analysis. On October 23<sup>rd</sup>, the selectboard and members of the planning team reviewed the survey response. On February 26<sup>th</sup>, a warned public meeting was held to review mitigation strategies. Following FEMA guidance in Local Mitigation Plan Review Tool Regulation Checklist and FEMA informational resources, the plan was written using data sources that included:

- Surveys and warned, public meetings collecting public comment (issues raised were addressed in plan and the public meeting)
- 2016 Granby Town Plan (provided town data, current goals and regulations supporting mitigation, recent capital expenditures and infrastructure value helped to drive vulnerability assessment)
- 2009 Granby Zoning Regulations (Used for current flood hazard regulations and land use planning)
- 2013 Vermont State Hazard Mitigation Plan (provided key guidance language and definitions throughout the plan).
- Vermont Agency of Natural Resources (ANR) and Transportation (VTrans) (Provided key policy recommendations on environmental conservation, high accident locations, climate change and fluvial erosion data).
- Vermont Departments of Health (VDH) and Environmental Conservation (DEC) (provided information related with public health services that could be impacted during a disaster and state support functions designated to both VDH and DEC. DEC also provided river corridor data for mapping purposes.
- FEMA Open Source (data.gov) Data for Disaster History and PA funding (provided comprehensive declared disaster by year and type as well as project descriptions and cost per event).
- FEMA NFIP “Bureau.Net” database (provided detailed information on repetitive loss properties and associated flood insurance claims).
- EPA’s Incident Action Checklist for cold weather resilience of water systems (provides a guidance tool for public works to cross-reference actions on the system).
- 2013 ACCD Mobile Home Resilience Plan

While many small communities in Vermont face similar circumstances (e.g. flooding, winter storms and remote residents), each one has unique considerations and opportunities. There was a point made to capture the subtle characteristics of the town, its history and its residents. From this, the specific risks, vulnerabilities and mitigation strategies were developed.

NVDA’s role in assisting the entire region with all facets of planning provided crucial information and NVDA’s Emergency Management Planning representative attended planning team meetings and provided guidance.

On February 28th, 2019, the town held a warned public meeting to review the identified hazards and associated mitigation strategies. The draft plan was then revised based on input and presented to the town. The revised draft was made available for review at the town office and residents were informed via meeting minutes and the town bulletin board of the ability to review the draft and additional opportunity for formal comment and suggestions. All neighboring town offices (Burke, East Haven, Guildhall and Victory) were sent the draft for review and comment in early July of 2019. Neighboring Vermont towns were asked to share the information with their selectboards and given instructions how to respond with questions, comments or concerns (via email to the Granby Town Clerk) by July 25<sup>th</sup> if there was an intent to comment at all. There

were no comments leading to an edit of the presented draft despite Guildhall requesting to review the draft. The final draft was submitted to VEM and then to FEMA for formal review and approval pending municipal adoption. A resolution of adoption is anticipated following final FEMA approval.

## SECTION 2: HAZARD IDENTIFICATION

The 2005 Plan profiled the following hazards and while never adopted, it was reviewed in the development of this first time plan:

- **Flooding**
- **High Winds**
- Power Failure
- **Severe Winter/Ice Storm**
- Town Road Incidents
- Fire: Urban and Wildfires/Forest Fires
- School Safety Issues

The planning team considered the continued inclusion or deletion of the 2005 hazards profiled and for each, considered prior history, current trends and available data to estimate risk. As highlighted above, some profiled hazards remain a risk for the town. However, other hazards, due to lack of occurrence frequency, risk and/or vulnerability have been removed from consideration.

Because this plan represents the first of its kind for the town and is intended to provide a comprehensive resource for understanding the relationship between hazards, vulnerabilities and subsequent mitigation efforts, the profiled hazards will form the basis of mitigation actions for the next five-year planning cycle. The following represents the profiled hazards in Granby. The definitions of each hazard, along with historical occurrence and impact, will be described in this section.

- **Natural Hazards:** weather / climate hazards (drought, hurricane/tornado, high winds, severe winter storm, extreme temperatures, climate change, lightning, hail), flooding, geological hazards (landslide / erosion, earthquake, naturally-occurring radiation), and fire hazards.

Profiled Natural Hazards: High Winds, Severe Winter Storm, Flooding, Extreme Cold Temperature

### 2.1 Disaster History

The number of natural disasters in Essex County since 1998 (12) is at the US average (12). There have been 12 major disasters (Presidential) declared and 3 Emergencies declared. The causes of natural disasters have been; Floods: 9; Storms: 7; Winds: 2; Heavy Rain; 1

Landslide: 1; Snowstorm: 1; Tropical Storm: 1 (Note: Some incidents may be assigned to more than one category). The following discussion on natural hazards is based upon information from several sources. General descriptions are based upon the *2013 Vermont State Hazard Mitigation Plan*. Due to rural nature of Northeast Kingdom, there is little historical data available for presentation related to all hazards but when available, relevant data is included.

The highest risk hazards (High Winds, Severe Winter/Ice Storm, Flooding, Extreme Cold Temperature) have been profiled to provide the basis of future mitigation strategies. It should be noted here that the town has only received disaster funding for flood-related events. However, lower risk natural hazards (drought, tornado, high winds, extreme eat, hail, landslide, earthquake, naturally-occurring radiation, hurricanes and fire hazards) are omitted from full profiling because they do not pose enough risk to substantiate mitigation efforts at this time. Hurricanes flood risk is, however, addressed in the flooding section of this plan.

*Table 2-1: Summary of Vermont Emergency Declarations*

<b>Number</b>	<b>Year</b>	<b>Type</b>
3338	2011	Hurricane Irene
3167	2001	Snowstorm
3053	1977	Drought

Source: FEMA

*Table 2-2: Summary of Vermont Major Disaster Declarations since 1998 (Essex County in Bold with events that resulted in PA funding for the town with an “(\*)”)*

4380	2018	Severe Storms and Flooding
<b>4356</b>	<b>2018</b>	<b>Severe Storms and Flooding</b>
<b>4207</b>	<b>2015</b>	<b>Severe Winter Storm</b>
<b>4178*</b>	<b>2014</b>	<b>Severe Storms and Flooding</b>
4232	2015	Severe Storms and Flooding
<b>4163</b>	<b>2014</b>	<b>Severe Winter Storm</b>
4140	2013	Severe Storms and Flooding
4120	2013	Severe Storms and Flooding
4066	2012	Severe Storms, Tornado and Flooding
4043	2011	Severe Storms and Flooding
4022	2011	Tropical Storm Irene
<b>4001*</b>	<b>2011</b>	<b>Severe Storms and Flooding</b>
<b>1995</b>	<b>2011</b>	<b>Severe Storms and Flooding</b>
1951	2010	Severe Storm
1816	2009	Severe Winter Storm
1790	2008	Severe Storms and Flooding
1784	2008	Severe Storms, Tornado and Flooding
1778	2008	Severe Storms and Flooding
<b>1715</b>	<b>2007</b>	<b>Severe Storm, Tornado and Flooding</b>
<b>1698</b>	<b>2007</b>	<b>Severe Storms and Flooding</b>
1559	2004	Severe Storms and Flooding
1488	2003	Severe Storms and Flooding
<b>1428</b>	<b>2002</b>	<b>Severe Storms and Flooding</b>

1358	2001	Severe Winter Storm
1336	2000	Severe Storms and Flooding
<b>1307</b>	<b>1999</b>	<b>Tropical Storm Floyd</b>
1228	1999	Severe Storms and Flooding
1201	1998	Ice Storm

Source: FEMA

Table 2-3: Table 2-2.1. Summary of Granby Declared Disaster where PA was Received  
Applicant #: 009-29125-00

Disaster Number	Declaration Date	Incident Type	Applicant Name	Number of Projects	Federal Share Obligated
4001	07/08/2011	Severe Storm(s)	GRANBY (TOWN OF)	3	\$81,612.17
4178	06/11/2014	Flood	GRANBY (TOWN OF)	1	\$49,951.73

### 2.1.1. Profiled Hazards:

#### *An Introduction to Climate Change:*

From 1962 to 2006, each five-year period resulted in 0-6 Major Disaster Declarations in Vermont. From 2007-2018, there were 20. It is commonly accepted that weather extremes are becoming more commonplace in Vermont. Since 2011, record setting snow, rain and cold have been experienced in the state. In recent years, it has become evident that human activities, mostly associated with the combustion of fuel, have added to the natural concentration of greenhouse gases in the atmosphere and are contributing to rapid climate change on a global scale. While projections of the effects of climate change vary, it is generally predicted that Vermont will have warmer temperatures year-round, with wetter winters and drier summers. An increase in the size and frequency of storms is also predicted. Thus, climate change in the next century will likely increase the chance of weather-related hazards occurring. An increase in precipitation may also result in increased flooding and fluvial erosion. Drier summers may increase the chance of drought and wildfire. A warmer climate may also result in the influx of diseases and pests that cold winters previously prevented. The severity of climate change is also difficult to predict, though the effects may be mitigated somewhat if greenhouse gas emissions are reduced soon. In 2011, Governor Shumlin formed the *Vermont Climate Cabinet*. The Cabinet, chaired by the Secretary of Natural Resources, is a multidisciplinary approach to enhance collaboration between various state Agencies. Its primary objectives include providing the Governor with advisory information and facilitating climate change policy adoption and implementation. In 2013, the Vermont Agency of Natural Resources (ANR) released the Climate Change Adaptation Framework which addresses climate change exposures, vulnerability-specific elements within each of the natural resource sectors, and ongoing and proposed actions that can be or have been taken to prepare for the expected changes. In line and in conjunction with the ANR report, the



primary goal of a VTrans climate change adaptation policy is to minimize long-term societal and economic costs stemming from climate change impacts on transportation infrastructure.

Arguably, Essex County is the most rural of the three counties in the Northeast Kingdom. With that, much of weather data available to Caledonia and Orleans County is absent for Essex County. When applicable, and since Granby shares its entire western border with Caledonia County, weather data from the county is used in adjunct to the local historical knowledge related to extreme weather events.

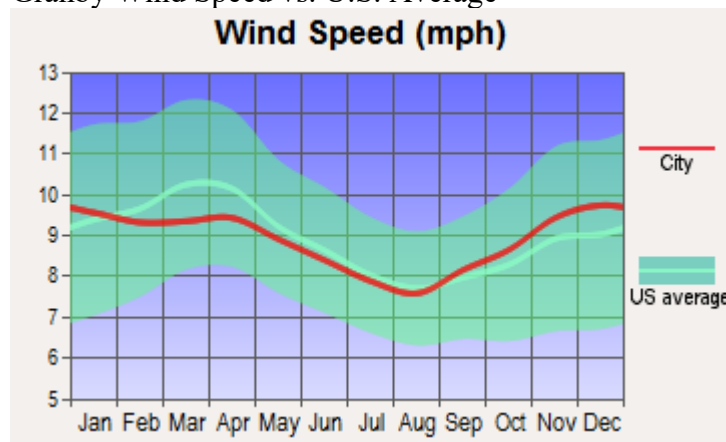
### ***High Winds***

High wind events do occasionally cause damage for the town, normally measured in downed power lines. The last recorded high wind event as tracked by the National Weather Service was recorded on 17-18 January 2012. An 81-mph wind gust was measured atop Vermont's highest peak Mount Mansfield. During this event, Essex County had wind speeds of 30-60 mph. Specific data for the town is collected by a local resident with the highest recorded event occurring on April 15<sup>th</sup>, 2007 at 11:55am with 90mph gusts. As the wind tracking shows, high wind events that may reach category 2 speeds, but it is unlikely, based on previous events, that a category 3 event will occur in the region. The duration of power supply disruption in Granby for any hazard is 6 hours according to Green Mountain Power. That outage was caused by a problem associated with Green Mountain Power electrical supply infrastructure. The following table describes the Beaufort Scale for non-hurricane winds. There have been no events recorded by NOAA in recent years for the county, as such specific wind speeds and damage incurred at the town level are unknown.

Table 2-3: Beaufort Scale and Granby Windspeed vs. U.S. Average

Beaufort*	Avg Miles per Hour	Knots	Surroundings
0 calm		0-1	Smoke rises vertically and the sea is mirror smooth
1 light air	1.2 - 3.0	1 - 3	Smoke moves slightly with breeze and shows direction of wind
2 light breeze	3.7 - 7.5	4 - 6	You can feel the breeze on your face and hear the leaves start to rustle
3 gentle breeze	8.0 - 12.5	7 - 10	Smoke will move horizontally and small branches start to sway. Wind extends a light flag
4 moderate	13.0 - 18.6	11 - 16	Loose dust or sand on the ground will move and larger branches will sway, loose paper blows
5 fresh breeze	19.3 - 25.0	17 - 21	Surface waves form of water and small trees sway
6 strong breeze	25.5 - 31.0	22 - 27	Trees begin to bend with the force of the wind and causes whistling in telephone wires. Some spray on the sea surface
7 moderate gale	32.0 - 38.0	28 - 33	Large trees sway. Moderate sea spray
8 fresh gale	39.0 - 46.0	34 - 40	Twigs break from trees, and long streaks of foam appear on the ocean
9 strong gale	47.0 - 55.0	41 - 47	Branches break from trees
10 whole gale	56.0 - 64.0	48 - 55	Trees are uprooted and the sea takes on a white appearance
11 storm	65.0 - 74.0	56 - 63	Widespread damage
12 hurricane	75+	64 +	Structural damage on land, and storm waves at sea

### Granby Wind Speed vs. U.S. Average



### Severe Winter Storm

Winter storm frequency and distribution varies from year to year depending on the climatological patterns. Because such storms are expected during a Vermont winter, the town is well-equipped to deal with snow removal and traffic incidents. The most damaging types of snowstorms are ice-storms caused by heavy wet snow or rain followed by freezing temperatures. This leads to widespread and numerous power and telephone outages as lines either collapse due

to the ice weight or are brought down by falling trees and branches. According to the 2013 Vermont State All-Hazards Mitigation Plan:

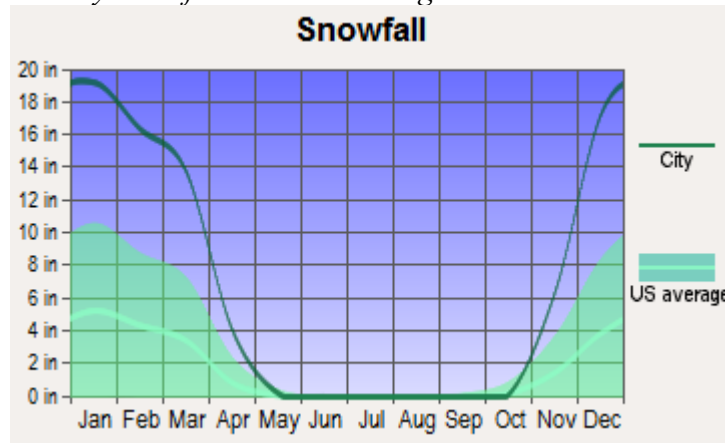
*“A winter storm can range from moderate snow to blizzard conditions. A severe winter storm deposits four or more inches of snow during a 12-hour period or six inches of snow during a 24-hour period. A blizzard is a snowstorm with sustained winds of 40 miles per hour or more with heavy falling or blowing snow and temperatures of ten degrees Fahrenheit or colder. An ice storm involves rain, which freezes upon impact. Ice coating at least one-fourth inch in thickness is heavy enough to damage trees, overhead wires, and similar objects and to produce widespread power outages.”*

The winters of 1969-72 produced record snowfalls for nearby St. Johnsbury, and greater than normal precipitation was recorded in 8 of the 11 years during 1969-79. The closest available data was collected in nearby Waterford, which shares its eastern border with Granby, where the max 24-hour snowfall occurred February 24-25, 1969 at 34” with an additional 2.12” of rain during the period. Regionally, the winter of 2010-2011 was the third-snowiest on record with a total of 124.3 inches for the county. The record for the county was 145.4 inches set in 1970-1971. The potential for a major snowstorm that exceeds the capabilities of town exists every year but with the recent increase in snow fall totals and cold temperature duration, the town realizes the further consideration are required. NOAA's National Centers for Environmental Information is now producing the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two thirds of the U.S. The RSI ranks snowstorm impacts on a scale from 1 to 5, similar to the Fujita scale for tornadoes or the Saffir-Simpson scale for hurricanes. NCEI has analyzed and assigned RSI values to over 500 storms going as far back as 1900. New storms are added operationally. As such, RSI puts the regional impacts of snowstorms into a century-scale historical perspective. The index is useful for the media, emergency managers, the public and others who wish to compare regional impacts between different snowstorms. The RSI and Societal Impacts Section allows one to see the regional RSI values for particular storms as well as the area and population of snowfall for those storms. The area and population are cumulative values above regional specific thresholds. For example, the thresholds for the Southeast are 2”, 5”, 10”, and 15” of snowfall while the thresholds for the Northeast are 4”, 10”, 20”, and 30” of snowfall. 2010, 2012, 2014 and 2015 have some of the highest rankings for notable storms. These rankings are based, in part on the severity of the storm using the following system. Since 2000, there has only been one event that reached a category 4 in the Northeast, five reached Category 3, eight were “significant” and all others were notable. Despite having considerably more snow than the U.S. average, Granby has had no major PA funding related to damage from snow events.

Table 2-4: NOAA’s Regional Snowfall Index (RSI) and Granby Snowfall vs. U.S. Average

CATEGORY	RSI VALUE	DESCRIPTION
1	1–3	Notable
2	3–6	Significant
3	6–10	Major
4	10–18	Crippling
5	18.0+	Extreme

Granby Snowfall vs. U.S. Average



According to the NOAA, there were four extreme events from 2011-2018 for the county. Two were heavy snow 2/5 and 2/13 2014 (the others were extreme cold/wind chill). While declared snow storm disaster have been declared for the county, Granby has not received PA funding for these events. Because such storms are expected during a Vermont winter, the town is well-equipped to deal with snow removal and traffic incidents. The most damaging types of snowstorms are ice-storms caused by heavy wet snow or rain followed by freezing temperatures. This leads to widespread and numerous power and telephone outages as lines either collapse due to the ice weight or are brought down by falling trees and branches.

Sources: [www.ncdc.noaa.gov](http://www.ncdc.noaa.gov) [www.nws.noaa.gov](http://www.nws.noaa.gov)

**Ice Storm**

Major Ice Storms occurred in January 1998 and again in December 2013. The North American Ice Storm of 1998 was produced by a series of surface low pressure systems between January 5 and January 10, 1998. For more than 80 hours, steady freezing rain and drizzle fell over an area of several thousand square miles of the Northeast, causing ice accumulation upwards of 2” in some areas. Granby received .5 to 1 inch of ice. On December 13<sup>th</sup>, 2013, another ice storm hit

portions of Essex County, including Granby but the extent of this storm is unknown. While there is evidence that supports an increase in weather and precipitation severity, the incidence of ice storms remains fairly spaced out. The town expects to have another ice storm but unlike rain and snow events, the occurrence of a major ice storm is not expected every year. *Source:* [www.wrh.noaa.gov/map/?wfo=sto](http://www.wrh.noaa.gov/map/?wfo=sto)

### ***Extreme Temperatures***

While there is no historical evidence to support a concern over the consequences of extremely hot temperatures on human health and safety in Granby, high temperatures can help to create severe storms as the one evidenced on September 11<sup>th</sup>, 2013, where record heat (90F) helped to produce damaging hail and winds in parts of the NEK and other areas of Vermont and NY. Recent extremes in cold temperatures is a concern. 2015 tied the coldest winter (January to March) on record (1923) for Vermont as a whole according to the NOAA's National Climatic Data Center whose dataset dates to 1895. Cold temperatures are expected in the Northeast but they can pose a serious threat to health and safety, especially as the severity and duration increases in conjunction with other technological (e.g. power outage, fuel oil delivery disruption) and societal (ability to purchase heating fuel) factors. Maintaining a safe living environment for livestock during extreme temperatures, especially cold extremes, is a concern for the region and Granby. Granby's winter of 2015 was the coldest anyone could remember with a mean temperature of 7.8 degrees Fahrenheit and a max-low of -26 degrees Fahrenheit in February. However, the January of 1970 had a mean temperature of 6.6 degrees Fahrenheit which is the coldest mean temperature for the county and January is the statistically coldest month in all of Vermont. Since 1900, January produced temperatures in the negative 20's and 30's consistently for Essex County with record cold temperatures occurring in 1914 (-38). There is no evidence to support concern over increases in high temperatures for the town as it relates to health and human safety at this time. According the NOAA extreme weather data, there were two extreme cold events for the county on 1/7 and 2/1 2015.

### **Flooding**

In the north 22,000 acres in the West Mountain Wildlife Management Area and to the south 16,000 acres of the Victory State Forest. Geographically Granby is dissected from its southern point to its northwest boundary by a range of 2000' mountains. South of this mountain range is the Passumpsic River Basin and north of the range is the Upper Connecticut River Basin. In the Upper Connecticut River Basin waters flow north northeast draining into Granby Bog and surrounding wetlands. In the Passumpsic River Basin waters flow south southeast. For Granby, flooding mainly occurs when small streams overflow and run down into town where the population is concentrated. The Special Flood Hazard Areas are found in two areas one in the southwest corner of town along the Moose River and in the north-northeast portion of town along the Granby Stream. There is no development in the Flood Hazard Area. Future development in the Flood Hazard Area is prohibited in Granby's zoning regulations. Of the total of 115 structures in Granby 1 is in the flood plain and 3 are within a river corridor.

Overall, flooding is the most common recurring hazard event in the state of Vermont. June, 2015 broke records across the state for the wettest on record. Granby received nearly 6 inches of rain in June, 2015 but flooding did not result. This amount is high but not highest for the region. 9.65'' fell in 1973 in Saint Johnsbury and the greatest 24-hour rainfall records for the area occurred in May 30<sup>th</sup>, 2011 at 6.47''. Recent history, including the flooding events of 2011;

where the town sustained historic levels of damage with over 40 areas needing repair, most of which receiving Federal assistance to repair and the records set in 2015 suggest that increases in total rain fall and severity are to be expected along the lines seen with the records set across the state recently. There are three sources of historical precipitation data for Vermont. The data are reported at the county level: 1) recurrence time intervals for 24-hour rainfall storm depth, 2) annualized daily frequency of rainfall, and 3) rainfall-intensity frequencies. The first source of data is the recurrence time intervals for 24-hour rainfall storm depth. The recurrence depth data describes the expected intensity of major rainfall events with respect to both rainfall depth and frequency of occurrence. Since 2011, there have been 3 flood events listed for the county on the NOAA extreme weather data site. Two flood events on 4/15/2014 and a flash flood on 6/19/2017 but these did not impact the town.

*Table 2-8: 24-Hour Rainfall Depths (inches) for Common Recurrence Intervals (ANR, 2002)*

<i>County: Essex</i>
<i>1-yr, 24-hr Rainfall Depth: 2.2''</i>
<i>2-yr, 24-hr Rainfall Depth: 2.3''</i>
<i>10-yr, 24-hr Rainfall Depth: 3.1''</i>
<i>100-yr, 24-hr Rainfall Depth: 5.1''</i>

*The second source of data are the annualized daily frequencies of rainfall, which were obtained from the National Climatic Data Center (NCDC), Climate Normals program. The data provides the average number of days per year with measurable precipitation (greater than 0.01 inches) on a county by county basis. This data allows for the conversion of the annual probabilities derived from the recurrence time intervals to daily probabilities. The annualized estimated daily frequency of measurable rainfall for Essex County is 157 days (4<sup>th</sup> highest in the state) with 107 days of rain and 50 days of snow (data is correct for Essex County). The final source of data are rainfall-intensity frequencies. Hourly precipitation totals throughout the state of Vermont were obtained from the NCDC's Cooperative Observer Program (COOP). Hourly rainfall data were available for 26 COOP locations. Each station is associated with the specific county in which it was located, and the hourly precipitation totals for each station are aggregated by county to yield a frequency distribution of hourly rainfall intensities.*

*Table: 2-9: Essex County Rainfall-Intensity Range (in. /hr.)*

<i>County: Essex</i>
<i>x ≤ 0.01: 22.5%</i>
<i>0.01 &lt; x ≤ 0.05: 25.6%</i>
<i>0.05 &lt; x ≤ 0.10: 38%</i>
<i>0.10 &lt; x ≤ 0.15: 3.2%</i>
<i>0.15 &lt; x ≤ 0.20: 5.9%</i>
<i>0.2 &lt; x ≤ 0.25: .8%</i>
<i>0.25 &lt; x: 4.7%</i>

There are three main types of flooding that occur in Vermont: flooding from rain or snow melt, flash flooding and urban flooding. Flooding has also been known to occur as a result of ice jams in rivers adjoining developed towns and cities. These events may result in widespread damage in major river floodplains or localized flash flooding caused by unusually large rainstorms over a small area. The effects of all types of events can be worsened by ice or debris dams and the failure of infrastructure (especially culverts), private and/or beaver dams. Rain storms are the cause of most flooding in Granby. Winter and spring thaws, occasionally exacerbated by ice jams, are another significant source of flooding, especially when coupled with high rain levels. Much of this flooding is flash flooding, occurring within hours of a rainstorm or other event. Flash flooding, as opposed to flooding with a gradual onset, causes the largest amount of damage to property and infrastructure. Floods cause two major types of damage: water damage from inundation and erosion damage to property and infrastructure. The *2013 Vermont State All-Hazards Mitigation Plan* discusses flooding extensively. While that plan is concerned with all of Vermont, the information on flooding is all relevant to Granby in that:

*“Recent studies have shown that most flooding in Vermont occurs in upland streams and road drainage systems that fail to handle the amount of water they receive. Due to steep gradients, flooding may inundate these areas severely, but only briefly. Flooding in these areas generally has enough force to cause erosion capable of destroying roads and collapsing buildings. These areas are often not mapped as being flood prone and property owners in these areas typically do not have flood insurance (DHCA, 1998). Furthermore, precipitation trend analysis suggests that intense local storms are occurring more frequently. Additionally, irresponsible land use and development will exacerbate the preexisting vulnerability. Urban flooding usually occurs when drainage systems are overwhelmed and damages homes and businesses. This flooding happens in all urban areas, but specifically in Burlington where the downtown area is located at the bottom of a gradient, which adds to the intensity of this localized flooding....*

*...Over the past two decades, flood damage costs have risen dramatically in Vermont due to increasing occurrences of flooding and increases in vulnerability associated with unwise land use development in flood plains or within stream corridors. The geography and topography are right for a significant localized storm with extreme damage at almost any location in Vermont. Heavy rains with previous ground saturation, which causes runoff, are a significant part of the flooding formula in Vermont. Steep topography and narrow, inhabited, stream and river valleys further increase the dangerous nature of this hazard. Furthermore, precipitation trend analysis suggests that intense, localized storms that can cause flash flooding are occurring with greater frequency. While flooding will continue, planning and other mitigation measures can help minimize damages.*

*All of Vermont’s major rivers have inhabited flood plains. While residents in mountain valleys are at risk, they may not be aware of the danger or may choose to ignore it. There are many reasons property owners are reluctant to relocate to less flood prone ground, not the least of which is the lack of personal experience of flooding. In addition, many communities originated beside rivers and streams; some of the most attractive property is located in vulnerable areas. Lakeshore property in Vermont is vulnerable to flooding from high water levels, either by surface water erosion or flooding. Occasionally, water-saturated ground and high-water tables cause flooding to basements and other low-lying areas. Lakeshore property is highly desirable and valuable, making the development of lakeshore areas very likely, even with the high potential for flooding. Restrictions on lakeshore property development have significant negative*

*economic and tax revenue impacts that must be carefully weighed against the gains in personal safety and protection of property.”*

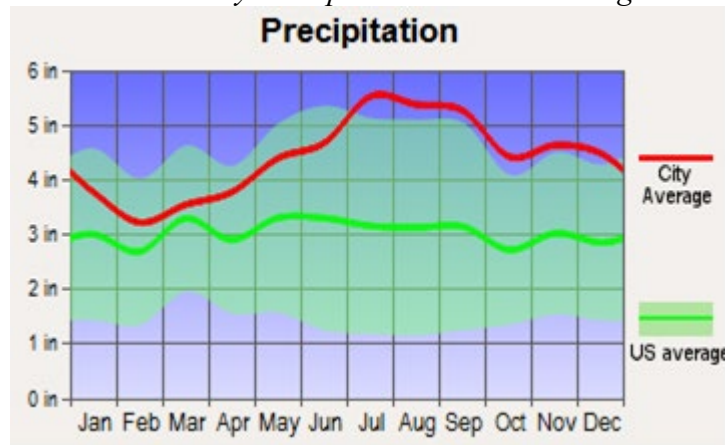
Vermont experienced major floods long before Federal disaster assistance became available. The most destructive recorded event was in November of 1927. In the month before the flood, rains in excess of 150% of normal precipitation fell after the ground had frozen. The flood itself was precipitated by 10 inches of rain falling over the course of a few days. The flood inundated parts of many towns and damaged or destroyed numerous bridges in the county. As the history of the flooding cited above bears out, the geography and topography are right for a significant localized storm with extreme damage at almost any location in Vermont. Numerous floods have resulted in Presidentially-declared disasters and an influx of Federal disaster assistance. Of these disasters, 1973 flood inflicted widespread damage across the state and the residual rains of Hurricane Belle in 1976 resulted in substantial federal disaster assistance in Vermont. The following chart provides the history of recent PA funding related to flooding events in Granby. While this does not reflect the total impact of flooding on the town, PA funding history does provide a reference for vulnerable areas in the town and those areas will be addressed.

*Table 2-5: Bulk PA Funding related to Flooding in Granby since 2004*

*Source: FEMA*

Disaster Number	PW Number	Application Title	Damage Category Code	Project Amount	Federal Share Obligated	Total Obligated
4001	103	pdesxgra03c felker	C - Roads & Bridges	\$10,267.95	\$7,700.96	\$7,700.96
4001	186	pdesxgra01c porrell	C - Roads & Bridges	\$59,448.12	\$44,586.09	\$44,586.09
4001	197	pdesxgra02c shores hill	C - Roads & Bridges	\$39,100.16	\$29,325.12	\$29,325.12
4178	23	GRANC01 - TH-2, TH-3, TH-6, TH-9.	C - Roads & Bridges	\$66,602.31	\$49,951.73	\$49,951.73

*Table 2-7: Granby Precipitation vs. U.S. Average*





Previous experiences have proven to the town that flooding is the greatest risk and another flood event is probable by the time this plan requires an update. With this conviction, the need to complete viable mitigation actions to town infrastructure becomes incredibly important and the town remains aware of this. The estimated Capacity-Disruption Levels Given a Measured Rainfall Event can be interpreted as the conditional probability that a particular roadway capacity disruption occurs, given that a rainfall event occurs. For Essex County, the probability that the intensity of a rain event will result in approximately a 2%, 7.5%, or 13.5% roadway capacity reduction are 28.2%, 69.2%, or 2.6%, respectively (*Source: A Risk-Based Flood-Planning Strategy for Vermont's Roadway Network, 2015*).

### ***Inundation and Floodplains***

Regarding flood inundation issues, the 2013 Vermont State All-Hazards Mitigation Plan states:

*“While inundation-related flood loss is a significant component of flood disasters, the predominant mode of damage is associated with the dynamic, and often times catastrophic, physical adjustment of stream channel dimensions and location during storm events due to bed and bank erosion, debris and ice jams, structural failures, flow diversion, or flow modification by man-made structures. Channel adjustments with devastating consequences have frequently been documented wherein such adjustments are linked to historic channel management activities, flood plain encroachments, adjacent land use practices and/or changes in watershed hydrology associated with conversion of land cover and drainage activities. The 100-year, or “base” floodplain is the national standard for floodplain management. The area is shown on City Flood Insurance Rate Maps (FIRMs) as issued by FEMA. The 100-year floodplain has one chance in a hundred of being flooded in any given year. The probability that a 100-year flood will occur is a statistical determination based on past flooding in an area. This is not to say that a flood of such magnitude cannot occur two years in a row or twice in the same year. The term only means that in any given year, the odds are 1% that the area will be flooded. The same logic holds true for defining a 500-year flood. In this case, a flood of the 500-year magnitude has a 0.2% chance of occurring in a year. Much flood damage in Vermont occurs along upland streams, damaging private property and infrastructure such as bridges, roads, and culverts. The failure of beaver dams, private ponds and public and private culvert crossings contributes to flood surges and often dramatically increased damage downstream. Homes and other private investments along these streams are generally not recognized as a flood area on FEMA maps of flood hazard zones and, thus, are not typically identified as being vulnerable to flooding or erosion. Town plans and zoning regulations have generally not identified these stream corridors as areas needing protective setbacks for development or zoning.”*

In general, floods in the area are caused by heavy rains. Springtime rains are often associated with snowmelt. A winter thaw, accompanied by rain often leads to ice jams which also cause riverine flooding. Hurricanes traveling up the east coast of the country produce occasional flooding situations. The most frequent flooding occurs in early spring as a result of snowmelt and heavy rains, but flooding has historically occurred in every season. Notable floods in this area have occurred in the last several years. Steep slopes, culvert failure and inadequate ditching have resulted in the bulk of damage and subsequent repairs.

### ***Fluvial Erosion***

Erosion occurs on a consistent, but small-scale, basis within the riparian corridor of the town's streams and rivers. This is a part of normal natural processes and as such is necessary for the proper functioning of the ecosystem of these waterways. However, fluvial erosion on a large scale can damage stream banks and undercut infrastructure such as roads, bridges and culverts as well as agricultural land and structures, causing severe damage. Erosion can cause stream bank collapses, which are generally classified as landslides. Most flood damage is associated with fluvial erosion rather than inundation. The *2013 Vermont State All-Hazards Mitigation Plan* contains the following discussion of fluvial erosion:

*“Vermont’s landscape has historically contributed greatly to the widespread practice of the channelization of rivers and streams in order to maximize agricultural land uses and facilitate the development of transportation infrastructure. Channelization, in combination with widespread flood plain encroachment, has contributed significantly to the disconnection of as much as 70% of Vermont’s streams from their flood plains. In this unsustainable condition and when energized by flood events, catastrophic adjustments of the channel frequently occur, usually with consequent fluvial erosion damage to adjacent or nearby human investments. All areas of the state suffer equally from fluvial erosion hazards. Some areas have suffered more than others simply because of the location of storm tracks. Transportation infrastructure and agricultural property are the most frequently endangered types of human investment affected by fluvial erosion hazards. Residential, commercial and other municipal properties are also frequently endangered. Changes in watershed hydrology that significantly influence fluvial stability are commonly associated with urbanization or with silvicultural practices. However, watershed scale hydrologic changes have been observed in Vermont as a localized phenomenon either in small, highly urbanized watersheds or in small, rural sub watersheds where clear cutting of a large percentage of the watershed land area has recently occurred. Stream geomorphic assessments and a fluvial geomorphic database maintained by the Agency of Natural Resources have identified main stem rivers typically channelized from 60-95% of their lengths. When human investments and land use expectations include all the land in the valley up to the river banks, there results extreme public interest in maintaining this unsustainable morphological condition despite its great cost and resultant hazard to public safety.”*

The Vermont Agency of Transportation (VTTrans) applies the term “scour critical” to stream crossing structures especially vulnerable to streambed scour—the undermining of bridge supports by water action and erosion. A spreadsheet database is maintained by VTTrans and continually updated by the Bridge Inspection Program. Structures inspected are only those of 20 ft. or longer owned by a municipality or the state. The scour critical rating is based on the structure itself, and does not consider debris jams, outflanking, channel change, or other issues commonly associated with fluvial erosion. Water supply source and distribution systems are also endangered by fluvial erosion. Many water distribution systems involve buried pipes that cross streams, which are vulnerable to fluvial erosion. In December 2014 the Vermont Department of Environmental Conservation (DEC) released the “Flood Hazard Area and River Corridor Protection Procedures” guide, outlining specific actions and considerations. While fluvial erosion potential has not been addressed yet, new data is constantly becoming available, such as the

recently released River Corridors Base Map by the Agency of Natural Resources. While Granby's exposure is limited by the length and character of the rivers within the town, the potential for significant property damage under unique circumstances is a concern. Therefore, new river corridor data will be evaluated as it becomes available to identify any potential problem areas and any measures that will minimize or eliminate the impact of fluvial erosion shall be implemented.

That

### ***Ice Jams***

Ice jams, which can cause rapid and catastrophic flooding, are considered increasingly hazardous in parts of Vermont. In addition to the inundation damage they cause, ice jams can block infrastructure such as roads and culverts. Ice jams pose a risk in the town. A list of historic ice jams, including municipalities and streams, is maintained by VEM and the Vermont Agency of Natural Resources (ANR). The US Army Corps of Engineers Cold Regions Research and Engineering Laboratory maintains a more specific database of ice jams, which includes over 987 events in Vermont with the latest occurring in 2018. Historic events in Granby include an ice jam recorded at USGS gage Kirby Brook on March 17, 1968 with a discharge of 5.0 cfs. Another on Kirby Brook on March 9<sup>th</sup>, 1966 at 6.63 feet due to an ice jam with discharge at 14 cfs. Regionally, nearby Passumpsic had 19 (10<sup>th</sup> highest in the state) and St. Johnsbury had 38 (5<sup>th</sup> highest in the state) with the Connecticut River being number one in the state with 84 recorded ice jams.

(Source: [http://rsgisias.crrel.usace.army.mil/apex/f?p=524:39:10954063060296::NO::P39\\_STATE:VT](http://rsgisias.crrel.usace.army.mil/apex/f?p=524:39:10954063060296::NO::P39_STATE:VT))

## **SECTION 3: RISK ASSESSMENT**

### **3.1 Designated Hazard Areas**

#### *3.1.1. Flood Hazard Areas*

It is difficult to estimate the total number of structures in the 100-year limit of the FIRM (1974) identified flood plain as those maps do not accurately match up to the E911 maps that are based on the structures' geographical location (latitude and longitude). However, it can be estimated that there are approximately 10 structures in or near the flood areas depicted on the FIRM. However, there are no repetitive loss properties in town. (source: *Granby Town Plan/NFIP Insurance Report: Vermont*)

#### *3.1.2. Fluvial Erosion Hazard Areas*

In 2009 the Essex County Natural Resources Conservation District completed a Phase II Stream Geomorphic Assessment report on six reaches (or sections) of the Moose River. Recommendations included the establishment of forested riparian buffers in reaches M7, M9, M10 and M13 and fencing and installation of riparian buffer in Reach M08 below Granby village, where grazing areas are adjacent to the stream. About two-thirds of Vermont's flood-related losses occur outside of mapped floodplains, and this reveals the fundamental limitations of the FEMA FIRMs. A mapped floodplain makes the dangerous assumption that the river

channel is static, that the river bends will never shift up or down valley, that the river channel will never move laterally, or that river beds will never scour down or build up. River channels are constantly undergoing some physical adjustment process. This might be gradual, resulting in gradual stream bank erosion or sediment deposit – or it might be sudden and dramatic, resulting in a stream bank collapse. In fact, this type of flood-related damage occurs frequently in Vermont, due in part to the state’s mountainous terrain. Land near stream banks are particularly vulnerable to erosion damage by flash flooding, bank collapse, and stream channel dynamics. The Vermont Department of Environmental Conservation, Agency of Natural Resources, has identified river corridors, which consist of the minimum area adjacent to a river that is required to accommodate the dimensions, slope, planform, and buffer of the naturally stable channel and that is necessary for the natural maintenance or natural restoration of a dynamic equilibrium condition. In other words, the river corridor provides “wobble room” for a stream as its channel changes over time. Keeping development out of the river corridors therefore reduces vulnerability to erosion. Development is prohibited in Special Flood Hazard Area and Fluvial Erosion Hazard Zones and is specifically defined in the Town’s Zoning Regulations.

### Repetitive Loss Properties

The town has no repetitive loss properties (buildings or homes).

*source: FEMA Repetitive Loss/BCX Claims provided with packet. NOTE: BCX claims are ones located out of the SFHA.*

## 3.2 Non-designated Hazard Areas

### 3.2.1. Ice Storm Damage

Historic impacts of ice storms in Granby were severe due to magnitude of tree stands and logging

1998 data: <https://www.fema.gov/disaster/1201>

### 3.2.2. High Winds and Lightning

Ridgeline and hilltop homes as well as homes located in the midst of mature forests are the most vulnerable to damage from falling trees and tree limbs. The Vermont Agency of Transportation works to keep limbs trimmed. As with many Vermont communities characterized by natural terrain, the issue of downed trees creating power loss and property damage is more common compared to urban areas. Historically, these instances are short in duration and have not posed a serious risk for the town or its residents.

## 3.3 Previous FEMA-Declared Natural Disasters and Non-Declared Disasters

While the Town of Granby has had a history of flooding, losses to public infrastructure have intensified in recent years. The summers of 1996, 1998 and 2002 saw moderate road damage throughout the town and in the village areas. Damage was largely contained to local back roads (unpaved) due to washouts. The town has been fortunate that its buildings and residential

property has remained unaffected by recent disasters. Granby has received public assistance funding from FEMA for the following natural disasters:

*Table 3-1: KEY:*

DR	Date	Type
4001	07/08/2011	Severe Storm(s)
4178	06/11/2014	Severe Storm(s)

*Table 1-2: Town of Granby, FEMA-declared disasters and snow emergencies, 2004-Current:*

Disaster Number	PW Number	Application Title	Damage Category Code	Project Amount	Federal Share Obligated	Total Obligated
4001	103	pdesxgra03c felker	C - Roads & Bridges	\$10,267.95	\$7,700.96	\$7,700.96
4001	186	pdesxgra01c porrell	C - Roads & Bridges	\$59,448.12	\$44,586.09	\$44,586.09
4001	197	pdesxgra02c shores hill	C - Roads & Bridges	\$39,100.16	\$29,325.12	\$29,325.12
4178	23	GRANC01 - TH-2, TH-3, TH-6, TH-9.	C - Roads & Bridges	\$66,602.31	\$49,951.73	\$49,951.73

*Sources: FEMA and the 2015 Granby Town Plan*

Non-declared disasters (e.g. snow and rain storms) have not resulted in damage above and beyond normal maintenance. Extreme, long-lasting cold temperatures during winter months do pose a concern for the town as in many communities where the price of heating fuel often exceeds resident’s ability to pay. Coupled with high unemployment, there is an increased risk for the town’s residents to not meet the financial requirements for adequate heat, especially during long periods of extremely cold temperatures. Without adequate provisions, 48 hours of extremely cold temperatures could create a serious health hazard.

### 3.3 Hazard Assessment and Risk Analysis

Although estimating the risk of future events is far from an exact science, the Planning Team used best available data and best professional judgment to conduct an updated Hazards Risk Estimate analysis, which was subsequently reviewed and revised by town officials in August,

2018. This analysis assigns numerical values to a hazard's affected area, expected consequences, and probability and supports the inclusion of all profiled hazards in this plan. This quantification allows direct comparison of very different kinds of hazards and their effect on the town and serves as a method of identifying which hazards hold the greatest risk based on prior experience and best available data. The following scoring system was used in this assessment:

Area Impacted: scored from 0-4, rates how much of the municipality's developed area would be impacted.

Consequences: consists of the sum of estimated damages or severity for four items, each of which are scored on a scale of 0-3:

- Health and Safety Consequences
- Property Damage
- Environmental Damage
- Economic Disruption

Probability of Occurrence: (scored 1-5) estimates an anticipated frequency of occurrence based on prior experience and current information.

To arrive at the Overall Risk Value, the sum of the Area and Consequence ratings was multiplied by the Probability rating. The highest possible risk score is 80.

### 3.3.1. Natural Hazards

According to the Hazard and Risk Estimation for Granby, the following natural hazards received the highest risk ratings out of a possible high score of 80:

- Severe Winter Storm (30)
- Flooding (44)
- Extreme Cold (36)
- High Winds (32)

Flood-related disasters have had the greatest financial impact on the town. While no deaths or injuries have been recorded for declared or non-declared disasters, the potential for health and safety risk during a severe winter storm and/or extreme cold are considered higher than that posed by a flooding event. Lightning and high winds further the risk for power loss and high winds can occur any time of year (and normally occur in unison with rain or snow events).

Table 3-2 Natural hazards risk estimation matrix

<b>Granby, VT Hazard &amp; Risk Analysis: NATURAL HAZARDS with Hazardous Material Incident</b>		Drought	Flooding	High Winds	Fluvial Erosion	Landslide	Lightning	Multi-Structure Urban Fire	Hazardous Materials Incident	Winter Storm	Extreme Cold
<b>Area Impacted</b>											
Key: 0 = No developed area impacted											
1 = Less than 25% of developed area impacted											
2 = Less than 50% of developed area impacted											
3 = Less than 75% of developed area impacted											
4 = Over 75% of developed area impacted		2	3	4	1	1	1	2	4	4	
<b>Consequences</b>											
<b>Health &amp; Safety Consequences</b>											
Key: 0 = No health and safety impact											
1 = Few injuries or illnesses											
2 = Few fatalities or illnesses											
3 = Numerous fatalities		0	1	1	0	0	1	2	2	1	1
<b>Property Damage</b>											
Key: 0 = No property damage											
1 = Few properties destroyed or damaged											
2 = Few destroyed but many damaged											
3 = Few damaged but many destroyed											
4 = Many properties destroyed and damaged		0	2	1	1	1	2	1	2	1	
<b>Environmental Damage</b>											
Key: 0 = Little or no environmental damage											
1 = Resources damaged with short-term recovery											
2 = Resources damaged with long-term recovery											
3 = Resource damaged beyond recovery		2	2	1	1	1	1	2	0	1	
<b>Economic Disruption</b>											
Key: 0 = No economic impact											
1 = Low direct and/or indirect costs											
2 = High direct and low indirect costs											
2 = Low direct and high indirect costs											
3 = High direct and high indirect costs		1	3	1	1	1	3	3	3	2	
<b>Sum of Area &amp; Consequence Scores</b>		5	11	8	4	4	5	9	10	10	9
<b>Probability of Occurrence</b>											
Key: 1 = Unknown but rare occurrence											
2 = Unknown but anticipate an occurrence											
3 = 100 years or less occurrence											
4 = 25 years or less occurrence											
5 = Once a year or more occurrence		1	4	4	2	1	2	1	1	3	4
<b>TOTAL RISK RATING</b>											
Total Risk Rating =		5	44	32	8	4	10	9	10	30	36
Sum of Area & Consequence Scores											
x Probability of Occurrence											#####

The town is vulnerable to power loss and in colder months, this could place the residents of the town in harm's way. While the history of major power loss over extended periods of time is minimal, there have been repetitive short-term outages, the greatest lasting 48 hours. This duration poses a health and safety risk to residents as well as limiting response capabilities of town staff. The concern for a hazardous substance spill resulting from a transportation accident is a concern due to the nature of the road way system and ability for responders to arrive quickly. With the recent severity of cold temperatures lasting for longer durations, accessibility of heating fuel is a concern and this accessibility is defined by transportation issues resulting from a major storm where roads are impassable and from resident's ability to pay for the fuel. As with many disaster scenarios, the hazards categories are related to one another. Natural hazards can cause a technological problem which can then cause a societal problem.

### **3.4 Hazard Summary**

According to the risk estimation analysis, the highest rated hazards for Granby are:

1. Flooding
2. Severe Winter/Ice Storm
3. Extreme Cold
4. High Winds

Flooding is the highest rated hazard for Granby due to previous damage events and subsequent costs to repair. With 3 locations needing repair to the combined cost of just over \$80,000 following DR4001, the town had remained relatively insulated from major damage during disaster declarations. Within each of the highest rated hazards, there exists the potential for the secondary, but no less important, consequence of increased financial demand on residents as a result of an event. While winters in Vermont are characterized by cold weather, recent increases in the duration of extremely cold temperatures increase the costs of heating energy and this is a challenge that the state and local communities are being forced to address.

## **SECTION 4: VULNERABILITY ASSESSMENT**

Vulnerability refers to the potential impact of a specific loss related to an identified risk. Granby is a small town with very few buildings aside from residential. While the loss of any one facility would cause a disruption in town services and operations, the overall vulnerability is low. There are roads, bridges and culverts vulnerable to flooding and those are identified below. Loss of equipment function for the highway department is a vulnerability for the town but the risk is not due or predicted to be a result of a disaster, merely, the required maintenance expected of highway-related machinery.



For this section of the plan, the planning team looked at prior history and worst-case scenarios. Additional considerations include seasonal patterns, areas likely to be most affected, probable duration of the hazard, and speed of onset. A combination of the risk ranking, disaster history expenditures and frequency of the hazard was used to classify the community vulnerability as HIGH (25 years or less-low end), MODERATE (unknown but anticipate occurrence or 25 years or less-high end) or LOW (100 years or less). For example, a flood event is highly likely in many communities, but the degree of impact varies. A highly likely flood with critical or catastrophic impact rates the community vulnerability as HIGH. Another community with a highly likely or likely flood with a limited impact would receive a vulnerability rating of MODERATE. The vulnerability of a community having the occurrence of an event as possible or unlikely with limited or negligible impact would be classified as LOW.

### **Vulnerability Narrative for Profiled Hazards:**

#### **Severe winter storm: 25 Years or Less**

Summary: While all structures are vulnerable to major snow loads, there is little evidence to support concern over structure failure due to snow loads on roofs, ice on gutters, etc. Town snow removal equipment is vulnerable to damage with greater use, especially during emergency situations as well as road damage from plowing. Populations caught outdoors, commuting or working outside during a severe winter storm are more vulnerable to cold-related injury and/or snow related accidents but winter comes every year and residents and the town are accustomed to making intelligent decisions regarding safety and protection of infrastructure. Special populations (e.g. aging, disabled, etc.) are more vulnerable in terms of mitigating structure loads, hazardous travel and relocating to safety.

#### **High Winds: 25 Years or Less**

Summary: Infrastructure and people are vulnerable to power loss during extreme cold due to potential of pipes freezing and maintaining safe body temperatures.

#### **Flooding: 25 Years or Less**

Flooding is the most common recurring hazard event in the state of Vermont. There are three main types of flooding that occur in Vermont: flooding from rain or snow melt, flash flooding and urban flooding. Flooding has also been known to occur as a result of ice jams in rivers adjoining developed towns and cities. These events may result in widespread damage in major river floodplains or localized flash flooding caused by unusually large rainstorms over a small area. The effects of all types of events can be worsened by ice or debris dams and the failure of infrastructure (especially culverts), private and/or beaver dams. Rain storms are the cause of most flooding in Granby. Winter and spring thaws, occasionally exacerbated by ice jams, are another significant source of flooding, especially when coupled with high rain levels. Much of this flooding is flash flooding, occurring within hours of a rainstorm or other event. Flash flooding, as opposed to flooding with a gradual onset, causes the largest amount of damage to property and infrastructure. Floods cause two major types of damage: water damage from inundation and erosion damage to property and infrastructure. The *2013 Vermont State All-Hazards Mitigation Plan* discusses flooding extensively. While that plan is concerned with all of Vermont, the information on flooding is all relevant to Granby in that:

*“Recent studies have shown that most flooding in Vermont occurs in upland streams and road drainage systems that fail to handle the amount of water they receive. Due to steep gradients, flooding may inundate these areas severely, but only briefly. Flooding in these areas generally has enough force to cause erosion capable of destroying roads and collapsing buildings. These areas are often not mapped as being flood prone and property owners in these areas typically do not have flood insurance (DHCA, 1998). Furthermore, precipitation trend analysis suggests that intense local storms are occurring more frequently. Additionally, irresponsible land use and development will exacerbate the preexisting vulnerability. Urban flooding usually occurs when drainage systems are overwhelmed and damages homes and businesses. This flooding happens in all urban areas, but specifically in Burlington where the downtown area is located at the bottom of a gradient, which adds to the intensity of this localized flooding....*

*...Over the past two decades, flood damage costs have risen dramatically in Vermont due to increasing occurrences of flooding and increases in vulnerability associated with unwise land use development in flood plains or within stream corridors. The geography and topography are right for a significant localized storm with extreme damage at almost any location in Vermont. Heavy rains with previous ground saturation, which causes runoff, are a significant part of the flooding formula in Vermont. Steep topography and narrow, inhabited, stream and river valleys further increase the dangerous nature of this hazard. Furthermore, precipitation trend analysis suggests that intense, localized storms that can cause flash flooding are occurring with greater frequency. While flooding will continue, planning and other mitigation measures can help minimize damages.*

*All of Vermont’s major rivers have inhabited flood plains. While residents in mountain valleys are at risk, they may not be aware of the danger or may choose to ignore it. There are many reasons property owners are reluctant to relocate to less flood prone ground, not the least of which is the lack of personal experience of flooding. In addition, many communities originated beside rivers and streams; some of the most attractive property is located in vulnerable areas. Lakeshore property in Vermont is vulnerable to flooding from high water levels, either by surface water erosion or flooding. Occasionally, water-saturated ground and high-water tables cause flooding to basements and other low-lying areas. Lakeshore property is highly desirable and valuable, making the development of lakeshore areas very likely, even with the high potential for flooding. Restrictions on lakeshore property development have significant negative economic and tax revenue impacts that must be carefully weighed against the gains in personal safety and protection of property.”*

Vermont experienced major floods long before Federal disaster assistance became available. The most destructive recorded event was in November of 1927. In the month before the flood, rains in excess of 150% of normal precipitation fell after the ground had frozen. The flood itself was precipitated by 10 inches of rain falling over the course of a few days. The flood inundated parts of many towns and damaged or destroyed numerous bridges in the county. As the history of the flooding cited above bears out, the geography and topography are right for a significant localized storm with extreme damage at almost any location in Vermont. Numerous floods have resulted in Presidentially-declared disasters and an influx of Federal disaster assistance. Of these disasters, 1973 flood inflicted widespread damage across the state and the residual rains of Hurricane Belle in 1976 resulted in substantial federal disaster assistance in Vermont. The following chart provides the history of recent PA funding related to flooding events in Granby.

While this does not reflect the total impact of flooding on the town, PA funding history does provide a reference for vulnerable areas in the town and those areas will be addressed.

Previous experiences have proven to the town that flooding is the greatest risk and another flood event is probable by the time this plan requires an update. With this conviction, the need to complete viable mitigation actions to town infrastructure becomes incredibly important and the town remains aware of this. The estimated Capacity-Disruption Levels Given a Measured Rainfall Event can be interpreted as the conditional probability that a particular roadway capacity disruption occurs, given that a rainfall event occurs. For Essex County, the probability that the intensity of a rain event will result in approximately a 2%, 7.5%, or 13.5% roadway capacity reduction are 28.2%, 69.2%, or 2.6%, respectively (*Source: A Risk-Based Flood-Planning Strategy for Vermont’s Roadway Network, 2015*).

**Extreme Cold: 25 Years or Less**

Summary: Recent evidence shows that greater extremes in temperature and overall weather fluctuation are occurring with increased frequency. A long-duration cold snap can cause significant damage to structures due to bursting pipes and the residential health and safety considerations include factors related to financial resources, fuel supply, sheltering, provisions and employment.

*Table 4-2: Vulnerability Summary Table*

Hazard	Vulnerability	Extent (Storm Data from most severe event)	Impact (economic/health and safety consequence)	Likelihood
Flood	Culverts, bridges, road infrastructure,	The greatest 24-hour rainfall record for the immediate region occurred in late August 2011 at 4.01”. The greatest level of precipitation in any month occurred in August 2011 at 11.12” No detailed data was available for fluvial erosion damage in town in terms of numbers of acres lost during each event.	DR 4011 (7/2011) resulted in greatest financial impact and damage to roads and bridges with about \$80,000 in FEMA funding for 3 projects. With 10% of total housing being mobile homes, there is increased vulnerability to both residents and town tax base. Enhanced logging activity decreases natural protection from flooding.	25 years or less

<p>Extreme Cold/ Snow/Ice Storm</p>	<p>The entire Town is vulnerable, including road infrastructure, town and privately-owned buildings, utility infrastructure</p>	<p>Snowfall has varied, from a few inches to over a foot or more. Heavy snow and wind may down trees and power lines. Snow/ice contributes to hazardous driving conditions. Regionally, the winter of 2010-2011 was the third-snowiest on record with a total of 124.3 inches.</p>	<p>For roof collapse: monetary damages will depend on each structure but, collapse of barn roof is often a total loss. This does not include the loss of livestock. Collapse of a house roof may be at a 50% loss. For car crashes due to poor driving conditions: minimal damage to vehicle to totaled vehicle and operator injury. Health impacts could vary significantly. Loss of energy or communication capabilities may occur and impede recovery. 15% of housing is in mobile, which are impacted more during most, if not all, weather hazards.</p>	<p>25 years or less</p>
<p>High Winds</p>	<p>The entire town is vulnerable to the results of high wind exposure. Significant damage possible to trees, power lines, building roofs</p>	<p>The highest recorded event occurring on April 15<sup>th</sup>, 2007 at 11:55am with 90mph gusts, the town expects high wind events that may reach category 2 speeds but it is unlikely, based on previous events, that a category 3 event will occur in the region.</p>	<p>Falling trees and limbs pose hazard to structures, road and people. Power disruption due to high winds pose secondary health and safety risk especially in colder months</p>	<p>25 years or less</p>

4.1 Critical Facilities

The Center for Disaster Management and Humanitarian Assistance defines critical facilities as: “Those structures critical to the operation of a community and the key installations of the economic sector.” As mentioned in the summaries above, some critical facilities have increased vulnerability during specific hazard events. However, there is no evidence to suggest that any critical facility is even moderately vulnerable during any hazard event. All critical facilities in the town are outside the designated flood hazard areas and have no history of damage due to a

disaster. In this regard, the town is resilient to critical facility damage during a natural disaster most likely to affect the region.

## 4.2 Infrastructure

Flooding is the highest risk profiled hazard and town infrastructure has high vulnerability to damage during major flood events. The Natural Resources Atlas contains a “road erosion risk” layer, which ranks the erosion risk of unpaved Class 2, 3 and 4 Town roads as well as driveways longer than 1,000 feet. Features considered in assessing risk include undersized culverts, elevation and slopes, soil types, and proximity to rivers, lakes, and wetlands. The result is an identification of road segments that have a “low”, “moderate” or “high” erosion risk. This is a useful tool to identify potential road hazards during storm events. It can also be useful to the road commission as a starting point in prioritizing road infrastructure maintenance projects (source: <http://anrmaps.vermont.gov/websites/anra/>). The information presented below summarizes town infrastructure and high vulnerability areas.

### 4.2.1 Town Highways

5.27 miles of class 2

5.19 miles of class 3

6.11 miles of class 4

6.68 miles of legal trails

\*Mileage totals are from the most recently published Town Highway map (published 2/2015), and do not include the 1600’ extension of Porrell Road, which occurred in 2015. All of the roads in Granby are gravel. There are two concrete slab bridges and two pipe arch bridges. The majority of culverts are metal. The system as a whole is in adequate condition. The Town has adopted the 2013 VTrans current Road and Bridge Standards. *Source: data derived from VTrans TransRDS GIS data/Granby Town Plan*

### 4.2.2 Bridges, Culverts, and Dams

#### **Bridges:**

5 bridges (Shores Hill Bridge was replaced in 2016 with State Emergency Fund Grant of \$248,370.

The entire Bridge Inventory with maps for the town can be found on the state site: <https://vtculverts.org/bridges#list>

Table 5.1: Granby Bridges

Bridge #	Highway & Locations	Span
B2	Town Highway 2, Lund Lane, crossing Lund Brook, noted to be in good condition as of 2014.	15
B6	Town Highway 1, Granby Road, crossing Schoolhouse Brook, noted to be in poor condition as of 2014	6
B3	Town Highway 6 crossing Granby Brook, Shores Hill. Condition was poor due to abutment washout in 2014. Replacement of this bridge is	13

	nearly complete.	
B1	Town Highway 1, crossing Granby Brook, inspected 2014, but condition is unknown	8
B5	Town Highway 1, inspected 2014, but condition is unknown	N/A

Source: VTrans Town Highway Maps 2014

### **Culverts:**

There are 122 culverts that are classified in the system, the majority of which are in FAIR condition (13%) Excellent (12%) GOOD. The remainder are FAIR (73%) or POOR (2%). This inventory is being updated by the Town annually. There was a road closer due to a culvert failure during spring runoff in 2011. Critically undersized culverts have been replaced since 2011.

*Source: <https://www.vtculverts.org/structures>*

#### 4.2.3 Water, Wastewater and Solid Waste Removal

There is no municipally-owned community water system in the town of Granby at the present time. The Town belongs to the Northeast Kingdom Waste Management District. Until the summer of 2015, free refuse disposal was provided at no charge to the residents of Granby as long as they recycled. In accordance with Act 148, the Town now charges per bag, utilizing special tags that have to be placed on each bag. Each resident household receives 52 free tags a year, and each non-residential household receives 20 a year

#### 4.2.4 Electric Power Transmission Lines and Telecommunications Land Lines

Power is provided by Green Mountain Power. Telephone service is provided by FairPoint Communications. During a power outage the phone system is only operational for the first two hours. In an emergency this situation has the potential to be disastrous. This service has been identified as a potential area in need of upgrading.

### 4.3 Estimating Potential Losses in Designated Hazard Areas

According to most current American Community Survey 5-Year averages, the median value of an owner-occupied housing unit in Granby is \$162,500. With no repetitive loss properties, the town does not believe that even during a flooding event similar to those of 2011 that there would be substantial damage to buildings or residential housing that exceeded 1%. However, given the magnitude of damage to town roads, the potential for costs exceeding annual budgeting allotments is possible. However, the repairs and upgraded resilience of these locations associated with these prior expenses greatly reduces the potential for a recurrence.

## 4.4 Land Use and Development Trends Related to Mitigation

Traditionally, the town's steep slopes and rolling terrains have limited Granby's residential, commercial, industrial, and agricultural expansion. Granby's landscape is dominated by the Miles Mountain range, which has the town's highest elevations at 2,432 feet. This undeveloped area is composed of steep forested slopes which drain into a significant watershed area that encompasses many tributaries and wetland areas in Granby and in neighboring towns. This area includes Victory Bog. Goudreault Hill at 2,012 feet, has gentler slopes which guide the area's rain and snow runoff into natural watershed collection areas, including Miles Pond and the Moose River. Shadow Lake is a collection area for Shaw Mountain, 1,800 feet, and surrounding hills. East Granby's elevations average between 800 and 1,100 feet. The town's highlands have provided Granby's residents and wildlife with a number of water supplies. At the same time, multiple elevation changes within the town's lowlands tend to restrict the area's development and agricultural potential. The town's development districts, or corridors, should be designed to make the best use of these moderately sloped areas.

The town's bylaws currently include provisions for development within the 100-year floodplain, but there are no local provisions for runoff and erosion control, such as vegetation buffers around surface waters and erosion and sediment control during construction, especially for small scale projects that will not be regulated by the state (e.g. stormwater management, Act 250.). This issue can be best addressed by developing and implementing low-impact development standards for the Town of Granby. In addition, as noted in the Land Use section of this Plan, the State's recently enacted Shoreland Protection Act now establishes a regulated area of 250 feet around lakes greater than 10 acres. Setback requirements, and limitation on impervious coverage and clearing are addressed by these state regulations.

### 4.4.1. Proposed Land Use

Floodway limits are incorporated into the town's zoning bylaws, as is site plan review to ensure a site and its soils can support the proposed development. Under Granby's bylaws no structure or site may be used or occupied until a Certificate of Compliance is issued by the Administrative Officer. These bylaws tend to restrict residential and commercial development to areas within the community which are served by town roads and utilities. The current bylaws do not address or restrict development within wetlands, along stream beds, or in areas where the topography tends to create potential erosion and water pollution conditions. Although these zones have been adequate over the past several years, Granby needs to re-evaluate the current zoning bylaws in light of future development and current land use trends.

The Zoning Bylaws hold to the recommended practices under the NFIP and all continued compliance and participatory requirements are managed by the Zoning Administrator. The Administrative Officer (AO) enforces the flood hazard regulations, which are integrated with the City's zoning regulations. The AO receives, and reviews permit applications and forwards for board review as appropriate. In accordance with FEMA requirements, the AO maintains records of all permits issued for development in areas of special flood hazard; elevations, in relation to mean sea level, of the lowest floor, including basement, of all new or substantially improved buildings; elevations, in relation to mean sea level, to which buildings have been flood proofed;

flood proofing certifications; and all variance actions, including justification for their issuance. There are no repetitive loss properties in the town. There are no policies in town

Source: <http://bsa.nfipstat.fema.gov/reports/reports.html>

(Source: *Repetitive Losses / BCX Claims Federal Emergency Management Agency: VERMONT*).

#### 4.4.2. Land Use Goals

In 2011 the Granby Planning Commission held public work sessions to explore how the Town's zoning could be updated to protect Granby's rural and scenic areas, while encouraging and directing growth to nodes which were historically the centers of development activity in the Town. Several ideas were explored at the work sessions, which were summarized in a report dated July 25, 2011. Recommendations that emerged were:

- the creation of a conservation overlay zone;
- the establishment of shoreland and riparian buffer zones;
- the use of planned unit developments to preserve open space through clustering of lots; □ design standards that would minimize the visual impact of new development;
- downzoning (reducing the permitted density) of land in the Goudreau Hill and Streeter
- Road areas to preserve scenic viewsheds;
- Revising of lot width requirements and setbacks in the Low-Density district so as to
- better achieve the stated land use objectives of this district;
- Village Center Designation as a means to encourage revitalization of business
- properties.

#### 4.4.3. Land Use Strategies

The town believes it is important to concentrate growth in the village areas throughout the town. The villages have a significant amount of development potential, which may ultimately help to lessen the tax burden on residents. Granby's villages should maintain their traditional design through small-lot sizes, mixed uses, pedestrian elements (such as sidewalks and cross walks), and neighborhood green spaces. Adaptive reuse is encouraged in order to revitalize neglected and under-utilized properties before adding on to existing neighborhoods. The villages should also see the commercial sections of their main streets become popular public gathering areas with additional shops, restaurants, and service businesses. As the villages grow, areas for new residential blocks and streets should be designated to attract development that will fit in with design of existing neighborhoods. The town would like the villages of North Granby, East Granby, and Granby Corners to maintain and/or develop its mixture of uses (mostly residential and/or small businesses), encouraging commercial and industrial development in appropriate locations along Route 2, while avoiding "strip" commercial development – that is, linear commercial development along highways with limited pedestrian access and lack of connection to other land uses. The Town would like to accommodate new rural and tourism-oriented businesses throughout, without sacrificing the rural landscape and scenic views that attract both new residents and tourists.

#### 4.4.4 Future Development and Housing

Granby is experiencing increased development around the Miles Pond and Shadow Lake areas with increased upgrades to existing properties and conversion of single owner seasonal properties to year-round residential and rental properties. Because of this forecasted increase in development pressure, the Town of Granby should look to guide the development to appropriate



areas that will maintain the character of Granby, foster economic development, maintain a mixture of uses in the village areas, and protect local natural resources. The Town of Granby welcomes an increase in development. The Town has experienced an increase in small business growth but attracting larger commercial or industrial development has been difficult. The Town recognizes there is significant potential to build upon the local tourism industry as Burke Mountain expands and other recreational activities such as camping, swimming, boating, hunting, fishing, ATV riding, and snowmobiling increase within our borders.

## SECTION 5: MITIGATION STRATEGIES

### 5.1 Town Goals and Policies that support Hazard Mitigation

The Town Zoning Regulations are designed to implement the goals and objectives of the Town Plan. Furthermore, they are meant to promote the health, safety, and general welfare of the inhabitants of the Town of Granby through two main goals:

- a. Manage all flood hazard areas designated pursuant to 10 V.S.A. Chapter 32 § 753, the municipal hazard mitigation plan and make the Town of Granby, its citizens, and businesses eligible for enrollment in the National Flood Insurance Program (NFIP) and federal flood insurance, federal disaster recovery funds, and hazard mitigation funds as may be available; and
- b. Implement the goals, policies, and recommendations of the current Town Plan.

#### 5.1.1. Community Goals

- a. Continue supporting state standards with local, POS water/sewer sources.
- b. Take advantage of the UVM/ACCD mobile home park preparedness programs to support resiliency of this disproportionately impacted population during disasters if applicable.
- c. Consider implementation of special population tracking within the community where-by residents unable to drive or that have no one to depend on can self-identify for inclusion in a maintained data-base so that rescue personal and emergency managers can account for this demographic.
- d. Work with residents, NVDA, rescue services, Vermont EMS and the LEPC to accomplish community outreach to develop understanding of the scope of practice of EMS in rural Vermont.
- e. The Selectboard and Planning Commission shall pursue grant funding for shelter emergency generators.
- f. Selectboard and Planning Commission shall continue to study the availability of firefighting water supplies, recommend locations and install dry hydrants where needed.

h. The Selectboard and Planning Commission shall pursue grants and program participation for the provision of wireless and broadband communications.

*5.1.2. Capital Improvement Goals*

- a. Provide services and facilities deemed necessary for the orderly and rational development of the Town.
- b. Selectboard shall investigate options for the construction of public building or buildings to house Road Department equipment and operations and possibly an animal holding facility for dogs impounded by the Town and propose such facility to the voters.

*5.1.3. Public Participation Goals*

- a. Continue to solicit input regarding planning issues from town residents and from other entities which can help to offer solutions and insight into the problems the Town faces both now and in the future via formal meetings and advertised opportunities for input.
- b. Utilize the LEPC and NVDA to increase awareness, enhance planning and engage in exercises that address needs in the community.

*5.1.4. Regulatory Devices Goals*

- a. Continue to use the Zoning Bylaws. The bylaws have been established to conform to, and be in harmony with, the Vermont Municipal and Regional Planning and Development Act. Any conflicts that are identified between the two documents will defer to Title 24 VSA, Chapter 117 as the prevailing authority.
- b. Maintain and continue a Capital Expense Budget and Program for the purpose of ensuring that the rate of growth does not outstrip the town's ability to pay for the associated necessary services such as roads, schools, police and fire protection, solid waste, etc.
- c. Develop and maintain a "No Adverse Impact" (NAI) approach to flood hazard management by institutionalizing the best practices set forth by the ASFPM.
- d. Utilize best practices in flood-plain management for farm-related development in town.

*5.1.5. Land Use*

- a. Work to develop a Flood Hazard Area Overlay District to include all designated flood hazard areas. The purpose of the Flood Hazard Area Overlay District is to (1) protect public health, safety, and welfare by preventing or minimizing hazards to life and property due to flooding, and (2) to ensure that private property owners within designated flood hazard areas are eligible for flood insurance under the National Flood Insurance Program (NFIP).

*5.1.6 Natural Resources*

- a. Ensure that the existing health ordinance is enforced to maintain protection of both surface and groundwater supplies.

b. Ensure that permits issued for development near sensitive areas, such as steep slopes, high elevations, wetlands, scenic vistas and wildlife habitats, contain conditions assuring conformance to the goals set forth by the state of Vermont and when applicable and feasible, those defined as best practices by floodplain management organizations such as the ASFPM as well as those set forth in this plan and the most recent town plan.

c. The town should work with the NVDA and ACCD to continue the process of identifying the Town's land conservation priorities, and to the degree possible, link them to broader regional conservation work.

d. In line with the VTTrans mission statement regarding climate change, the town remains committed to:

- Ensure that there are viable alternative routes around vulnerable infrastructure such as bridges and roadways
- Make safety a critical component in the development, implementation, operation and maintenance of the transportation system
- Develop contingency plans for a wide-variety of climate impacts to be implemented as data/information becomes available
- Utilize information technology to inform stakeholders during times of emergency
- Educate of the public and other stakeholders on the threats posed by climate change and fluvial erosion hazards
- Increase inspection of infrastructure if warranted by climate change indicators
- Apply a decision-making framework to incorporate cost-benefit analyses into adaptive plans and policy
- Work to protect essential ecosystem functions that mitigate the risks associated with climate change
- Educate individuals within the agency to use best-practices during recovery periods to avoid ecological damage that may further exacerbate risk
- Recognize the interconnected nature of our built environment with ecological processes
- Protect the state's investment in its transportation system and adapting transportation infrastructure to the future impacts of climate change

e. In line with DEC's best practices regarding fluvial erosion, the town will work to:

- Slowing, Spreading, and Infiltrating Runoff (The State Surface Water Management Strategy is found at <http://www.watershedmanagement.vt.gov/swms.html> and <http://www.watershedmanagement.vt.gov/stormwater.htm>)
- Avoiding and Removing Encroachments. [http://www.watershedmanagement.vt.gov/rivers/htm/rv\\_floodhazard.htm](http://www.watershedmanagement.vt.gov/rivers/htm/rv_floodhazard.htm) [http://www.watershedmanagement.vt.gov/rivers/docs/rv\\_RiverCorridorEasementGuide.pdf](http://www.watershedmanagement.vt.gov/rivers/docs/rv_RiverCorridorEasementGuide.pdf)
- River and Riparian Management: DEC has prepared a compendium of *Standard River Management Principles and Practices* to support more effective flood recovery implementation; improve the practice of river management; and codify

best river management practices in Vermont. The document compiles the most current river management practices based on the best available science and engineering methods to create consistent practice and language for risk reduction while maintaining river and floodplain function. Best practices are established to address common flood damages, including:

- Erosion of banks adjacent to houses and infrastructure
- Erosion of road embankments
- Channel movement across the river corridor
- River bed down-cutting that destabilizes banks, undermines structure foundations, exposes utility crossings, and vertically disconnects rivers from adjacent floodplains
- Bridge and culvert failure

Source: [http://www.watershedmanagement.vt.gov/permits/htm/pm\\_streamcrossing.htm](http://www.watershedmanagement.vt.gov/permits/htm/pm_streamcrossing.htm)

#### 5.1.7. Policies

a. Through both town and state-level management, the town will work to:

- Encourage and maintain naturally vegetated shorelines, buffers and setbacks for all rivers, ponds and streams
- Allow higher density or cluster development in existing and designated settlement areas and low-density development in the remaining areas
- Reduce flood hazard and repetitive road and driveway washout through continued updates and adherence to priorities in road, bridge and culvert improvement projects
- Identify and manage pollution, flooding and fluvial erosion hazards along rivers and streams as they arise

#### 5.1.8. Transportation Plan

In adjunct to town-specific planning, the town is committed to continually subscribing to all current state standards related to:

- a. Maintaining safe operating conditions on the present system of town roads through design and modification to keep traffic at appropriate speeds and to assure the safest possible driving conditions, including consideration of additional paving (though only on portions of roads prone to damage) should state funding become available.
- b. Protection of existing town roads from flood damage and uncontrolled storm water runoff.
- c. Preserving the capacity of town roads and maintain adequate traffic flows and safety.
- d. Support the road maintenance crew through Town-provided training sessions. This includes ICS training along with the Road Commission (Selectboard).
- e. Support policies and procedures that ensure longevity of essential town-equipment and develop and maintain MOU's with neighboring towns related to equipment use during emergencies.
- f. Continue long term access opportunities to gravel and sand deposits for future road maintenance use.

g. Consider developing a standard operating procedure (SOP) based on ICS principles for highway department response events where coordination, communication and support are at a heightened level.

#### *5.1.9. Utilities and Facilities Goals*

a. Maintain current relationships with the Vermont State Police and Rescue for police and emergency medical services, respectively.

b. Develop policies and procedure that ensures equipment longevity to the greatest extent possible.

c. Ensure adequate provision of water sources for fire suppression by requiring dry hydrants, fire ponds, water storage, or other measures where appropriate.

#### *5.1.9.1. Educational Goals*

a. The School Board should work with the Selectboard, the American Red Cross and Fire Department to ensure that the necessary equipment exists at the school for its use as an emergency shelter.

b. Increase emergency planning cohesion between school and town EOPs through mutual participation and presentation at scheduled LEPC meetings and town and/or school meetings.

c. Continue collaboration with the Vermont Chapter of the American Red Cross on their sheltering initiative program to further readiness with training and supplies related to sheltering operations.

## 5.2 Existing Town of Granby Actions that Support Hazard Mitigation

The town has done an excellent job at monitoring and addressing transportation issues, engaging in a documented and systematic approach to mitigation actions. The Selectboard has successfully pursued funding to address needs. Additional funding relationships are established and ongoing with Better Back Roads, Structures Grants and FEMA. The town has been able to enhance its resilience and overall preparedness. The town has addressed its current and future needs and by and large, road improvement projects remain the primary focus for the town and the areas identified were selected based on the condition of culverts and ditches and primarily focused on runoff issues particularly as the incidence of heavy storms has increased. In many cases, culverts properly sized for normal rain events are overwhelmed by the severe ones. The town will seek local, state and federal funds to address the sites identified as priorities. Granby will earmark the funds necessary to complete a major project each year for the next 5 years and will keep its culvert inventory current to improve its institutional memory. The town has also adopted municipal road and bridge standards that meet or exceed the 2013 standards and has an approved and annually adopted Local Emergency Operations Plan and Town Plan.

<b>Type of Existing Protection</b>	<b>Description /Details/Comments</b>	<b>Issues or Concerns</b>
<b>Emergency Response</b>		
Police Services	Residents are to contact the Vermont State Police or the Essex County Sheriff (from Guildhall) for police service	None at this time
Fire Services	East Burke Volunteer Fire Department. In 2007, a dry hydrant was installed just over the town line, in Victory	Response time
Fire Department Mutual Aid Agreements	Northeast International Mutual Aid (19 participants)	None at this time
EMS Services	Burke Rescue	None at this time
<b>Other Municipal Services</b>		
Highway Services	Contracted out	None at this time
Highway personnel	1 FTE	Has completed scoping of priority mitigation projects and budgets work each fiscal year.
Water Department		Remediation of Arsenic levels due for completion. All Village drains updated.
Planning and Zoning personnel	Town positions filled	None at this time
Residential Building Code / Inspection	No	None at this time
<b>Emergency Plans</b>		
Local Emergency Operations Plan (LEOP)	2018	Assure sheltering plans and contact information is up to date and vulnerable populations are addressed.
School Emergency/Evacuation Plan(s)	none	Increased collaboration (with town staff, school, LEPC, NVDA), knowledge of roles and drills
Municipal HAZMAT Plan	None	Continue working/planning relationships with Waste USA/Airport
Shelter, Primary	Granby Town Office	Working with ARC's Shelter Initiative and have obtained certification, training and supplies. Include volunteer staff in planning communication and schedule drills to test efficacy.

Replacement Power, backup generator	Acquired	Stay proactive with state and FEMA regarding town interests.
<b>Municipal Plans</b>		
Town / Municipal Comprehensive Plan	2018	Update done
Town of Granby Road Erosion Site Inventory	2017-2018	Created with assistance from ANR
Hazard Specific Zoning (slope, wetland, conservation, industrial, etc.)	Town zoning (NFIP)/Utilize most current state regulations.	Consider using current best practices to guide actions for achieving a “No Adverse Impact” policy as well as assuring future farm development occurs with defined best practices
Participation in National Flood Insurance Program (NFIP) and Floodplain/Flood Hazard Area Ordinance	Active Participation and in good standing with NFIP. Managed by David Barlow, Zoning Admin.	9/27/85 current eff. map date
Certificate of Compliance with Road and Bridge Standards	3/19/2018	<a href="https://vtculverts.org/map">https://vtculverts.org/map</a> <a href="https://vtculverts.org/bridges#list">https://vtculverts.org/bridges#list</a> Strive to coordinate lists and keep up to date

5.2.1. *Flood Resilience Goals:*

- Mitigate Granby’s flood hazards in the most cost-effective manner possible
- Minimize the risk exposure and associated expense to Granby tax payers
- Ensure the Town and its facilities are prepared to meet the demands of the next flood
- Ensure the Town can receive the maximum outside assistance in the event of the next Federally declared disaster

5.2.2. *Flood Resilience Strategies:*

- Identify and protect Granby’s natural flood protection assets, including floodplains, river corridors, other lands adjacent to streams, wetlands, and upland forested cover
- Adopt flood hazard regulations that at a minimum, protect property from known risks
- Review and evaluate statewide river corridor information, when it becomes available
- Consider adopting regulations that will protect erosion prone areas for additional Development and encroachment
- Maintain and regularly update the Local Emergency Operations Plan.
- Continue to meet the VTrans Road and Bridge standards. Participate in regional Road Foreman trainings and Transportation Advisory Committee meetings to stay abreast of flood resilience measures for the Town’s roads and bridges
- Continue to update the Town’s transportation infrastructure information in the Vermont Online Bridge and Culvert Inventory Tool
- Upgrade undersized and failing culverts
- Develop and maintain a Local All-Hazard Mitigation Plan

- Equip the town’s emergency shelter (the school) with a generator and/or solar panel

### **5.3 Town of Granby All-Hazards Mitigation Goals**

The following goals were developed by the planning team, vetted during a warned community meeting and approved by the Town of Granby during the development of this plan:

1. Reduce at a minimum, and prevent to the maximum extent possible, the loss of life and injury resulting from all hazards.
2. Mitigate financial losses and environmental degradation incurred by municipal, educational, residential, commercial, industrial and agricultural establishments due to various hazards.
3. Maintain and increase awareness amongst the town’s residents and businesses of the damages caused by previous and potential future hazard events as identified specifically in this Local All-Hazards Mitigation Plan.
4. Recognize the linkages between the relative frequency and severity of disaster events and the design, development, use and maintenance of infrastructure such as roads, utilities and storm water management and the planning and development of various land uses.
5. Maintain existing municipal plans, programs and ordinances that directly or indirectly support hazard mitigation.
6. Develop a mechanism for formal incorporation of this Local All-Hazards Mitigation Plan into the municipal comprehensive plan as described in 24 VSA, Section 4403(5). This mechanism will be developed by the Planning Commission, Selectboard and NVDA and integrate the strategies into the existing town plan as annexes until the next formal update occurs, where a section devoted to mitigation planning will be integrated into the plan.
7. Develop a mechanism for formal incorporation of this Local All-Hazards Mitigation Plan particularly the recommended mitigation actions, into the municipal/town operating and capital plans & programs as they relate to public facilities and infrastructure. With the development of the road erosion site inventory, the town will begin a process that incorporates the budgetary requirements of the defined mitigation strategies into its formal budgeting paradigm. The Planning Commission will review the LHMP and use language/actions from it to inform the integration and update process. Town Meeting Day will serve as the formal time that mitigation strategy budgetary considerations will be approved and incorporated into the town budget.

### **5.4 Mitigation Actions**

In following FEMA guidance, the following mitigation action categories form the basis of the town’s future mitigation actions. The planning team decided to adopt this approach for all future mitigation work. For each mitigation action to follow, an indication of group will be given with the abbreviations below:

#### **Mitigation Action Groups:**



(P) Prevention: Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.

(PP) Property Protection: Actions that involve the modification of existing buildings or infrastructure to protect them from a hazard, or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, flood proofing, storm shutters, and shatter-resistant glass.

(PEA) Public Education & Awareness: Actions to inform and educate citizens, elected officials, and property owners about potential risks from hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.

(NRP) Natural Resource Protection: Actions that, in addition to minimizing hazard losses also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.

(SP) Structural Projects: Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include storm water controls (e.g., culverts), floodwalls, seawalls, retaining walls, and safe rooms

#### *5.4.1. Current Capabilities and Need for Mitigation Actions*

The Town Plan's goals and policies that support hazard mitigation and the existing mitigation actions demonstrate the variety of policies and actions forming the foundation of this All Hazards Mitigation Plan. Within the boundaries of both financial and political capabilities, the town will work on the following actions in the next five-year planning cycle

#### *5.4.2. Specific Mitigation Actions*

The following seven actions define the mitigation measures to be taken by the town in the next five years:

Action #1: Reduce flood-related impacts through infrastructure upgrades, improvement projects and floodplain management activities.

Action #2: Improve resilience to severe winter storms

Action #3: Reduce impact of extreme cold durations

Action #4: Raise public awareness of hazards and hazard mitigation actions

Action #5: Reduce impact of high wind events

Action #6: Continue fluvial geomorphology assessments in collaboration with DEC and develop strategies and regulatory actions in response to identified risk

Each of the seven actions listed above are explained below in regard to progress, project leads and partner agencies and specific action steps:

Action #1: Reduce flood-related impacts through infrastructure upgrades, improvement projects and floodplain management activities.

Group: SP, NRP, PP

Risk or Hazard Addressed: Risk to property, residents

Lead Responsible Entity: Town of Granby Road Foreman and Selectboard

Potential Partner Entities: Vermont Agency of Natural Resources; Vermont Agency of Transportation; NVDA, VEM, FEMA and the Agency of Commerce and Community Development

Timeframe: 2019 – 2024

Funding Requirements and Sources: FEMA or other hazard mitigation grants; FHWA grants; VAOT grants; Municipal Operating and Capital budgets.

Progress: The Road Foreman continually monitors road and storm water management capabilities. All bridges and culverts have been electronically accounted for and the town is diligent in maintaining a comprehensive and newly-formed, Road Erosion Site Inventory Plan that serves to guide action by identifying areas of road erosion, estimated costs of repair and future needs. In 2015, the University of Vermont released Scour research and opportunities for scour sensors.

Specific Identified Tasks:

- 1) Infrastructure Assessment for Storm Water Vulnerability – Funding and staff resources permitting, assess the vulnerability and operational capability of municipal-owned roads, culverts and other storm water management infrastructure to predicted storm water and snowmelt in areas with a documented history of recurring problems. The infrastructure will be evaluated regularly prior to replacement or upsizing of the existing infrastructure.
- 2) Continued Monitoring of Vulnerable Infrastructure - Monitor bridges and culvert locations that have erosion and scouring concerns and track via the Road Erosion Site Inventory.
- 3) Road Improvements - Within political and financial restraints, re-engineer certain sections of roads to lower overall maintenance costs, improving snow plowing speeds and improve overall capability of roads to handle current and projected traffic volumes. The following mitigation projects have been derived from the Town of Granby Road Erosion Inventory and Capitol Budget Plan (2018). While the project costs are listed here, each project has been thoroughly spec'd for problem, solution, material, labor and itemized cost. Specific projects include:

Identified Priority Road Projects:

1. Buzzell Gap and Porrell Road: \$30,053
2. Porrel Road: \$22,698
3. Lund Ln: \$10,597
4. Matthews Knoll: \$23,375
5. Shores Hill Road: \$36, 877
6. Felker Road: \$31,252

7. Granby Road-Granby Brook: \$27,306
8. Granby Road-Cutler Mill Brook \$28,186

Identified Priority Culverts:

1. Granby Road: \$65,000

- 4) Documenting – Develop a methodology that serves to efficiently capture work and expenditures on sites and keep this information at the town office
- 5) Increase Awareness of Funding Opportunities - Increase understanding of FEMA’s HMGP program so that this potential funding source can be utilized through trainings and communication with the State Mitigation Office.
- 6) ICS Training and Emergency Operations (SOP) Plan Development – Enhance knowledge of the principles of ICS and develop a Standard Operating Procedures that details the relationship, roles and responsibilities of the Highway Department and Road Commission during major events.

Rationale / Cost-Benefit Review: Conducting vulnerability assessments facilitates a targeted and effective approach to road and storm water management infrastructure. This will prove useful in the development and implementation of municipal capital and operating plans as well as the development and implementation of grant-funded mitigation projects. Some areas suffer low-level but consistent damage during heavy rains and snowmelt. Mitigating against these problems would reduce short and long-term maintenance costs and improve the flow of traffic for personal and commercial purposes during flooding events. Tracking road work and understanding the HMGP program can open funding streams into the town and can make the application process much easier when required information is already available. A basic understanding of ICS will serve the town and at little or no cost. As a requirement for an approved LEOP, municipal ICS-awareness is seen as necessary state-wide. During an emergency event when the Highway Department personnel are required to work beyond normal capacity, increased communication and collaboration between the Highway Department and local entities can be enhanced with a basic SOP. An SOP can also serve to increase institutional memory when there are staff changes at every level as well as provide a template from which tabletops and drills can be based off of.

Action #2: Maintain and improve resilience to severe winter storms

Group: SP, PP, PEA

Risk or Hazard Addressed: Risk to property, infrastructure and residents

Primary Responsible Entities: Town of Granby Selectboard, Planning Commission and Emergency Management director;

Potential Partner Entities: LEPC, Granby Fire Chief, ARC’s Sheltering Initiative Program

Timeframe: 2019 – 2024

Funding Requirements and Sources: VEM or FEMA hazard mitigation funding; existing programs, contingent on available resources and funding.

Progress: Roads are monitored and altered, when necessary so that plowing can occur without damage to trucks and/or road. The Granby School has been identified as the primary emergency

shelter. The school does not have an emergency generator. The fire department building is the secondary shelter and it does have a generator in place. Snow clearing equipment is regularly serviced, and the town maintains an adequate supply of salt.

Specific Identified Tasks:

- 1) Maintain Existing Shelter Capability: Maintain and improve capabilities of existing shelters. Notification procedures and shelter staffing is a priority for the town and intends to move forward on planning and public involvement. More formalized training is required and the ARC's "Shelter Initiative Program" can be used at no cost to the town to enhance both shelter management knowledge and sheltering supply cache.
- 2) Reduce risk of power failure due to ice storms: Enhance collaboration between town road foreman and electric company related to down-limbed induced power failure. Maintain function of generators.
- 3) Notification: Develop a notification/communication plan that conveys essential sheltering information using school phone system and back-up methodology (email, text, etc.)
- 4) Residential Programs: Provide guidance and communication to residents on the structural and mechanical actions that can occur to reduce risk to severe winter storms (e.g. weather-proofing, anchoring, alternative heating sources, tree trimming, financial programs, etc.)
- 5) Continue to monitor roads for safe and effective plowing: Efficient snow removal is the foundation to winter storm (snow) events, assuring roads are plowable before winter remains an important facet of highway department functions
- 6) Increase awareness of ICS structure and recommended practices: The town can mitigate the effects of a severe winter by understanding how a large-scale storm is managed when the State EOC is operational. Additional awareness of local-level roles and responsibilities during statewide event is a mitigation action.

Rationale / Cost-Benefit Review:

This mitigation action serves to reduce the economic impact and risk to both human and animal (livestock and pet) health and safety during severe winter storm events by reducing risk and enhancing the mechanisms of winter storm mitigation in the long term. More formalized policy formation in both staffing and notification procedures, especially pertaining to vulnerable populations where transportation and special needs are a concern could potentially significantly reduce the physical, psychological and social impacts of a disaster.

Action #3: Reduce impact of extreme cold durations

**Group: PEA, PP, SP**

Risk or Hazard Addressed: Risk to infrastructure, livestock and residents

Primary Responsible Entities: Town of Granby Selectboard and planning commission, NVDA, Granby School, local/regional assistance organizations.

Potential Partner Entities: VEM, LEPC

Timeframe: 2019-2024

Funding Requirements and Sources: Financial factors may produce barriers to change. Strategic planning and understanding of the total scope of needs and potential for change is logical first-step.

Specific Identified Tasks:

- 1) Economic Resilience: Establish program for assistance in paying heating bills during crisis situations, if not already required by state law. Develop and sustain a program that serves to connect resource organizations with residents in need of support services.
- 2) Maintain Existing Shelter Capability: Maintain and improve capabilities of existing shelters. Notification procedures and shelter staffing is a priority for the city and intends to move forward on planning and public involvement. More formalized training is required and the ARC's "Shelter Initiative Program" can be used at no cost to the town to enhance both shelter management knowledge and sheltering supply cache.
- 3) Assess Vulnerable Population— Develop an awareness of the most at-risk community members during an evacuation and/or sheltering event. Focusing on those that lack resources or capability to reach facilities when in need and create plans, including outreach protocol on how to address this potential hurdle.
- 4) Notification and Education – Investigate and develop a notification/communication plan that conveys essential sheltering information. Educating citizens regarding the dangers of extreme cold and the steps they can take to protect themselves when extreme temperatures occur by sustaining a process that serves to disseminate educational resources for homeowners and builders on how to protect pipes, including locating water pipes on the inside of building insulation or keeping them out of attics, crawl spaces, and vulnerable outside walls. Inform homeowners that letting a faucet drip during extreme cold weather can prevent the buildup of excessive pressure in the pipeline and avoid bursting through a yearly public service campaign.

Rationale / Cost-Benefit Review:

With an increase in extreme weather, including cold, there is a need to protect property and the population. Given the magnitude of population dependence on social services, indicating economic and other social vulnerabilities, effective outreach, education and collaboration with resources supports this mitigation action category.

Action #4: Raise public awareness of hazards and hazard mitigation actions

**Group: PEA**

Risk or Hazard Addressed: Risk to property, residents

Lead Responsible Entities: Town of Granby, Fire Chief, LEPC, NVDA

Potential Partner Entities: Vermont state agencies and regional organizations

Timeframe: 2019-2024

Funding Requirements and Sources: Majority of information is available and both state agencies and organizations can provide materials for outreach

Progress: As mitigation planning continues to integrate into normal, day-to-day operations, the town has an opportunity to engage its residents with information that will serve to mitigate several risks. The LEPC meets regularly and covers a host of topics related to emergency preparedness and raises awareness in the community about what organizations are doing around emergency response planning and chemical safety. Town meeting day can serve as an annual update and outreach opportunity as well.

Specific Identified Tasks:

- 1) Hazard Resilience for Property Owners- Develop and maintain education materials to inform property owners on how to protect their homes and businesses through accepted

hazard resilience actions (e.g. securing their structures from high winds, elevating their electrical equipment/furnaces in basements, protecting from lightning strikes by grounding electrical outlets, etc.).

- 2) HMGP Awareness: Attend informational sessions on the HMGP funding opportunities for acquisition, elevation and flood-proofing projects. Work with NVDA to develop an information brochure for residents.
- 3) School Programs – Assure the school is structurally ready to handle natural hazard risks to the greatest extent possible. Continue school programs to raise student awareness of hazards, safety, preparedness and prevention. Explore establishing the school emergency notification system as the primary methodology for all emergency notification procedures and build in the contact information accordingly.
- 4) Family Programs – Continue family programs, such as car safety seat and bike safety programs, to raise family awareness of hazards, safety, preparedness and prevention.
- 5) Fire Prevention Programs – Continue National Fire Prevention Week and other programs to raise public awareness of fire hazards, safety, preparedness and prevention.
- 6) Other hazard awareness programs – Develop public awareness programs, based on all-hazards needs. Programs to address pandemic hazards, preparedness and mitigation may be appropriate as directed by the state department of health and its jurisdictional offices of local health

Rationale / Cost-Benefit Review: Improved public awareness could potentially significantly reduce the loss of life and property damage through ongoing, formal, ongoing, public information campaigns that address property protection actions (flood proofing, elevation, anchoring mobile homes/propane tanks, electric and water system elevation, electric grounding, etc.) Improved awareness would also build understanding and public support for municipal mitigation actions to reduce potential infrastructure and liability costs.

Action #5: Continue fluvial geomorphology assessments in collaboration with DEC and develop strategies and regulatory actions in response to identified risks

Group: P, NRP, PEA, PP

Risk or Hazard Addressed: Risk to property, residents

Status: Ongoing

Primary Responsible Entities: Department of Environmental Conservation District Representative, NVDA Planners, Agency of Natural Resources (VT ANR) District Representative, Town of Granby Planning Commission.

Potential Partner Entities: Nonprofits, other Town of Granby officials, and other appropriate entities.

Timeframe: 2019–2024

Progress: DEC has completed assessments for Basin ID 15 (Passumpsic). NVDA can assist in enhanced mapping of the floodplain within the town and has provided the town with updated River Corridor Maps. The town has adopted flood hazard area zoning regulations and is considering a “no development” policy in the SFHA for the future.

Specific Identified Tasks

- 1) Fluvial Geomorphic Assessments – The town will work with DEC through coordinated meetings, workshops and communication to increase understanding of current findings and develop an applicable framework to help guide decisions related to priority infrastructure work and vulnerability.
- 2) Fluvial Erosion Hazard Mapping – Develop a fluvial erosion hazard map for the waterways, using the GIS extension known as SGAT (or Stream Geomorphic Assessment Tool) for assessed stream reaches. As assessments are completed, a map of all assessed waterways in the town will be created.
- 3) River Corridor Management Plans – Using the River Corridor Maps, the town will develop an outreach strategy to residents/structures in or near the defined corridor. This communication should focus on flood resilience measures and opportunities. With the lack of repetitive loss properties in the town, the likelihood of viable HMGP acquisition projects is low but increasing awareness of this program can serve the town well.
- 4) Fluvial Erosion Hazard Mitigation Implementation - The town will draft strategies to avoid or mitigate losses from the identified fluvial erosion hazards. These strategies may include the adoption and implementation of programs, mechanisms or regulations to prevent endangerment of persons and property in riparian corridor areas from fluvial adjustment processes. Efforts could range from a relatively simple, public information campaign about the map to the adoption of a municipal ordinance or by-law that restricts development in such hazard areas.
- 5) Administrative and Zoning Regulations: Zoning administrator will work with town officials and residents to determine if a “Zero Development” policy in high flood/erosion risk areas is required in the town and progress accordingly.

#### Rationale / Cost-Benefit Review:

Continuing this project will require a sustained succession of grants, state appropriations and other funding to complete assessments in Granby. Successful completion will provide municipal and regional benefits. The municipality’s fluvial erosion areas would be adequately and electronically mapped. This will enable the municipality to make residents and businesses aware of fluvial erosion hazards and potentially lead to municipally-directed programs, mechanisms and regulations that further mitigate against this hazard, protecting existing structures and infrastructure. Identifying fluvial erosion hazard areas could also help the municipality restrict future development in hazardous areas, if that should be an advantage to the town in the future. More accurate knowledge of fluvial geomorphology will enable the community to have a better understanding of hazard areas and what mitigation measures might most effectively address those concerns. Flooding is the most common and most significant hazard that can trigger a Federal disaster declaration in Granby. Along with an update to the flood hazard area maps, identifying the fluvial erosion hazard areas provides improved opportunities for the community to mitigate potential losses and gauge future development initiatives. With the upcoming advent of an advanced software system (CAI), the town can begin to develop enhanced mapping in-house using currently available data and use this resource as a guide for communication, planning and policy formation.

Action #6: Reduce vulnerability to high wind events with accepted best practices

Group: P, PP

Risk or Hazard Addressed: Risk to property, residents

Lead Responsible Entities: Granby Planning Commission, HED, NVDA.

Timeframe: 2019 –2024

Funding Requirements and Sources: Considering Granby Electric is a municipal service, funding provisions for this mitigation action can be assessed after additional planning actions occur to understand the scope of need. Included below are the tasks that will be assessed on a benefit-cost ratio level in this planning cycle.

Specific Identified Tasks:

1. Establish standards for all utilities regarding tree pruning around line: Incorporate inspection and management of hazardous trees into the drainage system maintenance process. Support and suggest the testing of power line holes to determine if they are rotting. Support the inspection of utility poles to ensure they meet specifications and are wind resistant. When feasible, support burying power lines to provide uninterrupted power after severe winds. Avoid use of aerial extensions to water, sewer, and gas lines when possible. Support use of designed-failure mode for power line design to allow lines to fall or fail in small sections rather than as a complete system to enable faster restoration.
2. Public Outreach: Ensure that school and hospital officials are aware of the best area of refuge in buildings and that their plans are viable in high wind mitigation events. Instruct property owners on how to properly install temporary window coverings before a storm. Support education to design professionals to include wind mitigation during building design/modification to an extent deemed necessary.

Rationale / Cost-Benefit Review:

High winds have impacted the town and do pose a risk for infrastructure, transportation and public safety. Many mitigation actions associated with high wind risk also address and reduce risk associated with other hazards affecting the city and maintaining the functionality of the city is not only important for the city and its residents but for the region as well.

*5.4.3. Prioritization of Mitigation Strategies*

Because of the difficulties in quantifying benefits and costs, it was necessary to utilize a simple “*Action Evaluation and Prioritization Matrix*” in order to affect a simple prioritization of the mitigation actions identified by the town. This method is in line with FEMA’s STAPLEE method. The following list identifies the questions (criteria) considered in the matrix so as to establish an order of priority. Each of the following criteria was rated according to a numeric score of “1” (indicating poor), “2” (indicating below average or unknown), “3” (indicating good), “4” (indicating above average), or “5” (excellent).

- Does the action respond to a significant (i.e. likely or high risk) hazard?
- What is the likelihood of securing funding for the action?
- Does the action protect threatened infrastructure?
- Can the action be implemented quickly?
- Is the action socially and politically acceptable?
- Is the action technically feasible?



- Is the action administratively realistic given capabilities of responsible parties?
- Does the action offer reasonable benefit compared to its cost of implementation?
- Is the action environmentally sound and/or improve ecological functions?

The ranking of these criteria is largely based on best available information and best judgment of project leads. For example, all road improvement projects were initially identified by Road Foreman and approved for inclusion in this plan by the road commission. It is anticipated that, as the town begins to implement the goals and actions of their Mitigation Strategies, they will undertake their own analysis in order to determine whether or not the benefits justify the cost of the project. Also, most proposed FEMA HMGP mitigation projects will undergo a benefit-cost analysis using a FEMA BCA template and approved methodology.

Table 5.1: *Granby Mitigation Action Prioritization Matrix*

Rank	Mitigation Action	Responds to high hazard	Funding potential	Protection value	Time to implement	Social and Political acceptance	Technical feasibility	Admin feasibility	Benefit to Cost	Environmental advantage	TOTAL
2	Reduce flood-related impacts through infrastructure upgrades, improvement projects and floodplain management activities	5	4	5	2	5	4	4	5	4	38
3	Improve resilience to severe winter storms	2	5	5	4	5	5	4	5	2	37
5	Reduce impact of extreme cold durations	3	2	4	2	3	2	2	3	3	24
4	Reduce impact of high wind events	3	4	5	2	5	3	3	5	1	27
1	Raise public awareness of hazards, hazard mitigation and disaster preparedness	4	5	5	5	5	5	5	5	3	43
6	Continue fluvial geomorphology (in coordination with state recommendations and protocol) assessments and develop strategies in response to any identified risk	3	2	4	2	2	2	2	3	3	23

## 5.5 Implementation and Monitoring of Mitigation Strategies

### 5.5.1. Public Involvement Following Plan Approval

After adoption, the town will continue to maintain web-presence of the mitigation plan with an opportunity for community input available on its website. Additionally, the selectboard will hold an annual public meeting after performing the annual progress report for the mitigation plan to discuss achievements and the following year's implementation plan. At town meeting, the town will present mitigation information and provide the public an opportunity to increase understanding and involvement with planning efforts. The LEPC will also host an annual mitigation plan presentation where response/state agencies, neighboring communities and other stakeholders can provide input. The town will also notify its neighboring municipalities of the availability of information for review and any significant risks and/or mitigation actions that have an impact on surrounding towns.

### *5.5.2. Project Lead and Monitoring Process*

The town's Selectboard chair is the project lead and will work in conjunction with the Selectboard, town clerk and NVDA to complete the yearly progress report included in the plan. The town will create a mitigation action collection system that will be used as the source of future updates following the annual evaluation that will occur in conjunction with the progress report using the Plan Implementation Matrix provided below. While mitigation actions are, by default, often addressed at monthly Selectboard meetings, the town will schedule one meeting annually to formally assess the plan and adopt updates following the annual progress report and community meeting regarding the LHMP. Once the plan is approved by FEMA, the calendar will begin for annual review. The town will take the following implementation matrix and add actions to it each year, modifying tasks and/or needs as required so that the next LHMP update will be populated with the specific actions related to each mitigation strategy by year.

### *5.5.3 Plan Evaluation and Update Process*

The town's Selectboard chair will lead the plan evaluation process as part of the annual progress report. Prior to town meeting and in preparation for the annual town report, a mitigation section will be included that provides an executive summary for the public that addresses the following topics:

- Status of recommended mitigation actions for the five-year planning period
- Identification of barriers or obstacles to successful implementation or completion of mitigation actions, along with possible solutions for overcoming risk
- Identification of a lead person to take ownership of, and champion the Plan if different from Selectboard Chair
- An approach to evaluating future conditions (i.e. socio-economic, environmental, demographic, change in built environment etc.)
- Discussion of how changing conditions and opportunities could impact community resilience in the long term
- Discussion of how the mitigation goals and actions support the long-term community vision for increased resilience

By engaging in the annual evaluation, the town will have a viable method for capturing the facets of efficacy and areas needing revision and improvement in its mitigation plan. The town is committed to “institutionalizing” mitigation into its normal operating procedures and with approval of this plan, embarks on the formal incorporation of mitigation actions and discussion, maintaining an awareness that involves not only the Selectboard, Town Clerk and Road Foreman but also the community at large, including the organizations represented by the current planning team. Along these lines, the town will maintain a contact list of the current planning team and make revisions as required, including the team on the evaluation process each year. Through this consistent attention resulting from the evaluation process, progress reports and communication in the annual town report, the town will achieve the consistency required to enhance resilience through planning, assessment and actions devoted to mitigation.

### *5.5.4. Plan Update Process*

The Plan update will be led by the Selectboard Chair and Town Clerk. Depending on funding availability, the town may elect to acquire the assistance of NVDA and/or a consultant to update

the plan following a declared disaster and/or the next five-year planning cycle. To assure that the Plan does not expire, the town will begin the update process within no less than six months of the current Plan's expiration date. Following a disaster and during the recovery phase, the town will use the experience to assess the current Plan's ability to address the impact of the most recent disaster and edit the plan accordingly. Using the annual progress reports and evaluation narratives as a guide, along with perceived changes in risk or vulnerabilities supported by data and/or observation, strategies will be captured in accordance with FEMA guidelines, which includes reconvening the planning team during the update process. The town will establish a "Mitigation File" that documents all evaluations and progress reports, along with actions, especially related to infrastructure improvement projects. While the progress reports are designed to capture the specific actions the town has accomplished related to implementation, keeping a narrative list with dates on all actions relatable to mitigation (e.g. school drills, LEOP updates, Fire Safety Awareness, meetings, etc.), will provide the town the bulk of information required in the update process.

#### *5.5.5. Implementation Matrix for Annual Review of Progress*

The following table is intended to aid municipal officials in implementing the mitigation actions for Granby and to facilitate the annual monitoring and progress reporting. Progress has been included as a guide to future updates. Each year, the town will reserve a Selectboard meeting to review and update the Implementation Matrix as means to establishing an accurate evaluation of the plan's efficacy and the information required for the succeeding update to the plan.

*Table 5.2: Local All-Hazards Mitigation Plan Implementation Matrix (following pages)*

<b>Action</b>	<b>Primary Responsible Entity</b>	<b>Timeline</b>	<b>Task</b>	<b>Brief Description</b>	<b>Progress</b>
Continue fluvial geomorphology assessments and develop strategies in response to identified risk.	VT DEC, NVDA, VT ANR	Spring 2019- Spring 2023	Fluvial Geomorphic Assessments and assessment-based mapping/action	Continue Phase I and Phase II fluvial geomorphic assessments on streams and waterways in Granby.	DEC has a comprehensive and interactive database for Basin 15 and hat the town can build from.
	NVDA, VT ANR	Fall 2019- Fall 2021	Fluvial Erosion Hazard Mapping	Rate the fluvial erosion hazard for each assessed reach and develop a fluvial erosion hazard map for the waterway using SGAT. Create map of all assessed reaches. Submit to VT ANR for QA/QC.	River Corridor maps have been completed by NVDA
	Planning Commission and Selectboard	Spring 2019- Spring 2021	River Corridor Management Plans	Where Phase I and II assessments are complete, develop a River Corridor Management Plan.	River Corridor maps are first step in planning process. Town reviews current zoning regulations for necessary changes annually
	Granby Planning Commission	Spring 2019- Spring 2021	Fluvial Erosion Hazard Mitigation Implementation	Develop strategies to mitigate losses from identified fluvial erosion hazards.	Problems areas have been identified
	Granby Planning Commission	Summer 2020	Flood Insurance Rating Map Updates	Review draft FIRM data. Update floodplain regulations/zoning.	See above
<b>Action</b>	<b>Primary Responsible Entity</b>	<b>Timeline</b>	<b>Task</b>	<b>Brief Description</b>	<b>Progress</b>

Reduce flood-related impacts through infrastructure upgrades, improvement projects and floodplain management activities.	Road Foreman, Commission	Spring 2022-Winter 2023	Infrastructure Assessment for Storm water Vulnerability	Funding and staff resources permitting, assess the vulnerability and operational capability of municipal-owned roads, culverts and other storm water management infrastructure to predicted storm water and snowmelt in areas with a documented history of recurring problems. The infrastructure will be evaluated regularly prior to replacement or upsizing of the existing infrastructure.	Town has developed a Road Erosion Site Inventory with problem, priority and estimated budget. With great institutional memory of town infrastructure, the highway department is well-equipped to assess, monitor and prioritize needs.
	Road Foreman, Commission	Spring 2020-Winter 2023	Continued Monitoring of Vulnerable Infrastructure	Monitor bridges and culvert locations that have erosion and scouring concerns and track via the Road Erosion Site Inventory.	Road and Bridge Standards adopted and meet or exceed 2013 standards.

Road Foreman	Spring 2019- Winter 2024	Road Impr

<b>Action</b>	<b>Primary Responsible Entity</b>	<b>Timeline</b>	<b>Task</b>	<b>Brief Description</b>	<b>Progress</b>
continued	Selectboard, Road Foreman	Fall 2019- Winter 2024	Documenting	Develop a methodology that serves to efficiently capture work and expenditures on sites and keep this information at the town office and/or current “Grater Log” used by Road Foreman	Communication between Highway Department and Road Commission is ongoing.
	Road Foreman	Fall 2019- Winter 2023	Increase Awareness of Funding Opportunities	Increase understanding of FEMA’s HMGP program so that this potential funding source can be utilized through trainings and communication with the State Mitigation Office.	ongoing
	Road Foreman	Fall 2019- Winter 2023	ICS Training and Emergency Operations (SOP) Plan Development	Enhance knowledge of the principles of ICS and develop a Standard Operating Procedures that details the relationship, roles and responsibilities of the Highway Department and Road Commission during major events.	ongoing
<b>Action</b>	<b>Primary Responsible Entity</b>	<b>Timeline</b>	<b>Task</b>	<b>Brief Description</b>	<b>Progress</b>
Maintain and improve resilience to severe winter storms	Emergency Management Director	Spring 2020- Winter 2023	Improve Existing Shelter Capability	Maintain and improve on capabilities of existing emergency shelter capability, including emergency generator functionality	The School has a generator. Explore other sheltering options and secure funding for emergency power/solar panels as required
	Emergency Management Director	Winter 2019- Winter 2023	Reduce risk of power failure due to ice storms	Enhance collaboration between town road foreman and electric company related to down-limbed induced power failure. Maintain function of generators	new



	Emergency Management Director	Fall 2020	Notification	Develop a notification/communication plan that conveys essential sheltering information using school phone system and back-up methodology (email, text, etc.)	new
	Emergency Management Director	Fall 2019	Residential Programs:	Provide guidance and communication to residents on the structural and mechanical actions that can occur to reduce risk to severe winter storms (e.g. weather-proofing, anchoring, alternative heating sources, tree trimming, financial programs, etc.)	new
	Road Commission	Fall 2019-2024	Continue to monitor roads for safe and effective plowing	Efficient snow removal is the foundation to winter storm (snow) events, assuring roads are plowable before winter remains an important facet of highway department functions	Needs assessment required
	Road Commission, Selectboard, EMD	State training calendar dependent	increase awareness of ICS structure and recommended practices:	The town can mitigate the effects of a severe winter by understanding how a large-scale storm is managed when the State EOC is operational. Additional awareness of local-level roles and responsibilities during statewide event is a mitigation action.	new
<b>Action</b>	<b>Primary Responsible Entity</b>	<b>Timeline</b>	<b>Task</b>	<b>Brief Description</b>	<b>Progress</b>
Reduce impact of extreme cold durations	Selectboard, EMD	Fall of each planning cycle year	Economic Resilience	Establish program for assistance in paying heating bills during crisis situations, if not already required by state law. Develop and sustain a program that serves to connect resource organizations with residents in need of support services.	new

	Selectboard, EMD	Fall of each planning cycle year	Maintain Existing Shelter Capability	Maintain and improve capabilities of existing shelters. Notification procedures and shelter staffing is a priority for the city and intends to move forward on planning and public involvement. More formalized training is required and the ARC's "Shelter Initiative Program" can be used at no cost to the town to enhance both shelter management knowledge and sheltering supply cache.	<b>new</b>
	EMD	Fall 2020-Fall 2021	Assess Vulnerable Population	Develop an awareness of the most at-risk community members during an evacuation and/or sheltering event. Focusing on those that lack resources or capability to reach facilities when in need and create plans, including outreach protocol on how to address this potential hurdle.	<b>new</b>

	Selectboard, EMD	Fall 2019-Fall 2020	Notification and Education	Investigate and develop a notification/communication plan that conveys essential sheltering information. Educating citizens regarding the dangers of extreme cold and the steps they can take to protect themselves when extreme temperatures occur by sustaining a process that serves to disseminate educational resources for homeowners and builders on how to protect pipes, including locating water pipes on the inside of building insulation or keeping them out of attics, crawl spaces, and vulnerable outside walls. Inform homeowners that letting a faucet drip during extreme cold weather can prevent the buildup of excessive pressure in the pipeline and avoid bursting through a yearly public service campaign.	<b>new</b>
<b>Action</b>	<b>Primary Responsible Entity</b>	<b>Timeline</b>	<b>Task</b>	<b>Brief Description</b>	<b>Progress</b>

Reduce vulnerability to high wind events with accepted best practices	Selectboard, Fire/EMD	Fall 2019-Fall 2024	Establish standards for all utilities regarding tree pruning around lines	Incorporate inspection and management of hazardous trees into the drainage system maintenance process. Support and suggest the testing of power line holes to determine if they are rotting. Support the inspection of utility poles to ensure they meet specifications and are wind resistant. When feasible, support burying power lines to provide uninterrupted power after severe winds. Avoid use of aerial extensions to water, sewer, and gas lines when possible. Support use of designed-failure mode for power line design to allow lines to fall or fail in small sections rather than as a complete system to enable faster restoration	<b>new</b>
	Fire, EMD	Fall 2019	Public Outreach	Ensure that school and hospital officials are aware of the best area of refuge in buildings and that their plans are viable in high wind mitigation events. Instruct property owners on how to properly install temporary window coverings before a storm. Support education to design professionals to include wind mitigation during building design/modification to an extent deemed necessary	<b>new</b>

<b>Action</b>	<b>Primary Responsible Entity</b>	<b>Timeline</b>	<b>Task</b>	<b>Brief Description</b>	<b>Progress</b>
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Raise public awareness of hazards, hazard mitigation and disaster preparedness.	Emergency Management Director; Granby Fire Chief	Fall 2019-2024	Residential Programs	Develop and maintain education materials to inform property owners on how to protect their homes and businesses through accepted hazard resilience actions (e.g. securing their structures from high winds, elevating their electrical equipment/furnaces in basements, protecting from lightning strikes by grounding electrical outlets, etc.).	New
	Emergency Management Director; Granby Fire Chief	Fall 2019-2024	Family Programs	Continue family programs, such as car safety seat and bike safety programs, to raise family awareness of hazards, safety, preparedness and prevention.	Ongoing
	Emergency Management Director; Granby Fire Chief	Fall 2019-2024	Fire Prevention Programs	Continue National Fire Prevention Week and other programs to raise public awareness of fire hazards, safety, preparedness and prevention.	Ongoing
	Emergency Management Director; Granby Fire Chief	Fall 2019-2024	Other hazard awareness programs	Develop public awareness programs, based on all-hazards needs.	Ongoing





