Adopted by the Town of Groton Select Board on July 13th, 2023

Town of Groton, Vermont
All-Hazards Mitigation Plan Update

LAST APPROVED PLAN: 2005

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Prepared by:

The Town of Groton, Vermont

CERTIFICATE OF LOCAL ADOPTION

Town of Groton, Vermont

A Resolution Adopting the Town of Groton, Vermont All-Hazards Mitigation Plan Update

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

WHEREAS, the Town of Groton 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 Groton to formally approve and adopt the Town of Groton, Vermont All Hazards Mitigation Plan Update.

NOW, THEREFORE BE IT RESOLVED that the Town of Groton adopts this All-Hazards Mitigation Plan Update.

7/12/23
Date

Selectboard Chair

Selectboard Member

Selectboard Member

Attested to by Town Clerk

Executive Summary

In September of 2022, the Town of Groton contracted with NVDA to update the 2005 Local All-Hazard Mitigation Plan (LHMP). This update reflects recent changes in the Vermont State Hazard Mitigation Plan and identifies the updated profiled hazards and associated mitigation actions for the next planning cycle. The results of this work represent the collaborative efforts of the 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 reimbursement 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. The pandemic-related events of 2020 have resulted in new considerations in the financial, health and safety arenas and the town feels it must formally engage in pandemic planning to mitigate risk. As the town moves towards formally adopting this All-Hazards Mitigation Plan update, the purpose of this plan is to:

- Identify specific hazards that impact the town
- 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 Groton and describes the planning process used to develop this plan.

Section 2: Hazard Identification expands on the hazards identified by the Town of Groton and from a historical perspective 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 as a means 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.

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 Groton Town Plan that support hazard mitigation and utilizes the town's 2015 Road Erosion Site Inventory and 2013 Zoning Bylaws to formulate and support actions that address the identified hazards. An analysis of existing municipal actions that support hazard mitigation, such as planning, and emergency services is also included. The town's all-hazards mitigation goals are summarized below:

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 within political and budgetary feasibility. The Planning Commission will review the updated LHMP and use language/actions from it to inform the integration and future update processes. 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 identifies and provides a detailed discussion of the following Mitigation Actions:

Action #1: Reduce vulnerability to flooding by evaluating capabilities of existing road and storm water management infrastructure, public education and through municipal services and regulations

Action #2: Improve resilience to severe winter storms

Action #3: Reduce impact of extreme hot and cold temperature durations

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

Action #5: Reduce risk and impact of pandemic

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 Groton Planning Commission and Selectboard

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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 update is to assist the municipality in continuing to identify all hazards facing their community and in identifying strategies to continue to reduce the impacts of those hazards. The plan also serves to better integrate and consolidate efforts of this municipality with those outlined in the most recent and future town plans as well as those of NVDA, relevant state agencies, including the Vermont 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 Groton with a goal to provide hazard mitigation strategies to aid in increasing the overall resilience of the Town, Caledonia County and the state as a whole.

1.2 Hazard Mitigation

The 2018 Vermont State All-Hazards Mitigation Plan (SHMP) states:

> *"The impact of anticipated yet unpredictable natural events can be reduced through community planning and implementation of cost effective, preventive mitigation efforts.*
>
> *The State of Vermont understands that it is not only less costly to reduce vulnerability to disasters than to repeatedly repair damage, but that we can also take proactive steps to protect our economy, environment and most vulnerable citizens from inevitable natural hazard events. This Plan recognizes that communities have the opportunity to identify mitigation strategies during all phases of emergency management (preparedness, mitigation, response, and recovery) to more comprehensively address their vulnerability. Though hazards themselves cannot be eliminated, Vermonters can reduce our vulnerability to hazards by improving our understanding of both the natural hazards we face and their potential impacts.*
>
> *The 2018 Vermont State Hazard Mitigation Plan (SHMP) presents the hazard impacts most likely to affect Vermont and a mitigation strategy to reduce or eliminate our most significant vulnerabilities."*

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 State's 2018 Hazard Mitigation Plan and as part of the 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. According to 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 in order for Pre-Disaster Mitigation funds (BRIC) 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 LHMP
- 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 BRIC program, a community may apply for BRIC funding through VEM but must have an approved plan in order to receive such funding
- For disasters declared after October 14th, 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 LHMP 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
- Ease the receipt of post-disaster state and federal funding because the list of mitigation initiatives is already identified and action can be taken prior to the next event
- 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 as a whole and its residents:

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- Reduce at a minimum, and prevent to the maximum extent possible, the loss of life and injury resulting from all hazards.
- Mitigate financial losses and environmental degradation incurred by municipal, educational, residential, commercial, industrial and agricultural establishments due to various hazards.

- 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.
- 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.
- Maintain existing municipal plans, programs and ordinances that directly or indirectly support hazard mitigation.
- 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 and NVDA and will integrate the strategies into the existing Town Plan as annexes until the next formal update occurs, when a section devoted to mitigation planning will be integrated into the plan.
- Maintain mechanism for formal incorporation of this Local All-Hazards Mitigation Plan, particularly the recommended mitigation actions, into the town operating and capital plans & programs as they relate to public facilities and infrastructure within political and budgetary feasibility. The Planning Commission will review the plan 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 budgets.
- Flood-related data and information originating in the Hazard Mitigation Plan will continue to be reviewed and assessed for relevant inclusion in the City Plan Updates specific to flood resilience.

1.6 Town of Groton: Population and Housing Characteristics

Chartered: October 20, 1789 (Vermont Charter)
Area: 35,221 Acres / 55.03 Square Miles
Coordinates (Geographic Center): 72°12'W 44°12'N
Altitude ASL: 773 feet
Population Density (persons per square mile): 15.9

1.6.1. Population

Groton is a rural town located in the southwestern corner of Caledonia County. The town is probably best known for the large number of public lands in Groton State Forest and for the large amount of undeveloped forestland and lakeshore throughout town. The State of Vermont's Agency of Natural Resources manages over 13,125 acres within the Town of Groton, 37.3% of the town. The unique character of a community comes from both is natural and built environments. Groton is blessed with rolling topography and fertile soils that provide for a variety of land uses. The community is also fortunate to have many historic and interesting buildings.

Five ponds lay completely within the Town of Groton and are part of one other. These ponds have 79,557 feet of shoreline of which 49.5% (39,359 feet) is undeveloped. Groton ranks second in Caledonia County (after Peacham), and fourth in the Northeast Kingdom, for having the most

undeveloped lake shoreline. Undeveloped shoreline contains many valuable attributes including critical wildlife habitat, it helps maintain high water quality and enhances recreation opportunities.

Protecting water quality is a high priority in the Town of Groton. Activities such as logging on steep slopes or down to the water's edge, building houses close to the water, and cutting all the vegetation along the shore, all affect the quality of water.

Traditionally, camps were built close to the water's edge to afford the best view from the living room and front porch. The camps were used only two or three weeks a year and the number of people staying at a camp were usually few. Life around some of Groton's lakes is different today. People use their camps for much longer periods and some have even been converted to year-round homes.

Groton has many areas with steep slopes in upper watershed areas where minimal alteration of vegetative cover through logging or changing drainage patterns through building roads may significantly increase the likelihood of flash floods. Although flash floods may not seem like a large problem, their potential should be recognized and monitored.

Roads are vital to the character, economy and lifestyles of the residents in Groton. They allow the movements of goods and people as well as direct where future land use development will occur. The maintenance of town roads is the second largest expenditure in the town budget (after schools).

Groton has a variety of public buildings including:

Emergency Services Building	*Salt shed*
Community building	*Cemetery building*
Town garage	*Pump house*
Gazebo	*Warming hut, skating rink*
Boy Scout Camp	*Old Groton Landfill*
Gravel pit	

Numerous free flowing springs, ground water from wells, and reasonably pure lakes, ponds and streams make it possible for residents to depend exclusively upon private sources of water. The State Forest campgrounds and day-use facilities have public drinking water. State and federal regulations of community water systems discouraged the creation and expansion of water systems. The recharge areas which restore the water may be a long way from where people pump the water from the ground into a house or barn. Protecting these recharge areas from inappropriate development and pollution is vital to those people who drink the water.

Table 1-1: Town of Groton, selected population characteristics, 2020 Census

Category	**Number**

Total Population	984
Total Housing Units	642
Total Households	423
Median age	42.4
Median Household Income	59,583

1.6.2. Zoning

Since the last approved plan, there has been no new development in the SFHA according to town records and the Zoning Administrator. The town continues to have one repetitive loss property (residential) that has two losses. The town's Flood Hazard Area Zoning Regulations provide clear rules on development in the designated hazard areas.

Flood Hazard Area Requirements

1. Lands to which these regulations apply. These regulations shall apply in all areas in the Town of Groton identified as areas of special flood hazard on the National Flood Insurance Program maps which are hereby adopted by reference and declared to be part of these regulations.

2. Development permit required. A permit issued by the administrative officer is required for development in areas of special flood hazard. Conditional use approval by the DRB is required for the construction of new buildings, the substantial improvement of existing buildings or floodway development prior to the issuance of a zoning permit by the administrative officer.

1.6.3. Hospitals and medical centers near Groton

- Northeastern Vermont Regional Hospital: Critical Access Hospital
- St. Johnsbury, VT Health and Rehab
- FMC OF ST. Johnsbury Dialysis
- Caledonia Home Health Care
- Pines Rehab and Health Center
- North Country Home Health and Hospice Agency
- Lafayette Center, Genesis Healthcare

1.7 Summary of Planning Process

In October of 2022, the town contracted with NVDA who then hired OPH Consulting Services to facilitate the update of the plan. The last approved plan for the town was in 2005. In October of 2021, the planning team was developed, representing the community as best as possible. The kick-off meeting was convened on October 25th, 2022. The work to update this 2005 single-jurisdictional plan was led by the planning team made up of municipal officials, school officials,

local businesses, service agencies, and the regional planning organization (NVDA). The planning team was introduced to the proposed work plan and prior update efforts were discussed and documentation shared. Additionally, the community survey was re-launched, asking for community input and made available through the town's standard public notification process with online access. The survey introduced the importance and informational needs of a LHMP and asked for specific concerns the resident and/or business owner had. On November 15th, a second meeting was held to introduce a comprehensive disaster summary with FEMA funded projects as well as the qualitative tool to determine the updated profiled hazards. All towns bordering Groton were sent notification of the plan's development, subsequent draft sections and were given an opportunity to provide input. Progress since 2005 was assessed to the greatest extent possible and addressed in all relevant sections of this update. Monthly communication on plan development were included in each Planning Commission meeting and an overview of hazards and disaster history was given at December Planning Commission meeting, where a discussion to incorporate facets of the updated LHMP into the next town plan and subsequent zoning regulations was had. Following FEMA guidance in Local Mitigation Plan Review Tool Regulation Checklist, the plan was written using data sources that included:

- 2005 Groton Town Hazard Area Zoning Regulations
- 2005 Groton Hazard Mitigation Plan
- Surveys collecting public comment (issues raised were addressed in the plan and the public meeting)
- 2016 Groton Zoning Bylaws (provided basis of current development protocol supporting hazard mitigation)
- 2018 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 P-956: Living with Dams (provides clear guidance on planning and considerations for municipalities with dams).
- FEMA NFIP "Bureau.Net" database (provided detailed information on repetitive loss properties and associated flood insurance claims).

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. Based on information obtained and input from town officials, the planning team, state plans, federal data bases, local associations and NVDA, the updated plan was drafted. As Groton is small, rural community, representatives of businesses, academic, and non-profit organizations, including community based organizations, that work directly with and/or provide support to underserved communities and socially vulnerable populations are extremely limited if not non-existent with services being located outside of the town. As a small, rural community, information from the town itself is considered an important hub for outreach and input from the community at-large. To address the needs and concerns of underserved communities and socially vulnerable populations in town, it is generally accepted that there is institutional awareness across the spectrum of town-level services that serve to maintain an awareness of those who may require specific assistance, outreach, and support within the limits that a small municipality can feasibly achieve. The Citizen Assistance Registration for Emergencies (CARE) is the preeminent tool for vulnerable populations to formally register for special service inclusion at the state level. As the older adult population is a significant population of concern, assuring information dissemination is timely and accessible is important. As a geographic cluster, Rural Edge Properties is a nine unit facility and a SASH (Support and Services at Home) provider to meet the care coordination and nursing needs of residents. During the planning process, the Rural Edge Executive Director was engaged with specific needs during a disaster event in addition to having the town Emergency Management Director on the planning team. By design, the EMD is the entity responsible for addressing underserved and vulnerable populations and has the most awareness in the town . While planning team participation requirements are out of scope for this community, the service providers have historically responded with a need for timely information and instruction during a disaster which remains an action item for this update. The 2022 Hazard Mitigation Planning Team includes:

Name	Title and Organization
Alison Low	Senior Planner, NVDA
Mike Welch	Secretary, Planning Commission (PC)
Mike Nahmias	Chair, PC
Dawn Evans	Vice Chair, PC
Brent Smith	Emergency Planning Coordinator
Steve Hart	PC Member
Jen Jodoin	PC Member
Emily Pratt	PC Member
Carrie Peters	Town Clerk
Dan Webster	Zoning Administrator
Lisa Hart	Town Treasurer

Name	Title and Organization
Harold Hatch	Road Foreman
Wade Johnson	Fire Chief

The following summary represents the timeline for the planning process:

- 10/25/22: Planning Team named and introduced to update process. "Kick-off" meeting at warned community meeting. Community survey logistics decided upon. The public was notified; however, no comments were received.
- 11/15/22: Planning Team meeting to review disaster history, 2018 State HMP hazard ranking and methodology for updating profiled hazards
- 11/21/22: Informational correspondence with Town Clerk, Road Foreman, Fire Chief, and Zoning Administrator to obtain key information related to 2005 mitigation action item status, repetitive loss properties and new development.
- 12/21/22: Selectboard planning update: Qualitative risk assessment was modified to include pandemic and extreme cold.
- 12/6/22: Planning team sent draft sections 1 and 2 for review and comment. Comments related to minor typos only.
- 12/7/22: Met with Road Foreman to discuss infrastructure scoping projects for the next planning cycle.
- 1/17/23: Planning team meeting to review status of mitigation action items from last approved plan, current actions supporting hazard mitigation, and vetting of infrastructure projects with one additional area of concern.
- 1/18/23: Planning team sent draft sections of sections 3 and 4.
- 1/31/23: Planning team meeting to review 2005 plan action item status and review current capabilities supporting hazard mitigation.
- 2/3/23: Planning team sent draft section 5 for review.
- 2/28/23: Proposed mitigation goals and actions were discussed at warned community meeting. The public was notified and in attendance at this meeting.
- 2/29/23: All neighboring towns received notice of availability of draft plan for review and comment via the town clerk. No comments were received.
- 3/23/23: Draft plan was returned following initial review by VEM and FEMA.
- 3/29/23: Revised draft was resubmitted to VEM.
- 4/24/23: Second request for revision received from VEM.
- 4/25/23: Planning Team meeting to discuss revision requests.
- 4/26/23: Plan resubmitted to VEM.
- 6/1/23: Plan edits received, made, and sent back to VEM.

SECTION 2: HAZARD IDENTIFICATION

For this update, new FEMA guidelines require that all hazards be profiled unless there is virtually no risk to the town (e.g., earthquake). The 2005 hazards profiled have hence, been modified to meet the new guidelines. The narrative methodology for the natural hazards profile combines the natural hazard categories outlined in the state mitigation plan and for each, considered prior history, current trends and available data to estimate risk. A profiled hazard can have high, moderate, or low risk. Those hazards omitted from full profiling do not pose enough risk to substantiate mitigation efforts at this time due to lack of occurrence frequency and/or vulnerability.

While there are commonalties of natural hazard risk across most of the state and county, awareness of historic events, financial burden, state, and city level assessments can support trajectory for the future mitigation actions. As indicated in the 2018 SHMP, the hazards of most concern across the state are in-line with the town of Groton. Given that the most recent SHMP was before the COVID-19 pandemic, the town has included pandemic (infectious disease) as a hazard due to the magnitude of impact the pandemic had. The hazards not profiled do not pose enough risk to the Town. As it pertains to town-level assessments, the planning team reviewed the Natural Hazard and Risk Analysis Tool for changes and additions and feel that while the assessment methodology is distinct from the SHMP Hazard Assessment, there are comparative similarities in scoring relationships. The definitions of each hazard, along with historical occurrence and impact, are described below.

Types of 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.

2005 Hazards: floods, flash floods, hazardous material, structure fire, power failures, winter storm/ice, high winds, dam failure, wildfire/forest fires and terrorism.

2022 Updated Profiled Natural Hazards: Severe Winter Storm/Ice, Flooding/fluvial erosion, Extreme Temperatures, Drought, Infectious Disease, and Wildfire.

2.1 Profiled Hazards:

There have been 32 major disasters declared since 1998 and 5 Emergencies declared since 1977. Groton was impacted by a fraction of these declarations. The following discussion on natural hazards is based upon information from several sources. General descriptions are based upon the *2018 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.

Table 2-1: Summary of Vermont Emergency Declarations

Number	Year	Type
3567	2021	Tropical Storm Henri
3437	2020	Pandemic (COVID-19) national 3/13/20
3338	2011	Hurricane Irene
3167	2001	Snowstorm
3053	1977	Drought

Source: FEMA

Table 2-2: Summary of Vermont Major Disaster Declarations since 1998 (Caledonia County in Bold with events that resulted in PA funding for the town with an "(*)—Groton")

Number	Year	Type
4621	2021	Severe Storm and Flooding
***4532**	**2020**	**COVID-19**
4474	2020	Severe Storm and Flooding
4356	2018	Severe Storm and Flooding
***4380**	**2018**	**Severe Storm and Flooding**
4330	**2017**	**Severe Storms and Flooding**
4207	2015	Severe Winter Storm
4232	2015	Severe Storms and Flooding
***4178**	**2014**	**Severe Storms and Flooding**
4163	**2014**	**Severe Winter Storm**
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**
***4001**	**2011**	**Severe Storms and Flooding**
1995	2011	Severe Storms and Flooding
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
***1715**	**2007**	**Severe Storm, Tornado and Flooding**
1698	**2007**	**Severe Storms and Flooding**
***1559**	**2004**	**Severe Storms and Flooding**
1488	2003	Severe Storms and Flooding
1428	**2002**	**Severe Storms and Flooding**
1358	2001	Severe Winter Storm
1336	2000	Severe Storms and Flooding
1307	**1999**	**Tropical Storm Floyd**
1228	**1999**	**Severe Storms and Flooding**

1201	1998	Ice Storm

Source: FEMA

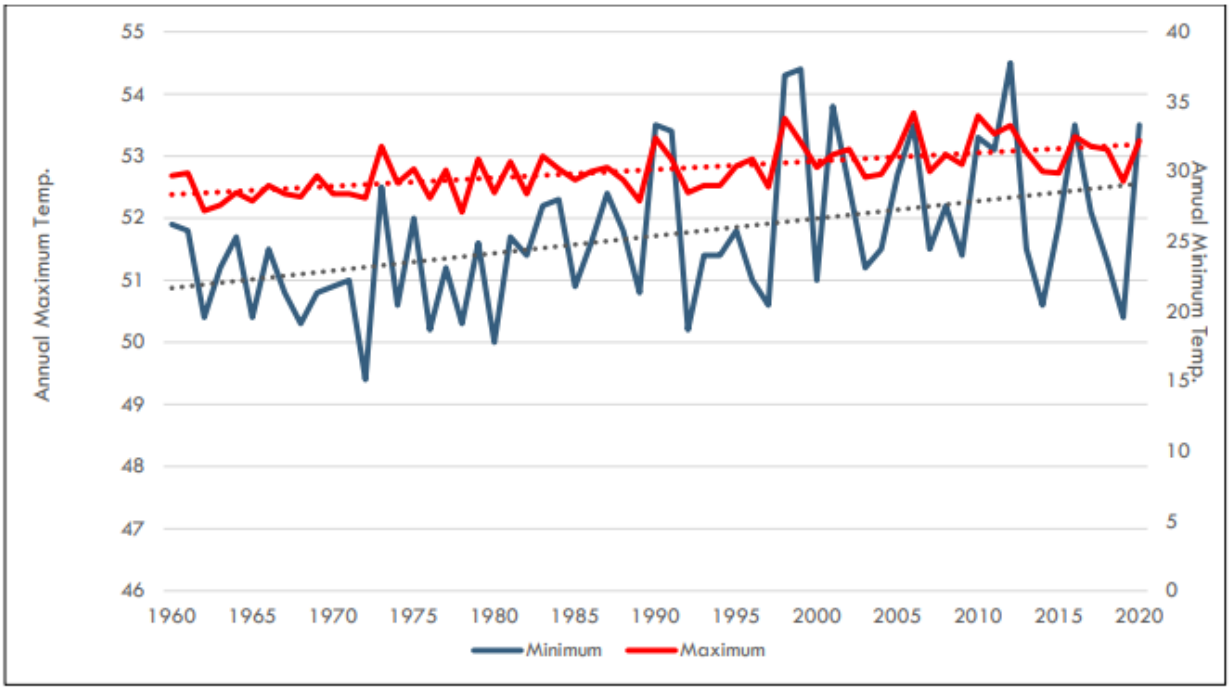
2.1.1. *An Introduction to Climate Change:*

"Over the past several decades, there has been a marked increase in the frequency and severity of weather-related disasters, both globally and nationally. Most notably, the Earth has experienced a 1°F rise in temperature, which has far-reaching impacts on weather patterns and ecosystems. This statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer), is known as climate change. The Intergovernmental Panel on Climate Change (IPCC) forecasts a temperature rise of 2.5°F to 10°F over the next century, which will affect different regions in various ways over time. Impacts will also directly relate to the ability of different societal and environmental systems to mitigate or adapt to change6. Increasing temperatures are forecasted to have significant impacts on weather-related disasters, which will also increase risk to life, economy and quality of life, critical infrastructure and natural ecosystems. The IPCC notes that the range of published evidence indicates that the costs associated with net damages of climate change are likely to be significant and will increase over time. It is therefore imperative that recognition of a changing climate be incorporated into all planning processes when preparing for and responding to weather-related emergencies and disasters. Most of the natural hazards identified in this plan are likely to be exacerbated by changes in climate, either directly or indirectly. The National Aeronautics & Space Administration (NASA) reports that global climate change has already had observable effects on the environment: glaciers are shrinking, sea ice is disappearing, sea level rise is accelerating, heat waves are occurring more frequently and intensely, river and lake ice is breaking up earlier, plant and animal ranges have shifted, and trees are flowering sooner. Though climate change is expected to have global reach, the impacts differ by region. While the southwestern United States is expected to experience increased heat, wildfire, drought and insect outbreaks, the northeastern region is predicted to experience increases in heat waves, downpours and flooding. Accordingly, consideration of climate change was identified as a key guiding principle of the 2018 SHMP, addressed in each of the pertinent hazard profiles and incorporated into all relevant mitigation actions." 2018 SHMP

From 1962 to 2006, each five-year period resulted in 0-6 Major Disaster Declarations in Vermont. From 2007-2022, there were 24. 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 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.

Table 2-3: Caledonia County Temperature Ranges from 1960-2020



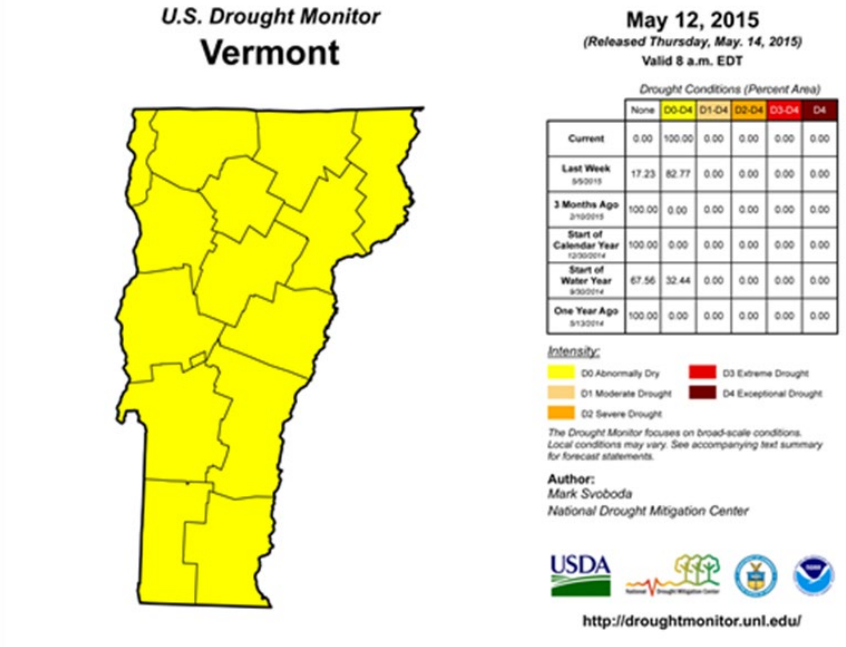
2.1.2 Profiled Hazards

Drought

Severe droughts are rare in Vermont. Summer is potentially a dry period, but local thunderstorms and moisture from tropical air masses generally prevent serious drought. A severe drought during 1930-36 affected the entire State. The drought of 1960-69 affected the entire State and was the most severe for the Town. The recurrence interval of the drought was greater than 50 years. This drought was regional in scope, encompassing most of the northeastern United States. Precipitation in the State was less than normal every year during 1960-68, which was the longest continuous spell of deficient precipitation since 1895. Streamflow deficiency was greatest during

1965. In 1969, the drought ended abruptly. Water was trucked in to provide relief to drought-stricken dairy herds. Below is the most recent drought monitor for the entire state. Spring can bring abnormally dry conditions as was evident in early 2015 and expects the extent of drought to remain as brief periods of abnormally dry conditions in the spring and occasionally, summer months. Table 2-3 below provides recent drought conditions and an explanation of the rating scale used. Data was not available specific to Groton.

Table 2-3: U.S. Drought Monitor: Vermont



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. Winter storms impact the entire planning area and can include snowstorm, cold, blizzard and ice. According to the *2018 Vermont State All-Hazards Mitigation Plan*:

> *"Severe winter storms bring the threat of heavy accumulations of snow, cold/wind chills, strong winds, and power outages that result in high rates of damage and even higher rates of expenditures. A heavy accumulation of snow, especially when accompanied by high winds, causes drifting snow and very low visibility. Sidewalks, streets, and highways can become extremely hazardous to pedestrians and motorists. Severe winter storms develop through the combination of multiple meteorological factors. In Vermont and the northeastern United States,*

these factors include the moisture content of the air, direction of airflow, collision of warm air masses coming up from the Gulf Coast, and cold air moving southward from the Arctic. Significant accumulations of ice can cause hazardous conditions for travel, weigh down trees and power lines, and cause power outages. Freezing rain can also be combined with snowfall, hiding ice accumulation and further hindering travel, or with mixed precipitation and potentially ice jams or flooding."

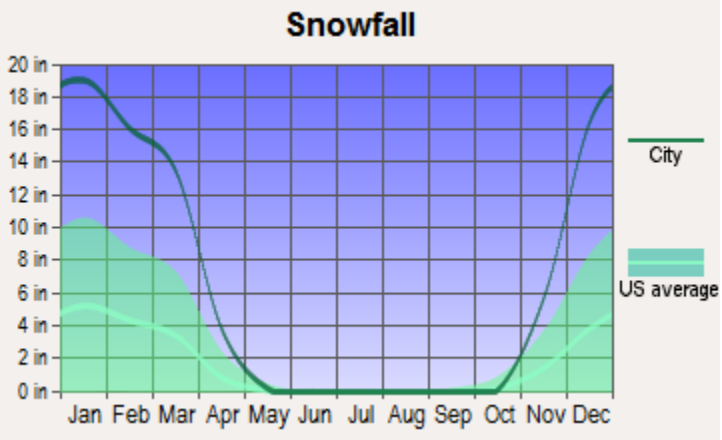
The winters of 1969-72 produced record snowfalls for nearby St. Johnsbury, and greater than normal precipitation was recorded in 8 of the 11 years during 1969-79. The Fairbanks Museum Weather Station receives precipitation measurements from an independent residing in Groton. According to the available history specific to Groton, the max 24-hour snowfall occurred February 24-25, 1969 at 34'' with an additional 2.12'' of rain during the period. 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 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, Groton has had no major PA funding related to damage from snow events.

Table 2-5: NOAA's Regional Snowfall Index (RSI)

CATEGORY	RSI VALUE	DESCRIPTION
1	1–3	Notable
2	3–6	Significant
3	6–10	Major

4	10–18	Crippling
5	18.0+	Extreme

Table 2-6: Groton Snowfall vs. US Average



While declared snowstorm disaster have been declared for the county, Groton 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.

There are no standard loss estimation models or methodologies for the winter storm hazards. Potential losses from winter storms are, in most cases, indirect and therefore difficult to quantify. According to the 2014 National Climate Assessment, there is an observable increase in severity of winter storm frequency and intensity since 1950. While the frequency of heavy snowstorms has increased over the past century, there has been an observed decline since 2000 and an overall decline in total seasonal snowfall (2018 SHMP).

Ice Storm

Major Ice Storms occurred in January 1998 and again in December 2013. Groton received the most significant damage to forest stands in recorded history and power was disrupted for over seven days. 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. Groton received .5 to 1 inch of ice. On December 13th, 2013, another ice storm hit portions of Caledonia County, including Groton 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. In the records available to the town regarding power outage, the longest duration outage was in May of 2013 at 24.35 hours and affecting 100 customers.

Extreme Cold

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 real concern for Groton and the rest of the state. Groton'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 Caledonia County with record cold temperatures occurring in 1914 (-38). 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 real concern for farmers in Groton and the rest of the state and while the temperatures for the town remain within averages seen in the last 85 years, the town expects dangerously cold temperatures every winter. The impact of extreme cold is summarized in the 2018 State Hazard Mitigation Plan:

> "Extreme cold temperatures can have significant effects on human health and commercial and agricultural businesses, as well as primary and secondary effects on infrastructure (e.g. burst pipes from ice expansion and power failure). What constitutes "extreme cold" can vary across different areas of the country based on what the population is accustomed to in their respective climates. Exposure to cold temperatures can cause frostbite or hypothermia and even lead to heart attacks during physically demanding outdoor activities like snow shoveling or winter hiking. When temperatures dip below freezing, incidents of icy conditions increase, which can

lead to dangerous driving conditions and pedestrian-related slipping hazards. A large area of low pressure and cold air surrounding the poles, known as a polar vortex, is strengthened in the winter. When these polar vortex winds are distorted, due to cyclical strengthening and weakening or interaction with high-amplitude jet stream patterns, they have the potential to split into two or more patterns, allowing artic air to flow southward along a jet stream1. As this arctic air is able to access more southerly regions, extreme cold conditions can be observed in Vermont, which also have the potential to remain over the region for extended periods"

Prior to the summer of 2021, the region had not seen the risk of drought conditions in decades but with wells running dry in other areas of the NEK, the town is aware of the potential for this. High temperatures can help to create severe storms as the one evidenced on September 11th, 2013, where record heat helped to produce damaging hail and winds in parts of the NEK and other areas of Vermont and New York. Recent extremes in cold temperatures is a concern and impact the entire planning area and region. 2015 tied the coldest winter (January to March) on record (1923) for Vermont 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. The winter of 2015 was the coldest anyone could remember with a mean temperature of 7.8 degrees Fahrenheit. However, the January of 1994 had a mean temperature of 2.7 degrees Fahrenheit which is the coldest mean temperature since 1930 and January is the statistically coldest month in all of Vermont. Since 1930, January produced temperatures in the negative 20's and 30's consistently for Orleans County with record cold temperatures occurring in 1957 and 1933 (-38). While the temperatures for the town remain within averages seen in the last 85 years, dangerously cold temperatures are expected every winter. The NOAA Wind Chill Chart identifies those temperatures and associated wind speeds that may cause frostbite if skin is exposed to the air over a certain period of time:

Table 2-7: NOAA Wind Chill Chart

Wind Speed (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes; 10 minutes; 5 minutes

Wind Chill (°F) = $35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$

Where, T = Air Temperature (°F) and V = Wind Speed (mph)

In anticipation of extreme cold temperatures, the National Weather Service may issue the following watches, warnings or advisories, which are aimed at informing the general public as well as the agricultural industry**:**

• Wind Chill Warning: Dangerously cold wind chill values are expected or occurring
• Wind Chill Watch: Dangerously cold wind chill values are possible
• Wind Chill Advisory: Seasonably cold wind chill values but not extremely cold values are expected or occurring
• Hard Freeze Warning: Temperatures are expected to drop below 28°F for an extended period of time, killing most types of commercial crops and residential plants
• Freeze Warning: Temperatures are forecasted to go below 32°F for a long period of time, killing some types of commercial crops and residential plants
• Freeze Watch: Potential for significant, widespread freezing temperatures within the next 24-36 hours

Flooding

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 because of ice jams in rivers adjoining developed towns and cities. While ice jam risk for the town is considered low, 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. Rainstorms are the cause of most flooding in town. 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 2018 Vermont State All-Hazards Mitigation Plan discusses flooding extensively:

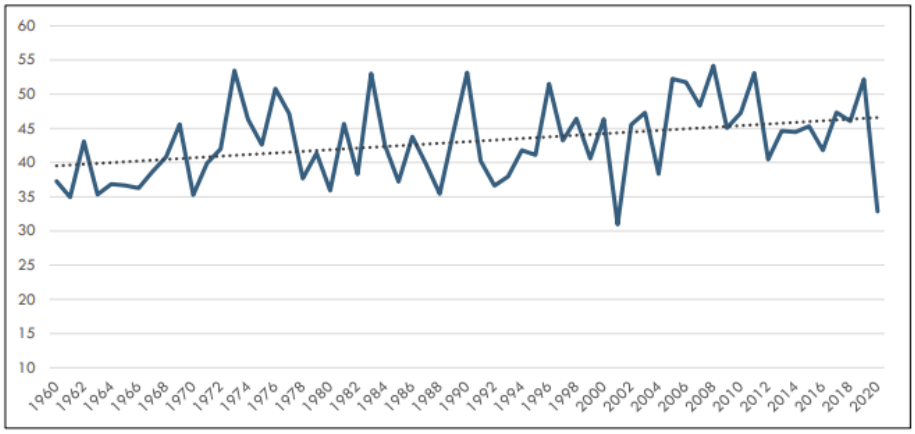
"Flooding is the most common recurring hazard event in Vermont. In recent years, flood intensity and severity appear to be increasing. Flood damages are associated with inundation flooding and fluvial erosion. Data indicate that greater than 75% of flood damages in Vermont, measured in dollars, are associated with fluvial erosion, not inundation. These events may result in widespread damage in major rivers' floodplains or localized flash flooding caused by unusually large rainstorms over a small area. The effects of both inundation flooding and fluvial erosion can be exacerbated by ice or debris dams, the failure of infrastructure (often as a result of undersized culverts), the failure of dams, continued encroachments in floodplains and river corridors, and the stream channelization required to protect those encroachments."

Vermont experienced major floods long before Federal disaster assistance became available. But in November of 1927, Vermont experienced catastrophic flooding. In the month before the flood, rains more than 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, the 1973 flood inflicted the most widespread damage, and the residual rains of Hurricane Belle in 1976 resulted in the second highest amount of federal disaster assistance in Vermont.

Widespread, steady rainfall from frontal systems, tropical cyclones, or "northeasters" can result in flooding of large areas. Extensive and disastrous floods are rare but can result from intense spring rains combined with warm, humid winds that rapidly release water from the snowpack. Such was true for the devastating flood of March 11-12, 1936. During this flood, total rainfall and snowmelt ranged from 10 to 16 inches over the southeastern one-half of the State. Rainfall alone can cause disastrous flooding similar to that in November 1927. During that flood, rainfall totals of 5-9 inches were common, and much more occurred at higher altitudes. Intense rainfall caused extensive flooding on September 21, 1938, when the "great hurricane" reached landfall in the southern area of the State. Severe thundershowers more commonly cause localized street and cellar flooding.

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. Groton 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 town occurred in May 30th, 2011 at 6.47''. Recent history, including the flooding events of 2011 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.

Table 2-8: Caledonia County Precipitation Totals from 1960-2020



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 Caledonia County is 174 days (highest in the state) with 119 days of rain and 55 days of snow. 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).

Tropical cyclones (storms) are officially ranked on one of five tropical cyclone scales, according to their maximum sustained winds and which tropical cyclone basin are located. Only a few scales of classifications are used officially by the meteorological agencies monitoring the tropical cyclones, but some alternative scales also exist, such as Accumulated cyclone energy, the Power Dissipation Index, the Integrated Kinetic Energy Index, and Hurricane Severity Index. Of most recent importance for Vermont was Tropical Storm Irene in 2011. Irene first struck the U.S. as a Category 1 hurricane in eastern North Carolina, then moved northward along the Mid-Atlantic Coast. Wind damage in coastal North Carolina, Virginia, and Maryland was moderate, with considerable damage resulting from falling trees and power lines. Irene made its final landfall as a tropical storm in the New York City area and dropped torrential rainfall in the Northeast that caused widespread flooding. Irene resulted in the worst Vermont flooding in 83 years.

Table 2-10: TSI Rain and Wind Extremes

Tropical Storm Irene Rain and Wind Extremes	
Rainfall	Wind
Mendon, 11.23 inches	Burlington, 51 mph
Walden, 7.60 inches	Morrisville, 40 mph
Randolph Center, 7.15 inches	Springfield, 40 mph

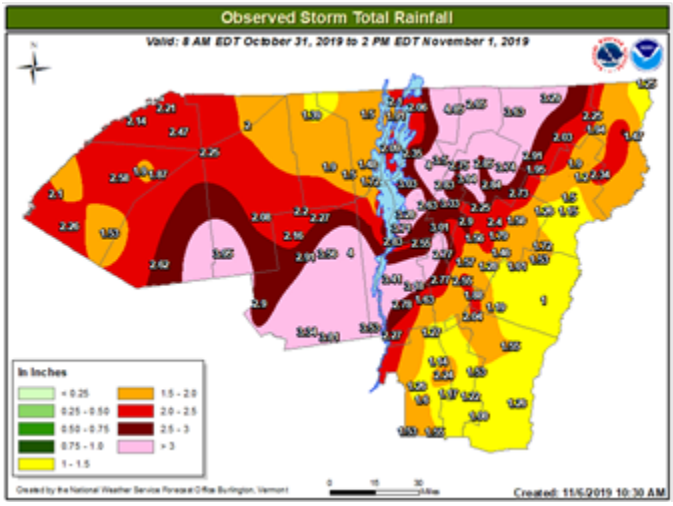
Source: http://www.accuweather.com/en/weather-news/irenes-infamous-top-ten-1/54348

While not classified as a Tropical Storm, the April 2011 rain totals for the NEK reached nearly 7'' compared to the normal precipitation for the month at 3''. The heaviest rainfall event was

associated with thunderstorms during the late afternoon of April 26th into the early morning hours of April 27th, 2011. These storms resulted in record and near record rainfall and flooding across portions of northern Vermont. Specific records for the town of Groton regarding rainfall totals were not available.

The "Halloween" storm of 2019 (DR4474) proved to be the most damaging flood event for many areas of the County in recent memory. This powerful storm system tracked across the eastern Great Lakes late on October 31st, 2019, and produced an axis of 3 to 5 inches of rain, which caused significant flooding across the region. Record rainfall occurred at Burlington, Vermont with 3.30 inches on October 31st, along with a record high temperature of 71 degrees. In addition, very gusty southwest winds developed behind this potent storm, which generated scattered to widespread power outages. Surface wind gusts measured up to 65 mph across northern New York and parts of Vermont, with gusts over 100 mph at the summits. The heavy rainfall washed out numerous roads and culverts from Essex County, New York into parts of central and northern Vermont, while 10 rivers reached flood stage with 8 reaching moderate to major levels. A new record high level of 14.72 feet was attained at North Troy on the Missisquoi River. Extensive flooding was observed in the following river basins: Missisquoi, Lamoille, Winooski, and Ausable, while flash flooding with very sharp rises of smaller streams and rivers occurred across the higher terrain of the eastern Adirondacks into central and northern Green Mountains of Vermont, including the Champlain Valley. Observed total rainfall recordings were 5.26 inches in East Berkshire, 4.85 inches in Enosburg Falls, 4.80 in Fletcher, 4.32 Westford, and 4.0 inches in Elizabethtown, New York. Table 2-7 below shows the storm total precipitation from 31 October at 8 AM to 1 November 2019 at 2 PM.

Table 2-11: Observed storm total rainfall from 8 AM EDT on 31 October to 2 PM EDT on 1 November 2019



Groton has experienced frequent flooding. The West Branch of Wells River is problem area. Route 302 has had instances with ice and flooding. In 1974, severe flooding took out Route 302. Access in and out of town can become a problem with flooded access routes. Groton also has many areas with steep slopes in upper watershed areas where minimal alteration of vegetative

cover through logging or changing drainage patterns may significantly increase the likelihood of flash floods. Although flash floods may not seem like a large problem, their potential should be recognized and monitored. For example, steep slopes behind properties along Scott Highway often send storm waters onto downslope properties. The Groton Community Center has erected a retaining wall in order to protect the property from sheet flow.

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 are not as much of a concern in Groton as elsewhere in Vermont. This is most likely due to the relationship between ice jams and the dam, the Moore Reservoir freezes over but the river is normally open. Water is drained in the reservoir for power generation and floating ice gets stuck behind the dam and in spring the water is generally low. Ice on the river below Moore Dam would back up at Comerford Dam. A list of historic ice jams, including municipalities and streams, is maintained by DEMHS 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 903 events in Vermont with the latest occurring in 2013. Despite Groton not having any recorded events, nearby Passumpsic had 19 (10th highest in the state) and St. Johnsbury had 38 (5th highest in the state) with the Connecticut River being number one in the state with 84 recorded ice jams and the Passumpsic River with only one.
(Source: http://rsgisias.crrel.usace.army.mil/apex/f?p=524:39:10954063060296::NO::P39_STATE:VT)

High Hazard Dams

The Noyes Pond Dam is considered a significant hazard dam despite its recreational use status. Originally built in 1934, parts of the dam were reconstructed in 1989. This DEC-owned dam is 17'' high and 453'' long and is between the South Branch of the Wells River and Noyes Pond.

The *2018 Vermont State All-Hazards Mitigation Plan* states:

> *While a rare occurrence, dam failure and resulting flooding can be devastating and threaten life and property downstream of dams. Dam failure can occur not only during large storms and high flows, but also during normal, sunny day conditions. While the depths and extents of flooding caused by dam failure are most severe during storms when reservoir elevations and rivers are at their highest, the public is generally conscience of flooding under these conditions. For this reason, it is often the sunny day failure scenario, that occurs with no warning, that is most dangerous. Dam failure is caused by the overtopping or structural failure of a dam resulting in a significant, rapid release of water, which can lead to flooding. Structural failure can be caused by many factors, such as internal soil erosion in earth embankment dams, sliding or overturning of concrete dams, gate failure, or caused by other means, such as deliberate sabotage. Dams are classified according to their potential for causing loss of life and property damage in the area downstream of the dam if it were to fail using the general classification system: High Hazard, Significant Hazard, and Low hazard. It is important to note that the hazard class is independent of the condition of a dam. Depending on the entity that regulates the dam, these definitions have*

minor but notable differences. In Vermont, dams are regulated by four distinct entities depending on the purpose and owner of the dam:

• Dams that are part of the production of power (i.e. hydropower) constructed before 1935 (with a few exceptions) are regulated by the State of Vermont Public Utility Commission (PUC). The PUC regulates approximately 25 dams, six of which are considered HIGH hazard and five of which are considered SIGNIFICANT hazard.
• Hydropower Dams constructed after 1935 (with a few exceptions) are regulated by the Federal Energy Regulatory Commission (FERC). FERC regulates approximately 80 dams, 18 of which are considered HIGH hazard and seven of which are considered SIGNFICANT hazard.
• Dams owned by the Federal Government (i.e. United States Army Corps of Engineers, USACE) are essentially self-regulated by that agency. Federal entities regulate approximately 5 HIGH hazard dams and one SIGNIFICANT Hazard dam.
• Non-federal, non-power dams are regulated by the Department of Environmental Conservation, (DEC). The DEC regulates approximately 41 HIGH Hazard Dams and 110 SIGNIFICANT hazard dams

In 2018, the Vermont State Legislature passed a law updating the existing regulation of dams, Statute 10 V.S.A. Chapter 43 which applies to the DEC and PUC. The purpose of the law is to serve to protect public safety and provide for the public good through the inventory, inspection, and evaluation of dams in the State. The law aims to provide a definition for a dam, update and modernize the State's dam inventory and give the DEC rulemaking authority for items such as exemptions, registration, hazard classifications, EAPs, inspections and design standards. These rules will be developed over the next several years.

Failure of any of these dams could result in significant downstream flooding There have been no recent or historically relevant flooding events associated with the failure of any dam in Vermont. However, as stated in FEMA Guide P-956 "*Living with Dams: Know Your Risks*" (2013): *"Although dam failures are infrequent, the impacts can be catastrophic, often far exceeding typical stream or river flood events."*

Inundation and Fluvial Erosion

Groton's floodplains are depicted on a FEMA Flood Insurance Rate Map (FIRM) with an effective date of September 27, 1991. This map depicts the Special Flood Hazard areas, which are floodplains that would likely become inundated during a significant flood known as a "base flood." The base flood is often referred to as the "100-year flood." "Approximate A" zones (i.e., flood hazard areas without any accompanying data such as base flood elevations) include Groton Pond, Kettle Pond, Ricker Pond, Levi Pond, and Noyes Pond, as well as Beaver Brook, Stillwater Brook, and Stillwater Brooks, portions of the Wells River, Red Brook, the North Branch of the Wells River, and portions of the South Branch of the Wells River. FEMA has produced more detailed data with an accompanying flood study for portions of the South Branch as it converges with the Wells River. The flood study provides base flood elevations (how high the water can be expected to rise in a significant flood event), and the maps delineate the floodway (where the floodwaters run the deepest and the fastest

Groton's FIRM is a paper map. Its age and relative lack of detail in some areas make interpretation difficult. A rough digitization shows a significant number of structures that may be located in the floodplain. However, the lack of data in the approximate A zones makes it difficult to tell if many of these structures are located in flood prone areas. For example, nearly all structures around Groton and Ricker Ponds area appear to be in the 100-year flood area. Given the fair number of map amendments issued to date (amendments to the flood map that effectively remove structures from the floodplain based on better elevation data), it may be reasonable to assume that not all these structures are flood prone. The South Branch of the Wells, the Wells, and the North Branch of the Wells River, may have as many as 30 structures in flood prone areas, and as many as 10 may be located either in or immediately adjacent to the delineated floodway . Regarding flood inundation issues, the *2018 Vermont State All-Hazards Mitigation Plan* states:

"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 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."

Flooding is a significant hazard in Groton. However, despite having both the Connecticut and Passumpsic Rivers, associated reservoirs and numerous brooks and ponds with geography characterized by steep alterations in elevations where infrastructure is located at the low points, there is one NFIP residential repetitive loss property with two losses. And while DR 4001 resulted in significant damage, the mitigation work completed prior to Hurricane Irene withstood the storm where many neighboring towns were hit just as hard. Protecting river systems as a preventative measure, protecting property, and protecting human health and safety remain priorities for flood-related hazard mitigation and response in the state and the town.

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 riverbeds 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 a stream bank collapse. The losses experienced during the May 2011 storms and Tropical Storm Irene were most often related to the latter. 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 "wiggle room" for a stream as its channel changes over time. Keeping development out of the river corridors therefore reduces vulnerability to erosion. Statewide river corridors maps were released in 2015. These maps were developed using remote sensing data, such as valley widths, slope, land use and encompass all streams with a drainage area of two square miles or greater. In Groton, this data includes Beaver Brook, Stillwater Brook, the North Branch, the South Branch, the Heath Brook, and Tannery Brook. A Phase 2 assessment (field work) is currently being completed on the upper Wells, which includes several stream reaches along the South Branch and its tributaries. The assessment should help the town to identify and prioritize potential stream bank stabilization projects.

Fluvial Erosion

Erosion occurs on a consistent, but small-scale, basis within the riparian corridor of the towns 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. Fluvial erosion on a large scale can cause stream bank collapses, which are generally classified as landslides. Most flood damage is associated with fluvial erosion rather than inundation. The *2018 Vermont State All-Hazards Mitigation Plan* contains the following discussion of fluvial erosion:

"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 area is located at the bottom of a gradient, which adds to the intensity of this localized flooding…

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The Vermont Agency of Transportation (VTrans) 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 VTrans and continually updated by the Bridge Inspection Program. Structures inspected are only those of 20 feet or longer owned by a municipality or the state. The scour critical rating is based on the structure itself, and does not take into account 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, however, the town does not have a municipal water supply. 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 for all towns in the state. Groton remains committed to enhancing awareness and incorporating recommendations in future planning and mitigation work. However, damage incurred to municipal property and infrastructure by fluvial erosion has not been an issue for the town nor for residents to an extent that influences repetitive loss numbers.

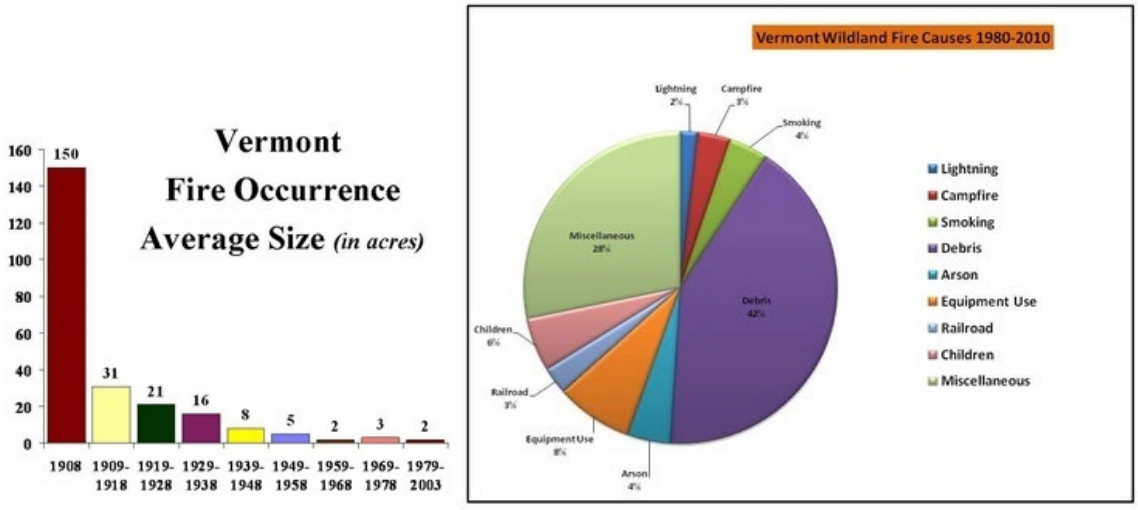
In summary, flooding is a hazard in Groton, a fact that is unlikely to change. Protecting river systems as a preventative measure, protecting property and human health and safety from flooding and flood-related damage remains important facets of mitigation planning for most Vermont communities including Groton. Groton remains committed to enhancing awareness and incorporating recommendations in future planning and mitigation work. The most common consequence to flooding for many Vermont towns is road and bridge (infrastructure) damage.

Major Fire –non-developed:

Due to its climate and primary vegetation types, Vermont is not considered to be at serious risk for large-scale wildfires. Despite not having had a major wildfire in the last 50 years, fire suppression systems are in place at the local level. Groton is unique in that the largest wildfire in state history occurred in the Groton state forest in 1908. Additional fires in 1876 and 1883 occurred in the forest and all were caused by the railroad. While the rail system is no longer functional, the shear expanse of the state forest at 29,000 acres, prior history, fire department concern, and that the State keeps a forest fighting vehicle in the state forest.

Isolated homes with single access roads are more vulnerable to wildfires than more heavily populated areas, and the threat is increased during dry periods, especially in the late summer and fall. The primary forms of 'wildfire' fire in Groton are brush and grass fires accidentally started by persons burning trash, leaves or brush. Additionally underground fires within the State Forest can be started due to rocky terrain and low levels of soil. The town has not seen a recent, significant fire to the extent that data has been captured in terms of duration or acreage. Drought and extreme heat can each increase risk of fire. Mitigation actions for fire hazard are identified in the raising awareness action item for this update.

Table 2-6: Vermont Fires: Size and Causes



Extreme Temperatures

Temperature extremes are increasing, and this phenomenon is likely to continue. High temperatures can help to create severe storms as the one evidenced on September 11th, 2013, where record heat helped to produce damaging hail and winds in parts of the NEK and other areas of Vermont and NY. Recent extremes in cold temperatures are a concern and impact the entire city and region. 2015 tied the coldest winter (January to March) on record (1923) for Vermont according to the NOAA's National Climatic Data Center whose dataset dates to 1895.

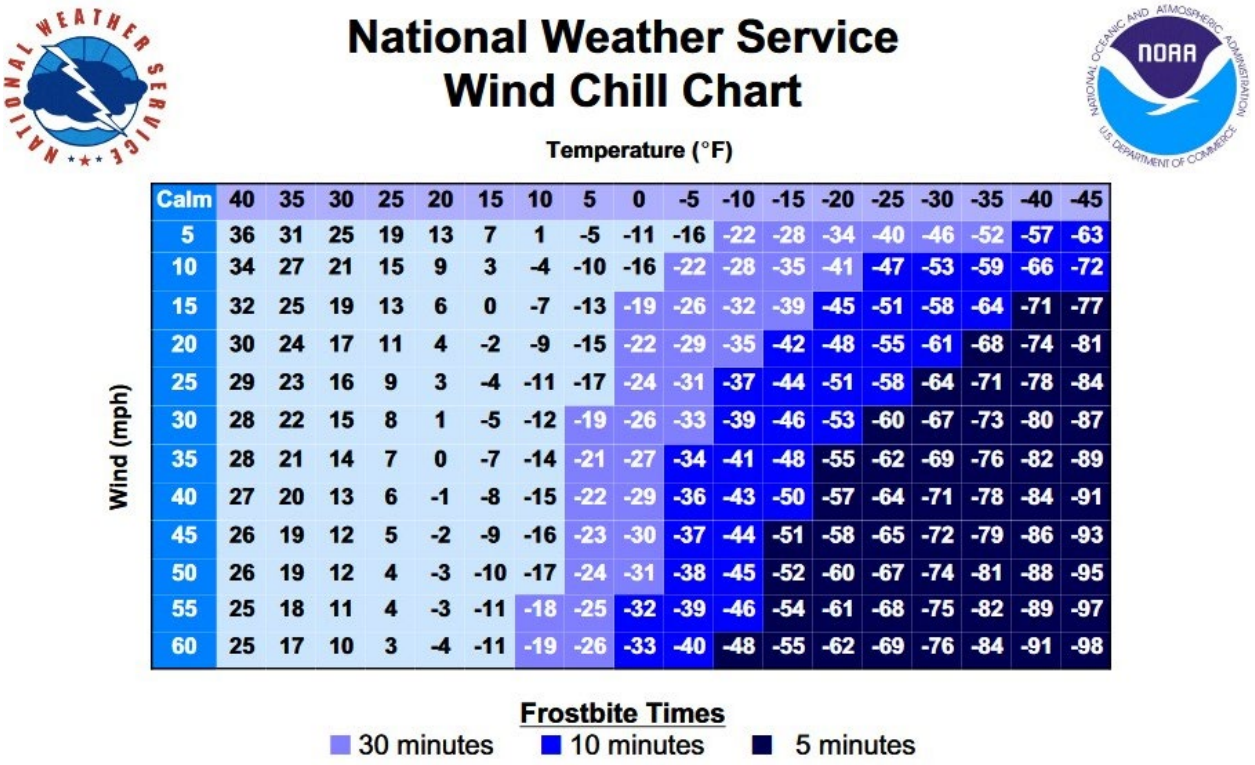
Cold temperatures are expected in the Northeast, but they can pose a serious threat to health and safety, especially as the severity and duration increases in conjunction with other technological (e.g. power outage, fuel oil delivery disruption) and societal (ability to purchase heating fuel) factors. The winter of 2015 was the coldest anyone could remember with a mean temperature of 7.8 degrees Fahrenheit. However, the January of 1994 had a mean temperature of 2.7 degrees Fahrenheit which is the coldest mean temperature since 1930 and January is the statistically coldest month in all of Vermont. Since 1930, January produced temperatures in the negative 20's and 30's consistently for Orleans County with record cold temperatures occurring in 1957 and 1933 (-38). While the temperatures for the city remain within averages seen in the last 85 years, dangerously cold temperatures are expected every winter. There is no evidence to support concern over increases in high temperatures for the city as it relates to health and human safety at this time.

"Extreme cold temperatures can have significant effects on human health and commercial and agricultural businesses, as well as primary and secondary effects on infrastructure (e.g., burst pipes from ice expansion and power failure). What constitutes "extreme cold" can vary across different areas of the country based on what the population is accustomed to in their respective climates. Exposure to cold temperatures can cause frostbite or hypothermia and even lead to heart attacks during physically demanding outdoor activities like snow shoveling or winter hiking. When temperatures dip below freezing, incidents of icy conditions increase, which can lead to dangerous driving conditions and pedestrian-related slipping hazards. A large area of

low pressure and cold air surrounding the poles, known as a polar vortex, is strengthened in the winter. When these polar vortex winds are distorted, due to cyclical strengthening and weakening or interaction with high-amplitude jet stream patterns, they have the potential to split into two or more patterns, allowing artic air to flow southward along a jet stream1. As this arctic air is able to access more southerly regions, extreme cold conditions can be observed in Vermont, which also have the potential to remain over the region for extended periods" (2018 SHMP).

The NOAA Wind Chill Chart identifies those temperatures and associated wind speeds that may cause frostbite if skin is exposed to the air over a certain period of time:

Table 2-6: NOAA Wind Chill Chart



In anticipation of extreme cold temperatures, the National Weather Service may issue the following watches, warnings or advisories, which are aimed at informing the general public as well as the agricultural industry:

• Wind Chill Warning: Dangerously cold wind chill values are expected or occurring
• Wind Chill Watch: Dangerously cold wind chill values are possible
• Wind Chill Advisory: Seasonably cold wind chill values but not extremely cold values are expected or occurring
• Hard Freeze Warning: Temperatures are expected to drop below 28°F for an extended period of time, killing most types of commercial crops and residential plants

• Freeze Warning: Temperatures are forecasted to go below 32°F for a long period of time, killing some types of commercial crops and residential plants
• Freeze Watch: Potential for significant, widespread freezing temperatures within the next 24-36 hours

Extreme Heat

Extreme heat and prolonged periods of hot weather have direct and indirect effects on other hazards such as drought, wildfire, invasive species, and infectious disease. Vermont has a climate where extreme heat is less likely than other regions in the country. However, heat-related events do occur and are beginning to occur in much greater frequency. Extreme heat and prolonged periods of hot weather have direct and indirect effects on other hazards such as drought, wildfire, invasive species, and infectious disease. While climate change specific to extreme temperatures is considered a high risk, associated hazards are not, by default, included as high risk. Vermont has a climate where extreme heat may be less likely than other regions in the country, but observation of temperature increases in the state have resulted in some concern. Heat-related occur in much greater frequency. Extreme maximum temperatures are often observed during drought years, and in many cases, the records that are broken were long-standing and set during previous droughts. It should be noted that a heat wave could be either a boon or a bane depending upon the time of year and the antecedent conditions. For example, the hot conditions of August 1996 followed a cool, wet summer, thereby providing an extra boost for plants. The 2018 Vermont State Hazard Mitigation Plan states the following:

"Extreme hot temperatures can have significant effects on human health and commercial and agricultural businesses, as well as primary and secondary effects on infrastructure (e.g. damage to asphalt roadways from softening). What constitutes "extreme heat" can vary across different areas of the world based on what the population is accustomed to in their respective climates. An example of this difference in acclimatization can be understood when comparing analyses of excess mortality due to heat: in New York City, the data show that the heat index threshold needs to reach at least 95°F to measure a significant rise in heat-related mortality, whereas the threshold in Montreal, Canada, only 400 miles north, is 91°F and did not need to factor in heat index. Similar epidemiological analyses completed by the Vermont Department of Health suggest that the heat threshold in which hospitals in the State see a rise in heat-related emergency room visits is 87°F1 . Temperature fluctuations are a result of several meteorological processes2 . Due to the tilt of Earth's axis, regions of the globe receive varying levels of solar radiation. The delta between these levels produces circulation patterns at the global level, which drive air and storm system movement via air masses. Air masses, as defined by NOAA, are thousands of feet thick and extend across large areas of the earth. Air masses that form over tropical ocean regions will become exceptionally hot and humid, while those masses above high latitude continents will become cool and dry. When these air masses meet, a front is created; fronts can either be cold or warm. In addition to these air mass and front-related impacts humans feel at ground level, movement of narrow bands of strong wind high in the atmosphere, known as jet streams, maneuver weather systems below and transfer heat and moisture across the globe. The

speed and intensity of the jet stream will affect the duration and temperature associated with a cold or warm front. Extremely high temperatures can occur when a high-pressure system (under which air is descending toward the Earth's surface) develops and intensifies. Under such conditions, the potential for a heat wave exists. A heat wave is a period of three or more consecutive days during which the maximum temperature meets or exceeds 90°F." *2018 SHMP*

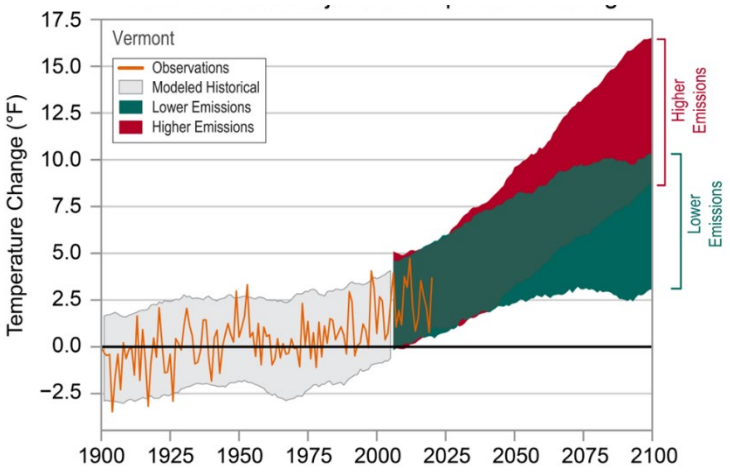
In anticipation of extreme heat events, the National Weather Service (NWS) may issue the following advisories:

- *Excessive Heat Outlook: A period of excessive heat is possible within the next 3 to 5 days.*
- *Heat Advisory – Take Action: A period of excessive heat is expected. The combination of hot temperatures and high humidity will create a situation in which heat related illnesses are possible. Heat Advisories are issued when heat indices are expected to reach at least 95°F*
- *Excessive Heat Watch: A prolonged period of dangerous excessive heat is possible within about 48 hours*
- *Excessive Heat Warning – Take Action: A prolonged period of dangerous excessive heat is expected within about 24 hours. The combination of hot temperatures and high humidity will create a situation in which heat related illnesses are possible. Excessive Heat Warnings are issued when heat indices are expected to reach at least 105°F*

The National Centers for Climate Information show that temperatures in Vermont have risen about 3°F since the beginning of the 20th century. While there are no data trends on the number of hot days (days with temperatures of 87°F or greater, the past 11 years (2010-2020) was the warmest period in history. Under a higher emissions pathway as shown below, we can expect unprecedented warming to continue through this century, while the intensity of extreme winter cold will drop as well.[1]

Table 2-7: Observed and Historical Temperature Change Scale

[1] Runkle, J., K.E. Kunkel, S.M. Champion, L.-A. Dupigny-Giroux, and J. Spaccio, 2022: Vermont State Climate Summary 2022. NOAA Technical Report NESDIS 150-VT. NOAA/NESDIS, Silver Spring, MD, 4 pp.



Source: NOAA National Centers for Environmental Information, State Climate Summaries 2022. https://statesummaries.ncics.org/chapter/vt

Unseasonal Heat

Higher spring and fall temperatures are leading to longer freeze-free seasons, as well as "backward" or "false" springs, where warming temperatures in the late winter or spring are followed by snow or freezing rain. These events are happening more frequently, and rapid thawing and refreezing are likely to damage roads. Early spikes in temperatures can also curtail maple production and disrupt the region's outdoor recreation sector.

March 8-9, 2000 is the only excessive heat event for Vermont on NOAA's records, impacting Windham and Bennington Counties. Temperatures climbed through the 60s to near 70°F on both afternoons. At the Albany International Airport, the high of 66°F on March 8 established a new record high, eclipsing the old record of 64°F set in 1942. On March 9, the temperature reached 68°F, replacing the old daily record high of 66°F set in 1977. March of 2012 set new records:

March 17, 2012: Winter of 2011-12 had temperatures that averaged 4-5°F above normal and snowfall 40-60% of normal. This combination accounted for snow pack across the region to be largely below normal or even non-existent by mid-March. In Vermont, temperatures climbed into the 70s March 18 and low-80s.

March 19-22, 2012: Record heat was recorded across all of Vermont with maximum temperatures 30-40°F above normal and some daily records being broken by 10°F or more. This event caused an estimated reduction of 30% of maple sugar production, resulting in an estimated impact of nearly $10 million. In addition, there was significant loss of ski industry revenue due to a 25-50% reduction in snow loading.

Dangerously High Summer Heat

Heat is most likely to pose the greatest risk to human health in July, which is typically the hottest month of the year. In July of 1911, Northfield had a 12-day average of 90.75°F. The summer of 1949 was also very hot, with 25 days above 90°F. It is important to note here, however, that hot weather can have health impacts at even lower temperatures, with health risks increasing considerably when temperatures reach the mid-to-upper 80s4 . Between 2000 and 2017, the

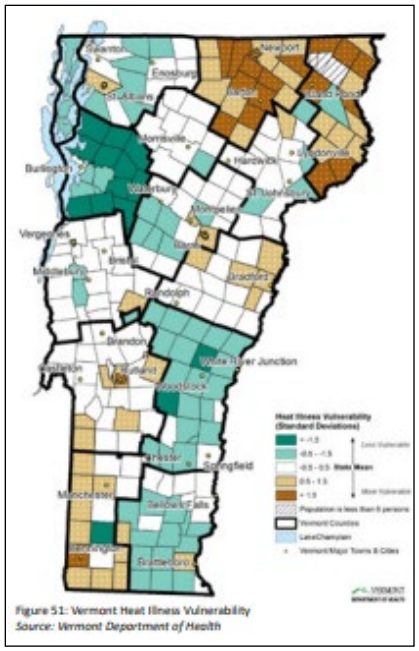
number of recorded days per year with a daily temperature high greater than or equal to 85°F peaked during the 2016 summer at 45 days, closely followed by the summer of 2015 at 41 days in Burlington. A heat wave across Vermont in late July 2022 resulted in seven consecutive days of temperatures above 80°F from July 20 through July 26. Maximum temperature reached 89°F on July 21st and July 24.

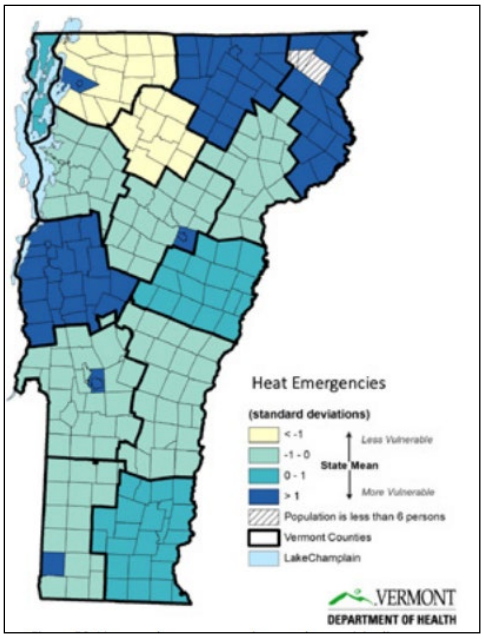
- *August 1-2, 2006: A heat ridge moved into Vermont during the early morning August 1. Temperatures soared into the 90s but significantly more important were dewpoints that reached the middle to upper 70s to produce excessive heat index values of 100°F to 105°F, some of the highest values in nearly a decade.*

- *July 21, 2011: Temperatures across much of southern Vermont warmed into 90s with dew points in the 70s, combined with the hot temperatures and resulted in heat indices of 100°F to 104°F. This was the 2nd day of a 3 to 4-day heat wave across a large portion of Vermont with heat index values of 100°F to 108°F across the Champlain and Connecticut valleys as well as some interior valleys. One death is attributed to this event in Windsor County.*

The Heat Vulnerability in Vermont report suggests that Vermonters are at a greater risk for serious, heat-related illness – potentially even death – when the statewide average temperature reaches or exceeds 87°F. The Health Department's Climate & Health Program has reviewed six heat vulnerability themes (population demographics of a town or city, socioeconomic status, health status of city residents, environmental characteristics, the ability of city residents to acclimate to hot temperatures and emergency room visits for heat illness) and determined a thematic vulnerability for each. In general, those at higher risk during hot weather include older adults and children, people with chronic medical conditions, people active outdoors, people without air conditioning, and people living in more urbanized parts of Vermont. The hot-weather vulnerability maps by theme, and more information regarding the health impacts of increasing temperatures and prolonged periods of hot weather are available at the Department of Health's Climate & Health website: www. healthvermont.gov/environment/climate. The northeast portion of Vermont, has the highest concentrated heat illness vulnerability and heat emergency ratings as seen in the maps below.

Table 2-8: Heat Vulnerability and Emergency Mapping





Source: https://www.healthvermont.gov/sites/default/files/documents/pdf/ENV-CH-hot-weather-planning-guidance.pdf

Vermont data indicate that Vermont residents experience heat-related illnesses at temperatures lower than in many other parts of the country. This is likely related to how infrequently hot weather occurs in Vermont, which has several impacts:
We do not experience enough hot weather for people's bodies to adapt to hotter conditions,
Many homes in Vermont are not adequately weatherized and do not have air conditioning,
At a state and community level, we have not developed plans and policies needed to be prepared for hot weather,
At an individual level, it can be hard to adapt behaviors to stay safe during hot weather, and
Vermont has a large population of older adults, who are at more risk for heat-related illnesses.

The primary impact of extreme heat or prolonged periods of hot weather is to human life. Hot conditions, especially when combined with sun and high humidity, can limit the body's ability to thermoregulate properly. Prolonged exposure to hot conditions can lead to heat cramps, heat exhaustion, heat stroke, or exacerbate other pre-existing medical conditions. Some of these impacts require medical attention and can be fatal if left untreated. Heat kills more people in the US each year than any other type of weather event.
A new guidance report released by the Vermont Department of Health highlights the health risks from extreme heat. The report is informed by the 2021 heat wave in the Northwestern US and Western Canada, an area with a similar summer climate to Vermont. More than 1,400 people died during that event.
Between 2009 and 2019, the Vermont Department of Health reports that there were an average of 104 heat-related emergency department (ED) visits per year and 12 total heat-related deaths across the state. Heat-related ED visits have trended up over that period by more than 2 additional ED visits each year. 2018 was the deadliest year in recent record, with 173 heat-related ED visits and 5 heat-related deaths in total, including 90 ED visits and 4 deaths during a 6-day heat wave in early July. These numbers only include ED visits and deaths specifically

attributed to heat in a hospital or death record. (Data at the County level is not available.). Heat-related illnesses mainly occur between May and September. It takes time for our bodies to adjust to warmer weather, so unseasonably hot days early in the year can be particularly harmful.

Table 2-8a: Heat Index with ED Visits

	May	June	July	August	September
Average daily high heat index* (°F), Burlington Airport	68°	75°	83°	81°	72°
Heat-related ED visits, statewide total, per month (2009-2019)	14	19	47	17	7

The risk for heat-related illnesses and deaths increases substantially when the heat index reaches 90°F or above in Burlington – which is equivalent to about 85°F in cooler places like Groton. All ED visits and deaths (related to any cause) increase as the heat index rises, as many chronic physical and mental health conditions are worsened by heat exposure.

Table 2-ba: Heat Index Magnitude and Frequency with ED Visits and Deaths

Max heat index (°F), Burlington Airport	Days per year*	Heat-related ED visits, per day*	Heat-related deaths, total*	All ED visits, per day*	All deaths, per day*
Less than 80°	97	0.2	2	742	12.9
80° - 89°	46	1	2	778	13.3
90° - 94°	6	3	2	789	14.1
95° or hotter	3	7	6	795	14.2

* Heat-related data are reported for May-September, 2009-2019. ED visits and deaths are statewide totals.

Vulnerable Populations

Although all Vermonters can be affected by hot weather, there are specific factors that can increase an individual's risk for experiencing heat-related health impacts. The risk for heat illnesses tends to be greater for the following groups of people:

People Living in Urban Areas: Only about one-third of Vermonters live in urban areas as defined by the US Census, but a disproportionate number of heat-related deaths from 2009-2019 (10 of 12) occurred in municipalities that are at least partially urban. Urban heat risk data collected by Health Department volunteers in 2020 were used to estimate that on a hot day, the heat index can be as much as 15°F hotter in the most urban locations in Vermont compared to largely undeveloped and wooded locations.

People Who are Unusually Sensitive to Heat Exposure: This category can include anyone not acclimated to hot weather, especially older adults and young children, pregnant women, people that are overweight or have a chronic medical condition, people using drugs, alcohol or some prescription medications, and people who experienced a prior heat illness. The most severe heat-related impacts in Vermont have been experienced by older adults. Ten of the 12 people that died in Vermont from a heat-related cause between 2009 and 2019 were over the age of 50.

Additional vulnerabilities related to extreme heat

Vector-born disease
Data suggest that health impacts are also associated with prolonged hot weather and increasing average temperatures. For example, increases in the incidence of vector-borne diseases (e.g. Lyme, West Nile and Eastern equine encephalitis) in Vermont and New England at-large have been observed and are attributed to warming conditions. The increase in average annual temperatures and shortened winters have allowed mosquitos and ticks to become more active earlier in the spring and remain active later in the fall. Because the incidence of Lyme disease in Vermont is higher than the national average at present, lengthening vector seasons is of great concern to the health community in Vermont. People working in the outdoors – loggers and farmers, for example – are most vulnerable to vector-borne illness.
Cyanobacteria blooms: Hot weather can increase thermal stratification in water bodies, where shallow water layers are much warmer and do not readily mix with cooler, deeper water layers. Stratified water layers are most common in late summer and early fall, providing more favorable conditions for development of cyanobacteria blooms in Vermont's lakes and ponds. Some types of cyanobacteria can release natural toxins or poisons (called cyanotoxins) into the water, especially when they die and break down. Swimming or wading in water with cyanobacteria may cause minor skin rashes, sore throats, diarrhea, stomach problems, or occasionally more serious health problems. Children and pets are at higher risk of exposure because they are more likely to play near the shoreline and drink water while swimming10. The rise in average annual temperature and increased occurrence of prolonged hot weather events will also have impacts on infrastructure, the environment and the economy in Vermont.

Drought & Wildfire
As temperatures continue to rise, there is likely to be a heightened consideration for water supplies. Higher temperatures will lead to increased evapotranspiration, soil drying rate and the frequency of short-term droughts, limiting water availability for tree growth. With a changing forest complexion and greater levels of evapotranspiration, extreme heat and prolonged hot weather could also lead to an increase in the occurrence of wildfires in Vermont.

Forest impacts & invasive species
Native forests and ecosystems are projected to experience negative impacts of these warming trends, as well11. Northern hardwood species like maple, yellow birch and American beech are anticipated to be nearly eliminated in the State, replaced by those tree species that thrive in warmer, drier conditions, like oak and pine. Additionally, the changing climate will allow for greater survival and reproduction of forest pest species, as trees that are stressed due to lower water availability reduce their ability to maintain sufficient defense mechanisms, making them more vulnerable to pest invasion and disease.
Planning Considerations:

Community cooling sites can be an essential resource for community members that do not have access to air-conditioning and need extra assistance to stay safe during hot weather. To be most effective, cooling site **locations** should be identified and advertised before hot weather occurs. The Vermont Department of Health maintains a map of known cooling sites at healthvermont.gov/climate/heat. Here are the characteristics of an optimal cooling site:

Table 2-9: Cooling Site Options

Minimum recommendations	Encouraged amenities
Air-conditioned	Public transit or personal transportation assistance
Free entry	Activities available for guests
Convenient for community to access	Separate room for families and children
American Disabilities Act compliant	Access to wi-fi and power for personal devices
Access to restrooms	Food/snacks provided
Access to water	Provisions for pets
Electricity for medical equipment	Back-up generator available
Refrigeration for medications	Extended hours as needed
Seating available for all guests	On-site health and social services
Widely advertised throughout community	Law enforcement or other site safety officer

People are reluctant to leave their homes in a heat emergency. Experience has shown that individuals can be reluctant to leave their homes, even in the event of an emergency. Successful messaging about cooling sites in the event of an extended heat advisory will depend largely on communication with property managers of rental properties, visiting nurses, and other home service providers for at-risk populations.

Infectious Disease

Climate change, global travel, and population density can all influence infectious disease incidence and prevalence. Small communities do have some level of protection from some infectious disease but others, like Lyme Disease can affect any community. The 2018 State Hazard Mitigation Plan states:

> *The Vermont Department of Health defines an infectious disease as one that is caused by micro-organisms, such as bacteria, viruses and parasites. A vector-borne disease is an infectious disease that is transmitted to humans by blood-feeding arthropods, including ticks, mosquitoes and fleas, or in some cases by mammals (e.g. rabies).*
>
> *Infectious Disease Trends & Vulnerability According to the Centers for Disease Control (CDC), the number of reported cases of vector-borne infectious disease has more than tripled between 2004 and 20162 . Those infectious diseases that fall into the first threat classification category identified in Table 38 (i.e. currently present in Vermont and which may be exacerbated by climate change) are already exhibiting increased prevalence in New England. For example, with both temperature (see: Extreme Heat) and precipitation (see: Inundation Flooding & Fluvial Erosion) expected to increase in Vermont, West Nile Virus mosquito vector activity will likely increase, as well as the vector's period of activity. Similarly, between 1964 and 2010, counts of Eastern Equine Encephalitis (EEE) have continued to rise in New England, though they remain constant in the southeastern states. Perhaps the most significant trend in infectious disease vulnerability in Vermont is that of Lyme disease, where Vermont ranks second in highest rate of disease incidence in the nation. The Vermont Department of Health reports that the number of*

reported cases of Lyme disease have increased dramatically over the last decade, and with shrinking winters, the potential for infection through tick bite continues to grow. Additionally, Vermont's increase in forest cover could provide a more suitable habitat for ticks and their hosts, which may lead to further spread of Lyme disease in the State. Outdoor laborers and recreationalists are especially vulnerable to Lyme disease, as exposure to ticks is greater. The southern and western halves of the State are more vulnerable to Lyme disease, as the warmer climate contributes to longer period of vector activity. Vermont is typically not vulnerable to diseases such as HIV/AIDS, SARS, cholera, malaria, and resistant tuberculosis, though they are considered to be major disasters in some parts of the world. However, an incident that caused water supplies to become contaminated or resulted in people eating spoiled food could have significant health implications. An animal infected with the rabies virus would be a localized threat. The potential for large-scale infection of Vermont's commercial animal population with foot and mouth disease, bovine spongiform encephalopathy (i.e. Mad Cow Disease), or any number of poultry viruses, while unlikely, could cause widespread economic problems. A health threat might also result from an act of bio-terrorism.

Pandemic planning in Vermont appears to ebb and flow. Following the H1N1 Virus Outbreak in 2009-2010, increased emphasis on pandemic planning was seen across the state. From 2010 to 2019 however, without another major U.S. event, emphasis on pandemic planning diminished. While Vermont, due to its rural nature, has some level of protection from national infection rates during a pandemic, the financial implications experienced during the COVID-19 pandemic in 2020 hit the state extremely hard.

COVID-19 is a new disease, caused by a virus not previously seen in humans. COVID-19 is highly contagious and people with COVID-19 who do not have any symptoms can spread the virus to other people. On March 13, 2020, President Trump declared a nationwide emergency pursuant to Sec. 501(b) of Stafford Act to avoid governors needing to request individual emergency declarations. All 50 states, the District of Columbia, and 4 territories have been approved for major disaster declarations to assist with additional needs identified under the nationwide emergency declaration for COVID-19. Additionally, 32 tribes are working directly with FEMA under the emergency declaration. FEMA announced that federal emergency aid has been made available for the state of Vermont to supplement the state and local recovery efforts in the areas affected by the Coronavirus Disease 2019 (COVID-19) pandemic beginning on January 20, 2020 and continuing. Public Assistance federal funding was made available to the state and eligible local governments and certain private nonprofit organizations on a cost-sharing basis for emergency protective measures (Category B), including direct federal assistance under Public Assistance, for all areas in the state of Vermont affected by COVID-19 at a federal cost share of 75 percent.

In early 2020, there was a quick return to the tenets of effective pandemic planning. Preparing for hospital surge, high death rates and the medical equipment necessary for both patients and health care workers are examples of the state's early focus. Public information and guidance on safety, isolation, travel and quarantine also became extremely important while mitigating the pervasive economic consequences of reducing work forces, sending students home and closing businesses. Additionally, Vermont had to consider the implication of, and work to control, the

immigration of people from other states. Both infection risk and taxing of local resources were the main concerns associated with this real consequence of the pandemic.

While the Northeast Kingdom remained insulated from infection rates (and subsequent deaths) seen elsewhere in the state (e.g., Burlington), issues of border closure, implementing safety protocol and procedures and economic resilience were experienced in every community, including Groton. Despite having relatively low illness and death, the economic and operational consequences of pandemic are of concern to the town. Having the capacity to navigate the funding opportunities as result of the pandemic for the town and residents is a concern in addition to providing resources to residents to mitigate spread (e.g., testing and vaccination services) and assure continuity of operations for government and community-based organizations. *(https://www.healthvermont.gov/response/coronavirus-covid-19/current-activity-vermont#town*

SECTION 3: RISK ASSESSMENT

This section first explores and defines specific locations of known, historic risk within the town with a disaster and non-disaster expenditure summary. Following, a qualitative risk analysis is documented for each hazard category. The highest ranked hazards, coupled with historic data, therefore, substantiate the profiled hazards in this update.

3.1 Designated Hazard Areas

In the upper watershed areas of Groton, flash floods have become more frequent as more housing is constructed with consideration for water runoff. Groton is fortunate to have a well-trained road commissioner who learned to 1. clean the ditches, 2. clean the culverts, and 3. take care of the road, in that order. Groton's roads and bridges are maintained in accordance with the VTrans Road and Bridge Standards (aka the "Orange Book.") That training and experience has saved many a road from being washed out by a mini "flash flood." Because Groton remains a rural community, care should be taken to inform new residents of the value of "water bars" on back roads. Many a road has been washed out in Groton by a citizen filling in a "water bar" to make the road smoother. All culverts in Groton are mapped, and it might be recommended that "water bars" be mapped as well. Construction of roads or driveways should be reviewed by the Road Commission to ensure that they are adequately sited to address water runoff management.

3.1.1 Flood Hazard Areas

Nearly all of Groton is contained in the Wells River watershed, which drains approximately 100 square miles, ultimately reaching the Connecticut River. It is roughly 22 miles (37 km) long, beginning upstream of Osmore Lake in the town of Peacham. The river flows generally southeast through Osmore Pond, Groton Lake, and Ricker Pond, joins with the North and South Branches in the southeast part of the Town of Groton, and continues southeast though the towns of Ryegate and Newbury, finally reaching the Connecticut River at the village of Wells River.

According to the FEMA NFIP Insurance Report (January 2015) private properties in Groton have been affected by flooding as well. There are 12 National Flood Insurance Program policies currently in effect, representing a collective insured value of $1,816,400. Nine of these policies are for structures in the "A" zones (i.e. 100 year flood plain). There have been nine claims paid since 1978, representing a total of $49,549.

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167	Buildings in the Special Flood Hazard Area (SFHA) (estimated from e911 sites).
3	Flood Insurance Policies in SFHA (Zone A, AE, AO, A 1- 30)
2%	Percent of buildings in the SFHA with flood insurance in force.
0	Critical or public structures in SFHA or 0.2% flood hazard area (est. from e911 sites.)
23%	Percent of buildings in the SFHA.
09/27/1991	National Flood Insurance Program (NFIP) (Enrollment Date)

3.1.2. Floodplains

Floodplains are low-lying areas adjacent to a river channel that become inundated as floodwaters rise up and spill out over a river bank. They provide an important ecological function by storing and conveying floodwaters, reducing downstream flood velocities, and mitigating riverbank erosion. Floodplains also help to protect water quality by filtering nutrients and impurities from runoff, processing organic wastes, and moderating temperature fluctuations.

Groton's floodplains are depicted on a FEMA Flood Insurance Rate Map (FIRM) with an effective date of September 27, 1991. This map depicts the Special Flood Hazard areas, which are floodplains that would likely become inundated during a significant flood known as a "base flood." The base flood is often referred to as the "100-year flood." "Approximate A" zones (i.e. flood hazard areas without any accompanying data such as base flood elevations) include Groton Pond, Kettle Pond, Ricker Pond, Levi Pond, and Noyes Pond, as well as Beaver Brook, Stillwater Brook, and Stillwater Brooks, portions of the Wells River, Red Brook, the North Branch of the Wells River, and portions of the South Branch of the Wells River.

FEMA has produced more detailed data with an accompanying flood study for portions of the South Branch as it converges with the Wells River. The flood study provides base flood elevations (how high the water can be expected to rise in a significant flood event), and the maps delineate the floodway (where the floodwaters run the deepest and the fastest. Unfortunately, the term "100-year flood" is misleading, because it creates the false impression that a flood of that magnitude will only occur once a century. What the term really means is that the base flood has a 1% chance of flooding in ANY given year. With a one percent annual chance, a structure in the Special Flood Hazard Area has more than a one-in-four chance of being affected by a flood during a thirty-year mortgage. By comparison the same structure has less than a one-in-ten chance of being affected by fire over the same mortgage.

Groton's FIRM is a paper map. Its age and relative lack of detail in some areas make interpretation difficult. A rough digitization shows a significant number of structures that may be

located in the floodplain. However, the lack of data in the approximate A zones makes it difficult to tell if many of these structures are actually located in flood prone areas. For example, nearly all structures around Groton and Ricker Ponds area appear to be in the 100-year flood area. Given the fair number of map amendments issued to date (amendments to the flood map that effectively remove structures from the floodplain based on better elevation data), it may be reasonable to assume that not all these structures are actually flood prone. The South Branch of the Wells, the Wells, and the North Branch.

3.1.3. River Corridors

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. In reality, 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 a stream bank collapse. The losses experienced during the May 2011 storms and Tropical Storm Irene were most often related to the latter. 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 "wiggle room" for a stream as its channel changes over time. Keeping development out of the river corridors therefore reduces vulnerability to erosion. Statewide river corridors maps were released in 2015. These maps were developed using remote sensing data, such as valley widths, slope, land use and encompass all streams with a drainage area of two square miles or greater. In Groton, this data includes Beaver Brook, Stillwater Brook, the North Branch, the South Branch, the Heath Brook, and Tannery Brook. A Phase 2 assessment (field work) is currently being completed on the upper Wells, which includes several stream reaches along the South Branch and its tributaries. The assessment should help the town to identify and prioritize potential stream bank stabilization projects.

3.2 Non-designated Hazard Areas

3.2.1. 1998 Ice Storm Damage

Impacts of the January 1998 ice storm in Groton were minimal in comparison to other areas of the state.

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 along with utility providers work to keep limbs trimmed.

3.3 Previous FEMA-Declared and Non-declared Natural Disasters

3.3.1. Road Infrastructure Failure

Groton has experienced frequent flooding. The West Branch of Wells River is problem area. Route 302 has had instances with ice and flooding. In 1974, severe flooding took out Route 302. Access in and out of town can become a problem with flooded access routes. Groton also has many areas with steep slopes in upper watershed areas where minimal alteration of vegetative cover through logging or changing drainage patterns may significantly increase the likelihood of flash floods. Although flash floods may not seem like a large problem, their potential should be recognized and monitored. For example, steep slopes behind properties along Scott Highway often send storm waters onto downslope properties. The Groton Community Center has erected a retaining wall in order to protect the property from sheet flow. Below is a table that describes FEMA public assistance received from 2004 through 2011 (Tropical Storm Irene). Public assistance helps to mitigate the cost of repair to roads, bridges, culverts, and other forms of transportation infrastructure. Clearly, damage to public infrastructure in more recent years has carried a significantly larger price tag. Groton has received public assistance funding from FEMA for the following natural disasters:

Table 2-1: Town of Groton, FEMA-Declared Disaster Summary, 2004-2022

Number	Date	Type
4178	06/11/2014	Flood
4022	09/01/2011	Hurricane
4001	07/08/2011	Severe Storm(s)
1790	09/12/2008	Severe Storm(s)
1715	08/03/2007	Severe Storm(s)
1559	09/23/2004	Severe Storm(s)

Table 3-2: Town of Groton, FEMA-Declared Disasters and Snow Emergencies, 2004-2022

Number	PW #	Application Title	Damage Category Code	Project Amount	Federal Share Obligated	Total Obligated
4178	5	GROTC01 -TH-41, TH-37, TH-35	C - Roads and Bridges	$18,333.99	$13,750.49	$13,750.49
4022	353	TMGRC04 Westville	C - Roads and Bridges	$00.00	$719.48	$719.48
4022	359	TMGRC05 Seyon	C - Roads and Bridges	$00.00	$3,624.32	$3,624.32
4022	339	TMGRC10 Annis	C - Roads and Bridges	$00.00	$301.21	$301.21
4022	338	TMGRC08 Glover	C - Roads and Bridges	$00.00	$333.14	$333.14
4022	330	TMGRC07 Powerhouse	C - Roads and Bridges	$00.00	$1,712.63	$1,712.63
4022	336	TMGRC02 Cochran	C - Roads and Bridges	$00.00	$497.85	$497.85
4022	364	TMGRC11 CATB	B - Protective Measures	$00.00	$388.31	$388.31
4022	365	TMGRC13 Branch Brook	C - Roads and Bridges	$00.00	$699.24	$699.24
4022	407	TMGRG09 Dry Hydrant	G - Recreational or Other	$00.00	$1,216.51	$1,216.51
4022	527	TMGRG03 Rail	G - Recreational or Other	$00.00	$3,481.91	$3,481.91
4022	702	NCGRC01 - Welton Road TH #48 BR # 18	C - Roads and Bridges	$00.00	$73,326.76	$73,326.76

Number	PW #	Application Title	Damage Category Code	Project Amount	Federal Share Obligated	Total Obligated
4022	315	TMGRC01 Town Garage	C - Roads and Bridges	$00.00	$494.97	$494.97
4022	329	TMGRC06 Heath Brook	C - Roads and Bridges	$00.00	$555.89	$555.89
4022	702	NCGRC01 - Welton Road TH #48 BR # 18	C - Roads and Bridges	$433,793.50	$325,345.13	$325,345.13
4022	702	NCGRC01 - Welton Road TH #48 BR # 18	C - Roads and Bridges	$55,051.57	$41,288.68	$41,288.68
4001	357	TMGRC09	C - Roads and Bridges	$4,872.44	$3,654.33	$3,654.33
4001	358	TMGRC07	C - Roads and Bridges	$20,361.18	$15,270.89	$15,270.89
4001	363	TMGRC14	C - Roads and Bridges	$2,227.73	$1,670.80	$1,670.80
4001	360	TMGRC04	C - Roads and Bridges	$2,069.31	$1,551.98	$1,551.98
4001	361	TMGRC11	C - Roads and Bridges	$14,370.31	$10,777.73	$10,777.73
4001	359	TMGRC02	C - Roads and Bridges	$6,706.96	$5,030.22	$5,030.22
4001	362	TMGRC06	C - Roads and Bridges	$5,278.29	$3,958.72	$3,958.72
4001	221	TMGRC10	C - Roads and Bridges	$2,196.60	$1,647.45	$1,647.45
4001	224	TMGRB13	B - Protective Measures	$2,916.52	$2,187.39	$2,187.39

Number	PW #	Application Title	Damage Category Code	Project Amount	Federal Share Obligated	Total Obligated
4001	269	TMGRC12	C - Roads and Bridges	$22,705.38	$17,029.04	$17,029.04
4001	268	TMGRC03	C - Roads and Bridges	$3,155.88	$2,366.91	$2,366.91
4001	191	TMGRC08	C - Roads and Bridges	$5,724.05	$4,293.04	$4,293.04
4001	225	TMGRC05	C - Roads and Bridges	$14,510.34	$10,882.76	$10,882.76
4022	407	TMGRG09 Dry Hydrant	G - Recreational or Other	$8,110.05	$6,082.54	$6,082.54
4022	527	TMGRG03 Rail	G - Recreational or Other	$23,212.76	$17,409.57	$17,409.57
4022	359	TMGRC05 Seyon	C - Roads and Bridges	$24,162.10	$18,121.58	$18,121.58
4022	365	TMGRC13 Branch Brook	C - Roads and Bridges	$4,661.57	$3,496.18	$3,496.18
4022	315	TMGRC01 Town Garage	C - Roads and Bridges	$3,299.82	$2,474.87	$2,474.87
4022	336	TMGRC02 Cochran	C - Roads and Bridges	$3,319.00	$2,489.25	$2,489.25
4022	329	TMGRC06 Heath Brook	C - Roads and Bridges	$3,705.93	$2,779.45	$2,779.45
4022	338	TMGRC08 Glover	C - Roads and Bridges	$2,220.96	$1,665.72	$1,665.72
4022	353	TMGRC04 Westville	C - Roads and Bridges	$4,796.51	$3,597.38	$3,597.38

Number	PW #	Application Title	Damage Category Code	Project Amount	Federal Share Obligated	Total Obligated
4022	339	TMGRC10 Annis	C - Roads and Bridges	$2,008.09	$1,506.07	$1,506.07
4022	364	TMGRC11 CATB	B - Protective Measures	$2,588.76	$1,941.57	$1,941.57
4022	330	TMGRC07 Powerhouse	C - Roads and Bridges	$11,417.54	$8,563.16	$8,563.16
4001	93	WEM Access Rd, Helo, Hydrant	G - Recreational or Other	$11,779.81	$8,834.86	$8,834.86
1790	33	dd Groton 01 TH#30	C - Roads and Bridges	$5,842.09	$4,381.57	$4,381.57
1715	61	POUND ROAD	C - Roads and Bridges	$19,291.76	$14,468.82	$15,348.52
1715	54	HOOPER HILL ROAD	C - Roads and Bridges	$14,942.80	$11,207.10	$11,888.49
1715	12	CROSS ROAD; SURFACE STONE & DITCH WASHOUT	C - Roads and Bridges	$4,198.48	$3,148.86	$3,373.06
1715	11	GREAT ROAD	C - Roads and Bridges	$7,276.60	$5,457.45	$5,846.02
1559	156	CULVERT REPAIR	C - Roads and Bridges	$1,103.02	$827.27	$868.96
1559	155	GRAVEL ROAD REPAIR	C - Roads and Bridges	$7,595.67	$5,696.75	$5,983.87
1559	154	GRAVEL ROAD REPAIR	C - Roads and Bridges	$32,131.76	$24,098.82	$25,436.67

Sources: Town Records, Project Worksheets, financial report forms and award letters.

Non-Declared Disaster Summary:

As with any municipality, maintaining transportation routes through road, bridge and culvert repair and replacement is ongoing and requires fiscal, environmental, communication and engineering planning to be successful. The work accomplished in Groton since 2005 that was not directly related to a declared disaster has supplemented the work accomplished in direct response to disaster-related damage to town roads and bridges. The cumulative effect of this work has served to enhance overall resilience to future events while assuring to the best degree possible, consistent use of transportation infrastructure in the face of severe weather precluding a level of disaster declarations.

3.4 Future Events

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 the fall 2015. This analysis assigns numerical values to a hazard's affected area, expected consequences and probability. 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. Although all assets may be affected by hazards, some assets are more vulnerable because of their physical characteristics or socioeconomic uses. This section provides an overall summary of the town's vulnerability to the identified hazards. 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:

1. Health and Safety Consequences
2. Property Damage
3. Environmental Damage
4. Economic Disruption

Probability of Occurrence: Scored from 1-5, estimates the anticipated frequency of occurrence.

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.

3.4.1. Natural Hazards

According to the updated Hazard and Risk Estimation for Groton, the profiled hazard summary scores are included below:

- Severe Winter Storm/Ice (32)

- Flooding/Fluvial Erosion (40)
- Extreme Heat (20)
- Extreme cold (24)
- Pandemic/infectious disease (12)
- Drought (7)
- Wildfire (6)

Flooding remains the most likely event to incur the most cost for the town based on historical analysis and disaster declaration-related funding since 2004 has all been a result of severe rainstorms. Given the magnitude of damage to such few areas during DR 4001, the realization that a major flooding event can result in major expense is evident, lending support that that flooding is likely to have a significant impact over a smaller area while a severe winter storm tends to affect the entire town. As with most Vermont towns, there is almost an inherent resilience to winter weather events because they are expected. However, as severity increases and consequences mount (e.g., power outage, road closures, etc.), the risk for health and safety also increases. High wind and lightning events happen and have the potential to disrupt functionality of the town, but the town is not at any increased risk in comparison to other areas of the state, but the sum area impacted, and probability of occurrence raise these two events in the hazard analysis methodology.

Table 3-3: Natural hazards risk estimation matrix

Groton Hazard & Risk Analysis: NATURAL HAZARDS		Drought	Flooding	High Winds	Fluvial Erosion	Landslide	Extreme Heat	Infectious Disease	Wildfire	Winter Storm	Ice Storm	Extreme Cold	Hail
Area Impacted													
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	1	3	1	1	1	2	1	1	3	3	2	1
Consequences													
Health & Safety Consequences													
Key:	0 = No health and safety impact												
	1 = Few injuries or illnesses												
	2 = Few fatalities or illnesses												
	3 = Numerous fatalities	1	1	1	0	0	1	2	1	1	1	1	1
Property Damage													
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	1	2	1	1	0	0	0	1	1	1	1	1
Environmental Damage													
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	0	0	1	0	2	1	1	1	2
Economic Disruption													
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	2	2	1	1	1	1	3	1	2	2	1	1
Sum of Area & Consequence Scores		7	10	5	3	2	5	6	6	8	7	6	7
Probability of Occurrence													
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	2	2	1	4	2	1	4	2	4	2
TOTAL RISK RATING													
	Total Risk Rating =												
	Sum of Area & Consequence Scores	**7**	**40**	**10**	**6**	**2**	**20**	**12**	**6**	**32**	**14**	**24**	**14**
	x Probability of Occurrence												

3.5 Hazard Summary

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

1. Flooding
2. Severe Winter Storm
3. Extreme Temperatures (hot/cold)
4. Infectious Disease

Flooding is highest rated hazard for Groton, due in large part to their widespread nature and frequent occurrence. A severe winter storm is expected and while the town is well-equipped to handle winter storms and cold temperatures, the resilience of its residents is dependent on effective town emergency planning when intervention strategies are required.

SECTION 4: VULNERABILITY ASSESSMENT

Vulnerability refers to the potential impact of a specific loss related to an identified risk. Groton 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 vulnerability is low as all critical facilities are not in the SFHA. There are roads, bridges and culverts vulnerable to flooding and those are identified below. The Noyes Pond Dam is a concern solely because dams are identified targets for malicious activity (terrorism) and the impact of such activity could be catastrophic, but the town does not manage the Dam. Additionally, loss of fire and rescue services due to equipment issues (unrelated to profiled hazards however) makes the town vulnerable in several ways.

Of the profiled hazards, the following vulnerability rating (high, moderate, low) is given below. This vulnerability rating is based on the disaster case history for the town and when the greatest financial impact was seen due to the disaster. A "high" vulnerability reflects substantial case history ($\geq$2 in last five years) of events with an economic impact requiring action. A "moderate" vulnerability reflects limited case history ($<$ 2 in last five years) of an event with and economic impact requiring action. A "low" vulnerability reflects little to no case history in the last five years. The specific vulnerability to the population as a whole or any specific sub-population (e.g., elderly) is subjective because there is no historical data to rank vulnerability to health and safety of Groton residents, workers or travelers.

4.1 Vulnerability Narrative by Profiled Hazard

Severe winter/ice storm: Moderate
Summary: While snow and ice events are distinct hazards, the likelihood of these two hazards occurring at a level of concern is considered equal. While a major ice event can have catastrophic consequences for the entire planning area, these events are rare. 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 serve 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.

Extreme Heat and Cold: Moderate
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. Extreme heat is a risk for the city because of the health and environmental variables associated with this growing threat.

Wildfire: Moderate to Low
Summary: The size and soil composition of the Groton State Forest create vulnerability. While there has been historic wildfires in the past, these events were over 100 years ago and their cause has been eliminated (railroad operations). The current burn bans for specific residential properties in the forest speak to the risk and the town can further concentrate efforts in reducing risk through public education, and review/amendment of permitting requirements, access to firefighting water supplies, and zoning in the next planning cycle.

Pandemic: Moderate
Summary: Not only is the COVID-19 current during the drafting of this plan but it will likely remain active for some time to come. While Vermont has remained relatively insulated from the worst-case scenarios already seen in other states in regard to infection rates and deaths, there have been significant financial impacts for the region and state. There are several important considerations for the town and villages to take on. Issues such as tax revenue reductions from failure to pay on a large scale to how a major storm event could compromise pandemic response (e.g., sheltering operations and resource allocation).

Flooding (including fluvial erosion/dam breech/inundation): High
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. Rainstorms are the cause of most flooding in Groton. 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.

Previous experiences have proven to the town that flooding is the greatest risk and another flood event is probable. 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 Caledonia 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).*

4.2 Infrastructure

Flooding is the highest risk profiled hazard and town infrastructure has high vulnerability to damage during major flood events. Town assets include:

1. All Town-owned buildings are collectively assessed at $459,000. The largest of these holdings is the Community Building is a combination of town offices, vault and town hall. It is currently valued at $242,600 and land at $17,100.
2. The current Fire Station (mentioned above under discussion) is evaluated at $63,400 and land valued at $18,900. Other fire equipment is valued at $578,320.
3. The town garage on Scott Highway was built in 2009, The current town garage, as well as the former town garage building, are valued at $123,700 collectively. The land is valued at $32,600. The total equipment value is $440,900. The old town garage is now serving as the salt shed.
4. The Frost Ball Field (1.7 acres) is valued at $22,800, Veteran's Memorial Park (1.7 acres) valued at $18,900, Puffer Ball Field (3.8 acres) is valued at $23,700. All of these areas are utilized during the summer and fall. The 67 acres on the Welton Road, purchased for gravel, valued at $113,900, could be utilized for forest management and recreation.

The information presented below summarizes town infrastructure and high vulnerability areas.

4.2.1. Town Highways

The Town Highway Department services the approximately 39+ miles of town road in Groton. Numbered state highways are maintained by the District #7 Highway Garage in St. Johnsbury with personnel located at the Wells River garage on VT Route 302. The day-to-day operation of the Town Highway Department is the responsibility of the Road Commissioner, an elected official for the Town of Groton. The Highway Department budget is overseen by the Selectboard. The Town may, at the discretion of the Selectboard, accept new roads into its care only when constructed according to town standards approved April 5, 2001.

The following is a statistical overview of roads in the Town of Groton. These tables show the range of road types within the town, from highways to unpaved roads. The different road types

have different hazard vulnerabilities. Unpaved roads are more vulnerable to being washed out in a flood or heavy storm, while traffic incidents are more likely to occur on large, arterial roads.

Table 4-2: Town highway mileage by class, Town of Groton

Class 1	Class 2	Class 3	Class 4	State Hwy	Total 1, 2, 3, State Hwy
0	6.87	24.12	10.63	15.08	56.7

Source: data derived from VTrans GIS data –Groton Town Plan

4.2.2. Bridges, Culverts, and Dams

The Town of Groton's Road Commissioner has done a thorough job of maintaining an inventory of the town's road infrastructure on Vermont's online bridge and culvert inventory tool (www.vtculverts.org) The online inventory identifies 8 bridges and 18 large culverts (with a diameter of 60" or larger), along with 423 other smaller culverts. The Road Commissioner, along with NVDA, continues to assess all culverts and bridges with proposed replacement and rehabilitation to be scheduled with the Vermont Department of Transportation. Due to the funding structure, municipalities must participate in the regional Transportation Advisory Committee (TAC) to be placed on the priority list, which is reviewed yearly, in order to obtain funding from the bridge and culvert program. The Road Commissioner is currently active in this program.

Bridges:
Scour is by far the primary cause of bridge failures in the United States. Regionally, the vulnerability of bridges to flood damage became evident from the damage seen to Vermont bridges in the 2011 Tropical Storm Irene. Successfully mitigating scour-related problems associated with bridges depends on the ability to reliably estimate scour potential, design effective scour prevention and countermeasures, design safe and economical foundation elements accounting for scour potential, and design reliable and economically feasible monitoring systems. (*Scour Damage to Vermont Bridges and Scour Monitoring: UVM Transportation Research Center Report 15-002 June 10, 2015).*

Culverts:
The Town maintains a culvert inventory that assesses 18 large culverts (with a diameter of 60" or larger), along with 423 other smaller culverts. This data guides the town's culvert maintenance and replacement plan. The PA funding and listed projects provided in this plan explain, specifically, the work that was accomplished to reduce vulnerability to the areas of road listed. The work accomplished as result of the May 2011 flood events have had the greatest impact on reducing vulnerability for town roads as proven by the reduction in damage during the September 2011 flood event.

Dams:
There have been no recent or historically relevant flooding events associated with the failure of any dam in Vermont. However, as stated in FEMA Guide P-956 "*Living with Dams: Know Your Risks*" (2013): "Although dam failures are infrequent, the impacts can be catastrophic, often far

exceeding typical stream or river flood events." Great River Hydro now owns all dams along the Connecticut river. They are required to update and reprint its Emergency Action Plan for the dam every five years pursuant to requirements under the Federal Regulatory Commission (FERC). The plan also maps Breach and Non-Breach Conditions that may occur during a probable maximum flooding event. The exists a robust Planning Tool and notification system to assess and alert, respectively. The Planning Tool is portal-based and includes PDF maps with worst-case scenarios and GIS mapping with layers that allow time-since-breech modeling as well as structures impacted, including bridge decks and homes. The alerting system is based within VTAlert which uses the Everbridge system to alert the public. This methodology shows exceptional success during drills and exercises (96% contact success rate).

The Noyes Pond Dam is a recreational dam and originally built in 1934 and parts of the dam were reconstructed in 1989. A significant hazard dam as rated by the Vermont DEC.

Water, Wastewater and Natural Gas Service Areas

The Town currently has no water, wastewater or natural gas service areas. Water and sewer systems are the sole responsibility of the property owner, and they are required to meet state and federal regulatory standards. Vulnerability is low for the town.

Electric Power Transmission Lines and Telecommunications Land Lines

The electrical power for the town is supplied by Green Mountain Power and Washington Electric Cooperative. There is no scarcity of power. The only power problem is short term, when power is disrupted by storm damage. High-tension electric transmission run through the Town of Groton.

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." *Map 4-1* shows the geographic distribution of some critical facilities and utilities. Table 4-1 identifies critical facilities in Groton, excluding critical facilities designated as hazardous materials storage sites. 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 highly vulnerable during any hazard event.

4.3 Estimating Potential Losses in Designated Hazard Areas

Groton's FIRM is a paper map. Its age and relative lack of detail in some areas make interpretation difficult. A rough digitization shows a significant number of structures that may be located in the floodplain. However, the lack of data in the approximate A zones makes it difficult to tell if many of these structures are actually located in flood prone areas. For example, nearly all structures around Groton and Ricker Ponds area appear to be in the 100-year flood area. Given the fair number of map amendments issued to date (amendments to the flood map that effectively remove structures from the floodplain based on better elevation data), it may be reasonable to assume that not all these structures are actually flood prone. The South Branch of the Wells, the Wells, and the North Branch of the Wells River, may have as many as 30

structures in flood prone areas, and as many as 10 may be located either in or immediately adjacent to the delineated floodway.

Regarding town roads, losses can and have been substantial. With an approximate total cost of $500,000 to repair damages incurred during DR4001 and with a substantial percentage of damage occurring in the designated hazard areas, the town's entire yearly road budget could be exhausted with one event.

Table 4-5: Town of Groton Hazard Risk and Vulnerability Summary

Hazard	Vulnerability	Extent (Storm Data from most severe event)	Impact (economic/health and safety consequence)	Probability
Flood	Culverts, bridges, road infrastructure. 10 critical or public/residential infrastructure in SFHA/.2% FHA	The greatest 24-hour rainfall record for immediate region occurred in late October 31st, 2019 at 3''. The greatest level of precipitation in any month occurred in August 2011 at 11'' No detailed data was available for fluvial erosion damage in town in terms of numbers of acres lost during each event.	The two 2011 flooding events resulted in most damage for the town, over $600,000 in PA was received.	High
Fluvial Erosion	Roads and property adjacent to streams/rivers	Road scouring results from drainage issues. Erosion occurs at shore line but poses little risk.	No current data on erosion	Low

Extreme Cold/ Snow/Ice Storm	The entire planning area is vulnerable, including road infrastructure, town and privately-owned buildings, utility infrastructure	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.	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.	High
Pandemic	The entire planning area is vulnerable in both health and financial stability	COVID-19 has far-exceeded severity of 2009-2010 HINI Pandemic	2020 COVID-19 has resulted in the greatest infectious disease-related financial consequence for the planning area in history	High
Extreme heat/drought	The entire planning area is vulnerable in both human/environmental health and financial stability	The northeast portion of Vermont, has the highest concentrated heat illness vulnerability and heat emergency ratings	Between 2000 and 2017, the number of recorded days per year with a daily temperature high greater than or equal to 85°F peaked during the 2016 summer at 45 days, closely followed by the summer of 2015 at 41 days in Burlington. A heat wave across Vermont in late July 2022 resulted in seven consecutive days of temperatures above 80°F in Groton from July 20 through July 26.	High

			Maximum temperature reached 89°F on July 21st and July 24. At the time of this plan's update, **80.6%** of Caledonia County is in abnormally dry conditions. Crop growth is stunted; planting is delayed. Fire danger is elevated when this occurs.	

SECTION 5: MITIGATION STRATEGY

The greatest advancement in mitigation planning the town has achieved is from the direct experiences in responding to, and recovering from, the major disasters that have impacted the town in the last decade. These disasters, have, to a large extent, redefined how the entire state views and approaches mitigation. The work of state agencies, including those devoted to transportation, planning and emergency management have also changed the way towns go about their day-to-day operations and planning, both in emergency situations and out. It is because of this that the town views this update as the new standard in their mitigation planning efforts. This plan update allows for a continuation of the systematic documentation of mitigation efforts in the next planning cycle. We feel that the implementation matrix captures specific progress in certain areas but more importantly, gives the town a guide from which all future action and updates can be based on.

5.0 Land Use and Development Trends Related to Mitigation

As new and improved floodplain maps are expected in 2023, the town will have an enhanced tool to gauge future development and use areas. Until then, the land use plan represents a broad policy statement of the desired future land uses in Groton and is a summation of all the other surveys, inventories, analyses, and categorical plans which have preceded it. It is also based on surveys of existing conditions and trends and capabilities relative to land use. It is intended to work as a guide to public officials and private citizens in coordinating the future development of the town. It is the document upon which the Town's Zoning Bylaw is based. As a participating municipality in the NFIP, the town is committed, through its zoning laws, to minimize flood vulnerability to the greatest extent possible. Groton's flood hazard regulations are best characterized as minimally compliant with FEMA requirements. The shoreline district zoning preserves the attractive natural features surrounding the ponds and lakes of Groton while permitting seasonal and year-round residential uses. Shoreland includes the land within 500 ft. of the mean water level of ponds and lakes designated on the zoning map.

The current regulations do not prohibit development in the Special Flood Hazard Area, but new development does have to meet certain standards, such as elevation and floodproofing. If an existing residential structure currently in the Special Flood Hazard Area is more than 50% damaged from any cause, the structure is required to be brought into compliance by elevating it to the base flood elevation, prohibiting an enclosed below-grade basement, and allowing for flood waters to flow through basement openings to reduce hydrostatic pressure. Existing non-residential structures more than 50% damaged would need to be flood-proofed to at least the base flood elevation. While minimally compliant flood hazard regulations will allow property owners to purchase flood insurance at more affordable rates, the regulations should not be seen as an effective way to minimize flood risks. The minimally compliant standards still allow development in the Special Flood Hazard Area, so it is possible to cut off access to critical floodplain storage, resulting in increases to the base flood elevations and flood velocities to other properties. In addition to new development, substantial improvements to existing structures are required to meet elevation requirements and floodproofing measures (when applicable to NFIP policy requirements), There have been no changes in development in hazard prone areas that have impacted vulnerability since the last approved plan. Current regulations include:

- Any lots created after the effective date of this bylaw and all lots in excess of 40,000 square feet must comply with the Lot Size Category A requirements.
- The Lot Size-Category B requirements are for the development of existing lots that are larger than 5,000 square feet but smaller than 40,000 square feet.
- These lots may be developed for the purposes permitted in this district as long as such development does not put the property in further non-compliance of the Lot Size Category A requirements.
- For shorefront properties the front yards are considered the shoreline side of the lot. Front yard minimums are to be measured from the mean high-water mark of the pond or lake. Backyards are considered the side toward the primary road and will be measured from the centerline of the traveled portion of the right of way.
- In order to protect the water quality, stabilize the soil, and to prevent erosion, landowners are encouraged to preserve and maintain the natural ground cover.

5.0.1 Future Development and Housing

The town welcomes future development and there have been minor increases in development since 2005. There has been no major increase in new housing development and while the town does not anticipate significant new buildings or infrastructure development in the next planning cycle, promoting a development pattern that honors the tradition of compact village centers surrounded by open countryside will help to reduce energy costs in the long-range. This goal, however, is not without challenges. Given the range of housing options and easy access to multiple job markets, Groton has the potential to attract more families. Those who are drawn to Groton may be looking to enjoy the quiet countryside or to find more affordable housing, despite it being further afield from their place of employment and/or surrounding towns. While Groton may appeal to families and commuters, the region-wide shift to smaller households and an aging demographic also need to be taken into consideration. In general, family households now comprise a smaller share of all households in the Northeast Kingdom, and Groton is no exception to this trend. This is significant because family households – especially married couple

households -- tend to have higher rates of home ownership due to a number of factors, such as dual incomes, better access to credit, and cost-efficiencies from sharing resources. By contrast non-family households now account for a larger share of all households.

5.0.2. Housing

Groton Village has the highest concentration of housing stock (built 1939 or earlier). This is significant because this is where most apartment-type rental units can be found. Aging buildings may have safety issues, such as code compliance or accessibility issues. One way to encourage private property owners to update their rental housing stock may be through tax credits through the Village Center Designation Program. Tax credits are available for code and accessibility work for income producing properties built before 1983. Although the tax credits are awarded on a competitive basis, they are relatively easy to administer, which means that private property owners may find an incentive to create safe and accessible workforce housing. This tax credit program has been used to create market- rate units in other communities. The Town shall periodically review the Zoning Bylaws to ensure they encourage a vibrant array of housing options and allow for appropriate village-scale development.

5.0.3. Roads

Groton receives an appropriation from the state to pay for the maintenance of town highways. This appropriation does not require a match, as long as the municipality spends at least $300 per mile of local tax revenues on its highways. The appropriation is based on the mileage and classification of roads. State grant funds are available for repairs and replacement of bridges and culverts on town highways (Classes 1 through 3). The state share is limited to $175,000 per project. The local share is 20% of the project cost, unless the municipality has done the following

- Adopted the current VTrans Road and Bridge Standards
- Conducted a highway infrastructure study (not less than three years old) which identifies all town culverts, bridges, and identified road problems.

The inventory includes location, size, deficiency/condition, and estimated cost of repair –where the condition is less than acceptable (such as “Fair,” “Poor,” or “Critical).” If both requirements are met, the local share of the project cost drops to 10%. The Town of Groton meets both requirements.

5.1 Groton Town Goals and Policies that support Hazard Mitigation

5.1.1. Flood Resilience Goals:

a. Mitigate Groton’s flood hazards in the most cost-effective manner possible.
b. Minimize the risk exposure and associated expense to Groton taxpayers.
c. Ensure the Town and its facilities are prepared to meet the demands of the next flood.
d. Ensure the Town can receive the maximum outside assistance in the event of the next federally declared disaster.

Planning Policies:

a. Identify and protect Groton's natural flood protection assets, including floodplains, river corridors, other lands adjacent to streams, wetlands, and upland forested cover.
b. The Town will periodically evaluate Groton's flood hazard regulations to ensure at a minimum, ongoing eligibility for flood insurance through the National Flood Insurance Program.
c. The Town recognizes the need to balance flood regulations with the potential impact on property owners. Therefore, the Town prioritizes opportunities to acquire flood prone properties and lands that provide important floodplain function as a compensation for lost use of property. The highest and best use for such lands will likely be passive recreation (i.e., no structures).

5.1.2. Capital Improvement Goals

a. Provide services and facilities deemed necessary for the orderly and rational development of the Town.

b. Assure that the Highway Department has enough funding to fulfill the goals of the following year and in adjunct, increase awareness on eligibility requirements for infrastructure projects under the Hazard Mitigation Grant Program (HMGP).

c. Continue to meet or exceed 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.

d. Continue to update the Town's transportation infrastructure information in the Vermont Online Bridge and Culvert Inventory Tool (vtculverts.org).

e. Replace undersized and failing culverts.

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 community-based meetings, drills and exercises to increase awareness, enhance planning and promote resilience in the community.

5.1.4. Regulatory Devices Goals

a. Continue to amend and enforce zoning bylaws that promote flood protection.

b. Continue participation in the National Flood Insurance Program (NFIP) and reflect or exceed recommendations for best practices accordingly in Zoning Bylaws.

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 protect public health, safety, and welfare by preventing or minimizing hazards to life and property due to flooding, and to ensure that private property owners within designated flood hazard

areas are eligible for flood insurance under the National Flood Insurance Program (NFIP).

b. Follow recommendations associated with a "No Adverse Impact" methodology in land use decisions.

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 in this plan.

c. The Planning Commission should work with the NVDA 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. The Planning Commission shall also be an active participant in the local management plans for Groton's Natural Areas.

e. With recent FEMA guidance on Climate Resilient Mitigation Actions funded under the HMA program, the town will incorporate recommendations accordingly. In line with the VTrans 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 town 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

f. 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/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
    - Riverbed 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

5.1.6. Policies

a. Through both town and state-level management, 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 the Town Capitol Budget and Road Plan
- Identify and manage pollution, flooding and fluvial erosion hazards along rivers and streams as they arise

5.1.7. Transportation

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 to keep traffic at appropriate speeds and timely maintenance, 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.

e. Ensuring that owners and managers of recreational areas provide and maintain adequate and safe parking facilities.

f. Continuing long term access opportunities to gravel and sand deposits for future road maintenance use.

g. Consider implementation of a formal tracking mechanism by-which all infrastructure work is accounted for on a site-by-site basis. The purpose of this is to open funding possibilities under the HMGP.

h. Continue to enhance understanding of the Incident Command Structure (ICS) as means to achieving enhanced communications during a response phase where significant increases in highway department responsibilities are required.

i. Using ICS as a foundation, develop a Standard Operating Procedure for enhanced Highway Department activity (snow and/or flood related) that details the relationship and responsibilities of the Road Commission (Selectboard), Road Foreman and employees that is based on best practices and needs through a collaborative effort.

5.1.8. Utilities and Facilities Goals

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

b. Identify effective locations for tanker truck access to water in portions of town that currently do not have adequate supplies.

c. Promote high-speed internet access throughout town to assist and encourage local businesses to reside in Groton.

d. Identify resources/grant programs that can serve to enhance the equipment resiliency of the fire department.

5.1.9.1 Educational Facilities

a. 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.

5.2 Existing Town of Groton Capabilities 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. Using Better Roads, Structures Grants, FEMA funding streams and its own resources, the town has been able to enhance its transportation resilience and overall preparedness. By and large, road improvement projects

remain the primary focus for the town. The town will seek local, state and federal resources to address these sites systematically and as new priorities arise in the next five years. Along these lines, the town has adopted Road and Bridge Standards that meet or exceed most recent standards. The 2016 Town Plan has Flood Resilience sections and has updated its Local Emergency Operations Plan. The town participates in the NFIP and has Zoning Regulations that reflect its commitment to mitigating flood risk. Prior to the issuance of any zoning permit the Zoning Administrator shall first satisfy himself that the subject of the application is in conformance with this bylaw. Any proposed use or structure in the flood hazard area must meet all the standards and criteria for development in the zoning district it is located, after which it must meet the requirements of these flood hazard area regulations. The towns Emergency Management Coordinator is active in attending drills and exercises and the school has a crisis planning team and the technology to alert residents of emergencies related to school operations and potentially, all-hazards. Table 5-1 further identifies existing mitigation actions with suggestions for next steps, when applicable.

Table 5-1: Existing municipal capabiliites that support hazard mitigation

Type of Existing Protection	Description /Details/Comments	Issues or Concerns	Responsible Party
Emergency Response			
Police Services	Vermont State Police/ Caledonia County Sherriff	None at this time	n/a
Fire Services	Groton VFD	The Rescue Truck was replaced in 2016 and in good operational standing. There is a need for a new tanker/pumper which is being built and be ready by the end of 2022	Selectboard, WVFD
Fire Department Personnel	Groton VFD	Proper training to respond to major highway accidents that may involve hazardous substances.	See above
Fire Department Mutual Aid Agreements	Informal relationship with two bordering towns will continue	None at this time	See above
EMS Services	Calex	Annual contract between town and Calex will continue	Calex
Other Municipal Services			
Highway Services	Town Highway Department	ICS training. Establish SOP with Road Commission in times of heightened response	Road Commission/Foreman
Highway personnel	3 FTE field personnel		See above
Water / Sewer Department	None	None at this time	n/a
Planning and Zoning personnel	Yes	None at this time	Planning Commission/ZA
Residential Building Code / Inspection	No	No requirement for communities to have this.	n/a
Emergency Plans			
Local Emergency Operations Plan (LEOP)	2021	Assure sheltering plans and contact information are up to date and vulnerable populations addressed.	Selectboard. EMD, NVDA
School Emergency/Evacuation Plan(s)	2021	Increased collaboration (with town staff, LEPC, NVDA), knowledge of roles and drills are next step. Investigate	School Crisis Team, selectboard

		logistics of using school notification for all-hazard notification.	
Municipal HAZMAT Plan	None	Not required but enhanced knowledge via HMEP funded transportation study through LEPC would benefit town and fire.	Selectboard, EMD, WVFD
Dam Emergency Plans	Great River Hydro has shared its comprehensive Emergency Response Plan with the Town.	Invite representatives to LEPC and town to increase collaboration. Assure understanding of risk and associated protocol for residents and impacted town infrastructure (if any).	Great Bay Hydro, WVFD, EMD
Shelter, Primary	Groton School	Work with ARC with Sheltering Initiative to obtain training and supplies. Include volunteer staff in planning communication and schedule drills to test efficacy.	EMD, NVDA, Selectboard
Replacement Power, backup generator	Yes, installed	None at this time	See above
Shelter, Secondary:	Union Baptist Church	Assure continued communication lines are open and contacts are correct.	See above
Replacement Power, backup generator	Fire Dept. owns portable generator and can supply church	Need to verify connections, confirm which circuits are powered and have periodic load tests.	See above, WVFD
Municipal Plans			
Town / Municipal Comprehensive Plan	2016	Update in Process	Planning Commision, NVDA
Town of Groton Road Erosion Site Inventory	Scheduled for 2022	NVDA will complete	NVDA, Road Commission, Foreman
Hazard Specific Zoning (slope, wetland, conservation, industrial, etc.)	Yes, 2013 Zoning Bylaws address	Consider formal adoption of no development in SFHA	Planning Commission, ZA
Participation in National Flood Insurance Program (NFIP) and Floodplain/Flood Hazard Area Ordinance	Yes	Continue best practices and a no-adverse-impact policy approach to development.	Zoning board of appeals and Administrator
Culvert and bridge Inventory	2015	https://vtculverts.org/map https://vtculverts.org/bridges#list Keep up to date.	Planning Commission, Foreman

5.3 Town of Groton All-Hazards Mitigation Goals

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

- Reduce at a minimum, and prevent to the maximum extent possible, the loss of life and injury resulting from all hazards.
- Mitigate financial losses and environmental degradation incurred by municipal, educational, residential, commercial, industrial and agricultural establishments due to various hazards.
- 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.

- 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.
- Maintain existing municipal plans, programs and ordinances that directly or indirectly support hazard mitigation.
- Maintain mechanism for formal incorporation of this Local All-Hazards Mitigation Plan into the multi-jurisdictional 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.
- Maintain mechanism for formal incorporation of this Local All-Hazards Mitigation Plan, particularly the recommended mitigation actions, into the town operating and capital plans & programs as they relate to public facilities and infrastructure within political and budgetary feasibility. The Planning Commission will review the plan 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 budgets.

5.4 Mitigation Actions

While the town has seen little change in demographics and/or population, community impact and subsequent needs resulting from the pandemic provided new challenges and insights. Given this new awareness of the social vulnerabilities (e.g., loss of income, aging population, and access to health care) seen with the pandemic in addition to the health risks and that the town has continued to make progress in mitigating risk to the natural hazards, there is an opportunity to shift focus on addressing some lower priority items that serve enhance community resilience in a wholistic manner. In following FEMA guidance, the following mitigation action categories form the basis of the town's future mitigation actions. For each mitigation action to follow, an indication of group will be given with the abbreviations listed 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 Update. Generally, the Town considers its existing capabilities are adequate to address the identified priority hazards in this update. As with most towns in the state, mitigating flood-prone areas is a continuous effort that sees increased attention following a major event. The town remains aware and diligent in keeping up with mitigation actions for all municipal systems. There exists a collaborative spirit that not only is valued but serves to enhance efficiency of action what needs to be done. The Town regards its current hazard mitigation efforts carried out by the road departments as adequate to address winter storm impacts to local roads, however temporary road closure due to winter storms may isolate parts of town. Winter storms are often the cause of the power loss and telecommunications failure. Tree trimming and vegetation management coupled with maintaining adequate repair vehicles and personnel are the primary means of mitigation. However, the town can incorporate the use of public information to support community resilience during a power outage. As part of the strategies defined in this plan, the town will develop a plan for mass communication and, if telecommunication lines are down, a method for alerting residents of the alternate means of information dissemination and/or protocol (e.g., shelter logistics). Major infrastructure that has seen repeated damage due to flooding is a concern for the town and remaining active in identifying priorities, working with State Transportation and Natural Resource Agencies as means to increasing infrastructure resilience is a priority.

Progress in Mitigation Efforts

The resulting mitigation actions taken in response to the events of 2011 have served to protect the town during subsequent flooding events. Integration of these actions for this update are reflected through an altered approach to future mitigation actions. Natural hazards serve as the primary focus moving forward. As the last plan included both social and technological "hazards", upon further analysis, the town has determined that these are topics of vulnerabilities. Progress in Mitigation Efforts

The table below provides status updates on the mitigation actions specific to infrastructure projects listed in the last approved plan. Actions from the previous plan not addressed below have been determined to be low priorities for the city. A low priority action from 2005 is defined by one or more of the following attributes:

- An action that is no longer considered a necessary strategy to mitigate risk by respective experts at the city, state, and or regional level.
- An action that is not feasible or required to maintain daily operations and/or protection systems.
- An action that is not associated with reducing risk to a natural hazard with an acceptable cost-benefit ratio.

Table 5-2: Summary of Progress :

Project/Priority	Mitigation Action	Who is Responsible	Time Frame and Potential Funding	Initial Implementation Steps	2023 Update Status
Alternative well HIGH	Provide a suitable source of public water	The Selectboard and Road Commissioner	2005/6 Rural Development, Community Development Block Grants, PDM-C	Seek appropriate grant source, obtain cost estimate and apply for funding.	Town hall yes.
Install "dry hydrants" HIGH		Fire Chief	2005/6 Rural Development, Fire Grants	Seek appropriate grant source, obtain cost estimate and apply for funding.	Yes
10,000k Generator — portable with a few hookups - HIGH	Need backup supply for public facilities and shelters	Selectboard, Fire chief	2005/6 – EMPG, HMGP, HSU	Seek appropriate grant source, obtain cost estimate and apply for funding.	Town garage portable/fire station (permanent)
Need air packs, fire gear, radios, sand bags	Will provide needed fire safety equipment for volunteer fire fighters	Fire Chief	2005/6 – Fire Grants, HSU grants	Seek appropriate grant source, obtain cost estimate and apply for funding.	Yes
Better communication and cell service including a possible tower	Will help with emergency communication needs	Selectboard, Fire Chief	2005/6 – HSU funds, private sector funding (Verizon, Nextel, Unicel)	Begin requesting service from likely sources. Participate in statewide communications study through HSU.	Still an issue but some minor improvements in select locations
Replace old dam in village	Need village water supply for fire fighting	Selectboard, Fire Chief	2005/6 – Rural Development, HMGP, PDM-	Negotiate with private owner and	Removed

			C, FMA, CDBG, Fire Grants	other likely funding agencies.	
GIS mapping of NFIP areas	Identify flood areas with vulnerable structures consistent with Vermont GIS mapping effort.	Northeastern Vermont Development Association	2006/7 – FEMA FMA funds, HMGP or EMPG funds	Coordinated statewide NFIP mapping effort for all towns.	River corridor maps completed

5.4.2 Specific Mitigation Actions

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

Action #1: Reduce vulnerability to flooding by evaluating capabilities of existing road and storm water management infrastructure, public education and through municipal services and regulations.
Action #2: Improve resilience to severe winter storms.
Action #3: Reduce impact of extreme hot and cold temperature durations.
Action #4: Raise public awareness of hazards and hazard mitigation actions.
Action #5: Reduce risk and impact of pandemic.

5.4.2. 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?

Table 5-2: Groton Action Evaluation and Prioritization Matrix

Scoring: 1=Poor 2=Below Average or unknown 3=Average 4=Above Average 5=Excellent

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. Along these lines and as mentioned in a previous section, several action categories have fallen off from priority for the town and are no longer seen as viable methods, due to capacity and/or efficacy, to mitigate risk of natural hazards for the town.

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 vulnerability to flooding by evaluating capabilities of existing road and storm water management infrastructure, public education and through municipal services and regulations.	5	4	5	2	5	3	3	4	4	35
5	Protect infrastructure and population from extreme temperatures	4	2	4	2	3	2	3	3	2	25
4	Reduce vulnerability to pandemic	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	1	40
3	Improve resilience to severe winter storms	4	3	3	2	4	3	4	3	3	29

5.4.3. Specific Mitigation Actions

With emphasis on nature-based solutions (i.e., "green-engineering), several specific actions described below fall into the nature-based solution category. These sustainable planning, design, environmental management and engineering practices integrate natural features or processes into the built environment to promote adaptation and resilience. When an action is a nature-based solution, "NBS" will be included to denote the association.

Action #1: Reduce vulnerability to flooding by evaluating capabilities of existing road and storm water management infrastructure, public education and through municipal services and regulations.

Group: SP, NRP, PP

Hazard Addressed: Flooding and Severe Winter Storms

Lead Responsible Entity: Town of Groton Road Foreman and Selectboard

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

Timeframe: Summer 2023- Fall 2028

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. Since 2005, 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) Street reconstruction and street resurfacing (NBS) is considered a viable mitigation action and is the most visible part of the capital program for this planning cycle. The rationale for street resurfacing/reconstruction as mitigation is explained and summarized by the belief that through the consistent attention to areas in need, the town is reducing vulnerability to flood/snow-damaged transportation routes by reducing permeability to moisture invasion. The street construction cost shown in the summary by fund does not include any cost for water and sewer infrastructure. Considering road engineering practices (e.g., permeable road surfaces) that enhance green engineering practices will allow the city to mitigate hazard risk while benefiting the environment. 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. Specific projects, numbered by priority (details included in Road Erosion Site Inventory) include:
    1. Powder Spring Rd: Culvert Upgrade (4-8’ box).
    2. Buzzy’s Rd: Straighten curved section of road.
    3. Seyon Pond Rd up to Buzzys: High risk area, runs along the south branch of wells river.
    4. Branch Brook and US 302 always a flood problem. A state road that can impact the town considerably.
3) Documenting – – Develop a methodology that serves to efficiently capture work and expenditures on sites that could benefit from HMGP funding, the town will move forward in mitigating the long-term risk associated with vulnerable infrastructure and its subsequent repair costs. Also, an efficient mapping protocol that combines floodplain areas with zoning, culvert assessments, proposed development and critical facilities is needed and the town will work with NVDA to accomplish this.
4) 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.

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.

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

Group: SP, PP, PEA
Hazard Addressed: Severe winter weather.

Primary Responsible Entities: Town of Groton Selectboard, Planning Commission and Emergency Management Director.

Potential Partner Entities: LEPC, Groton Fire Chief, ARC's Sheltering Initiative Program

Timeframe: Fall 2023- Fall 2028

Funding Requirements and Sources: DEMHS 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. Groton Elementary School has been identified as the primary emergency shelter. The school does have an emergency generator. The Union Baptist Church is the secondary shelter and it does have a generator in place. The Fire Department is the third. 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 (NBS): 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. The town will review its current road equipment plan to assure adequate road and debris clearing capabilities.
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 risk and impact of a pandemic event
Group: PEA, PP, SP
Risk or Hazard Addressed: Risk to infrastructure, environment and residents
Lead Responsible Entities: Town of Groton, ACCD, VDH
Timeframe: Summer 2023- as required
Potential Partner Entities: VEM, FEMA
Funding Requirements and Sources: Pandemic planning funding is secondary to financial stability funding in response to potential economic consequences not known to be a serious consequence of infection mitigation efforts. State and Federal funding are primary sources with limited but important local opportunities.

Specific Identified Tasks:

1) Work with facility leads on understanding risk factors and what can be done to mitigate and enhance training and skills for response, misinformation, and support.
2) Enhance awareness and planning for COVID-19-related mandates, communication, isolation and quarantine logistics for residents, municipal operations and maintaining economic stability.
3) Maintain process for funding acquisition related to COVID-19 for schools, government, impacted residents, and other essential services.
4) Develop and maintain continuity of operations plans for critical government and community services.

Action #3: Protect infrastructure and population from extreme temperatures and drought
Primary Responsible Entities: Groton Planning Commission, NVDA, Emergency Planning services, VDH

Potential Partner Entities: Fire Chief, American Red Cross, Vermont's Medical Reserve Corps (MRC)
Timeframe: 2023 – 2028
Funding Requirements and Sources: Existing programs, contingent on available resources and funding.

Specific Identified Tasks:

Economic Resilience:

- Consider assessing, if feasible, the economic consequences of both extreme cold and heat (with drought) and develop actions steps to best support the community and protect infrastructure/the environment.

Zoning and Permitting Review Considerations:

- Consider stronger ventilation and cooling standards for mixed use development and multi-unit structures with four or more units.
- Enhance and expand availability of publicly available cooling sites. Groton's cooling options will need to serve a range of needs for a diverse population. Some sites will need to be located indoors and operate extended hours.
- Specific mitigation actions to consider:
- Execute an operating agreement with one facility to function as a dedicated cooling site that meets all of the minimum requirements, and at least two of the encouraged amenities
- Promote use of the Vermont Department of Health Cooling Sites map and review the map every time the Local Emergency Management Plan is updated.
- Establish procedures for ensuring that potable water is available for outdoor cooling sites during heat emergencies.
- Work with local housing providers, social service agencies, and the regional planning commission to ensure that cooling options are considered when planning for warming shelters for unhoused populations.
- Improve cooling and ventilation of existing housing stock. Current statewide and regional efforts to weatherize and fuel switch provide an excellent opportunity to address cooling and ventilation as well. Organizations such as HEAT Squad and Northeast Employment Training Organization provide low- and no-cost services to Groton's energy-burdened households.

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.

- Establish a local energy committee or appoint an energy coordinator to help Groton residents become more aware of weatherization and fuel-switching opportunities (NBS)

- Expand on "neighbor-to-neighbor" networks. NEK residents are famously independent and self-reliant, and many individuals will not ask for help, even in more dire situations. The neighbor-to-neighbor efforts that were mobilized during the pandemic response, however, establish a valuable precedent for future emergency responses, including heat emergencies.
- One statewide system that can be used in any community is the Citizens Assistance Registry for Emergencies, CARE (https://e911.vermont.gov/care). Anyone can register in CARE, and it is the responsibility of the local Emergency Management Director to request the CARE database for their municipality as needed. Registration in CARE is typically low, but promoting the use of it annually (such as Town Meeting Day) may help.
- Specific mitigation action to consider:
- Ensure that rental housing management staff, social service agencies, and visiting nurses have relevant and timely information on heat emergencies, including availability of cooling sites.
- Encourage enrollment in CARE.

Drought Planning: The city should consider what, if any, actions should be considered based off best practices related to drought mitigation, state guidance, and risk (NBS).

Rationale / Cost-Benefit Review:
With an increase in extreme weather, there is a need to protect property, the environment, 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. Given the high risk for heat related illness in the city, coordination with VDH and planning for such events is important.

Action #4: Raise public awareness of hazards, hazard mitigation and disaster preparedness.
Lead Responsible Entities: Groton, Fire Chief, VDH, NVDA.

Timeframe: 2023 – 2028

Progress: The Fire Department annually conducts fire preparedness programs and school and family programs related to hazard awareness and disaster preparedness, including providing information on Town Meeting Day. 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) School Programs: 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.
2) Family Programs: Continue family programs, such as car safety seat and bike safety programs, to raise family awareness of hazards, safety, preparedness and prevention.

3) Fire Prevention Programs: Continue National Fire Prevention Week and other programs to raise public awareness of fire hazards, safety, preparedness and prevention.
   a) Continue use of burn bans within the Groton State Forest for reducing wildfires during high-risk conditions
   b) Enhance public education of the risk of wildfires in the Groton State Forest and collaborate with state agencies (e.g., tourism, agriculture) on mixed-media sources to reach the largest audience most efficiently.
   c) Review planning, permitting, and zoning in and around the Groton State Forest to reduce risk. Consider controlling tree cover over new structures to reduce spread in the event of a structure fire.
   d) Explore opportunities through FEMA for Fire Assistance Grants and Post-fire assistance if needed (https://www.fema.gov/disaster/wildfire-actions#:~:text=Through%20FEMA%2C%20fire%20management%20assistance%20is%20available%20to,to%20help%20communities%20mitigate%20and%20respond%20to%20wildfires).
4) Dam Preparedness: Great Bay Hydro has the inundation maps and their own notification procedures which they shared with the city. The city should consider developing an outreach strategy based on likely scenarios and the subsequent properties that would be affected. Consider involving state agencies in planning and/or exercises that focus on the logistical considerations after a dam breach.
5) 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.
6) 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.). Inform the public about severe winter weather impacts with annual outreach related to: traveler emergency preparedness information about severe winter weather hazards and support inclusion of safety strategies for severe weather in driver education classes and materials.

   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.

5.5 Implementation and Monitoring of Mitigation Strategies

5.5.1. Public Involvement Following Plan Approval

After adoption, the city will continue to maintain web-presence of the mitigation plan with an opportunity for community input available on its website. Additionally, the town 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 Day, the town will present mitigation information and provide the public an opportunity to increase understanding and involvement with planning efforts. The city 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 Planning Commission 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. Formal integration into other community planning mechanisms since the last plan update have included the Town Plan related to the necessity of the plan itself and flood resilience measures. Given that the last approved plan was in 2005, there is an enhanced opportunity for more formal integration in other town plans, budgets, and planning. Many of the action items from the 2005 plan have been accomplished due to situational awareness of town officials to pre-existing momentum during the plan development.

5.5.4. Plan Update Process

The Plan update will be led by the Planning Commission Chair or designee. 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. Public participation will follow a similar engagement process that occurred for this update and explained in section 1.7. Through formal planning notification and opportunity for engagement, the public can continue to contribute to town mitigation initiatives. 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 Groton 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. The following table is intended to aid municipal officials in implementing the mitigation actions for Groton, and to facilitate the annual monitoring of the plan.

Table 5-3: Groton All-Hazards Mitigation Plan Implementation Matrix

Action	Responsible Entity	Timeline	Specific Identified Tasks	Annual Progress
Improve road infrastructure and municipal systems protection programs	**Town Road Foreman, PC**	Spring 2023 and each subsequent spring	Infrastructure Assessment for Storm Water Vulnerability	
	Town Road Foreman	Spring 2023 and as-needed related to weather patterns	Assessment for Fluvial Erosion, Landslide Vulnerability	
	Town Road Foreman	As needed during entire planning period	Culvert Upgrades	
	Town Road Foreman and associated municipal systems managers	Ongoing each fall and spring of planning period	Continued Monitoring of Vulnerable Infrastructure	
	Town Road Foreman	Spring 2023-Fall 2028 (each project will be selected based on capability and level of need within the planning period	1. Powder Spring Rd: Culvert Upgrade (4-8' box). 2. Buzzy's Rd: Straighten curved section of road. 3. Seyon Pond Rd up to Buzzys: High risk area, runs along the south branch of wells river. 4. Branch Brook and US 302 always a flood problem. A state	

			road that can impact the town considerably.	
Action	Responsible Entity	Timeline	Specific Identified Tasks	Annual Progress
Maintain and improve resilience to severe winter storms	Town Planning Commission (PC) and **Road Foreman**	Fall 2023 and each subsequent fall	Maintain Existing Shelter Capability	
	PC and **Road Foreman**	Fall 2023 and each subsequent fall	Reduce risk of power failure due to ice storms	
	PC and **Road Foreman**	Winter 2023-Summer 2028	Notification	
	PC and **Fire Chief**	Winter 2023-Fall 2028	Residential Programs	
	Town Road Foreman	Fall 2023 and each subsequent Fall in planning period	Monitor roads for safe and effective plowing	
	Emergency Management Director	Fall 2023-Winter 2028	Increase awareness of ICS structure and recommended practices	
Action	Responsible Entity	Timeline	Specific Identified Tasks	Annual Progress
Reduce impact of extreme cold durations	**PC Chair**, NVDA, School, local/regional	Winter 2023 and ongoing each fall	Economic Resilience	

	assistance organizations.			
	Town EMD and Selectboard	Fall 2023 and ongoing as preparation for winter	Maintain Existing Shelter Capability	
	EMD, NVDA, School, local/regional assistance organizations.	Fall 2023 and ongoing as preparation for winter	Notification and Education	
	Fire Chief, PC,	Fall 2023- Fall 2023	Assess Vulnerable Population	
Action	Responsible Entity	Timeline	Specific Identified Tasks	Annual Progress
Reduce Impact of Extreme Heat	PC	Summer 2023 and ongoing as required	<u>Economic Resilience</u>: • Consider assessing, if feasible, the economic consequences of both extreme cold and heat (with drought) and develop actions steps to best support the community and protect infrastructure/the environment. <u>Zoning and Permitting Review Considerations</u>: • Consider stronger ventilation and cooling standards for mixed use development and multi-unit structures with four or more units. • Enhance and expand availability of publicly	

			available cooling sites. Groton's cooling options will need to serve a range of needs for a diverse population. Some sites will need to be located indoors and operate extended hours. • Specific mitigation actions to consider: • Execute an operating agreement with one facility (gymnasium? Gateway?) to function as a dedicated cooling site that meets all of the minimum requirements, and at least two of the encouraged amenities in Table 1. • Promote use of the Vermont Department of Health Cooling Sites map and review the map every time the Local Emergency Management Plan is updated. • Establish procedures for ensuring that potable water is available for outdoor cooling sites during heat emergencies. • Work with local housing providers, social service agencies, and the regional planning commission to ensure that cooling options are considered when planning for	

			warming shelters for unhoused populations. • Improve cooling and ventilation of existing housing stock. Current statewide and regional efforts to weatherize and fuel switch provide an excellent opportunity to address cooling and ventilation as well. Organizations such as HEAT Squad and Northeast Employment Training Organization provide low- and no-cost services to the Groton's energy-burdened households. <u>Notification and Education</u> – 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. • Establish a local energy committee or appoint an energy coordinator to help Groton residents become more aware of weatherization and fuel-switching opportunities. • Expand on "neighbor-to-neighbor" networks. NEK residents are famously independent and self-reliant, and many individuals will not ask for help, even in more dire situations. The neighbor-to-neighbor efforts that were mobilized during the pandemic response, however, establish a valuable precedent for future emergency responses, including heat emergencies. • One statewide system that can be used in any community is the Citizens Assistance Registry for Emergencies, CARE (https://e911.vermont.gov/care). Anyone can register in CARE, and it is the responsibility of the local Emergency Management Director to request the CARE database for their municipality	

			as needed. Registration in CARE is typically low, but promoting the use of it annually (such as Town Meeting Day) may help. • Specific mitigation action to consider: • Ensure that rental housing management staff, social service agencies, and visiting nurses have relevant and timely information on heat emergencies, including availability of cooling sites. • Encourage enrollment in CARE. Drought Planning: The city should consider what, if any, actions should be considered based off best practices related to drought mitigation, state guidance, and risk.	
Action	Responsible Entity	Timeline	Specific Identified Tasks	
Reduce risk and impact of a pandemic event	**PC,** ACCD, VDH, NVDA, school	Summer 2023-Spring 2023 (as-required)	Work with facility leads on understanding risk factors and what can be done to mitigate and enhance training and skills for response. Explore ESSER funding for school.	
	PC, ACCD, VDH, NVDA	Summer 2023-Spring 2023 (as-required)	Enhance awareness and planning for COVID-19-related mandates, communication, isolation and	

			quarantine logistics for residents, municipal operations and maintaining economic stability	
	PC	Summer 2023-Spring 2023 (as-required)	Develop and maintain continuity of operations plans for critical positions	
Action	**Responsible Entity**	**Timeline**	**Specific Identified Tasks**	Annual Progress
Raise public awareness of hazards and hazard mitigation actions	Fire Chief, NVDA, **PC**, EMD	Winter 2023-Spring 2024	Hazard Resilience for Property Owners	
	PC	As needed for residents and town	HMGP Awareness	
	Schools	Fall 2023- Fall 2026	School Programs	
	PC, Clerks	Fall 2022 and ongoing as needed	Family Programs	
	Fire Chief, PC	Spring 2023 and on-going as needed	Fire Prevention Programs a) Continue use of burn bans within the Groton State Forest for reducing wildfires during high-risk conditions b) Enhance public education of the risk of wildfires in the Groton State Forest and collaborate with state agencies (e.g., tourism, agriculture) on	

			mixed-media sources to reach the largest audience most efficiently. c) Review planning, permitting, and zoning in and around the Groton State Forest to reduce risk. Consider controlling tree cover over new structures to reduce spread in the event of a structure fire. d) Explore opportunities through FEMA for Fire Assistance Grants and Post-fire assistance if needed.	
	Fire Chief	Summer 2023 on on-going as needed	Other Hazard Awareness Programs	

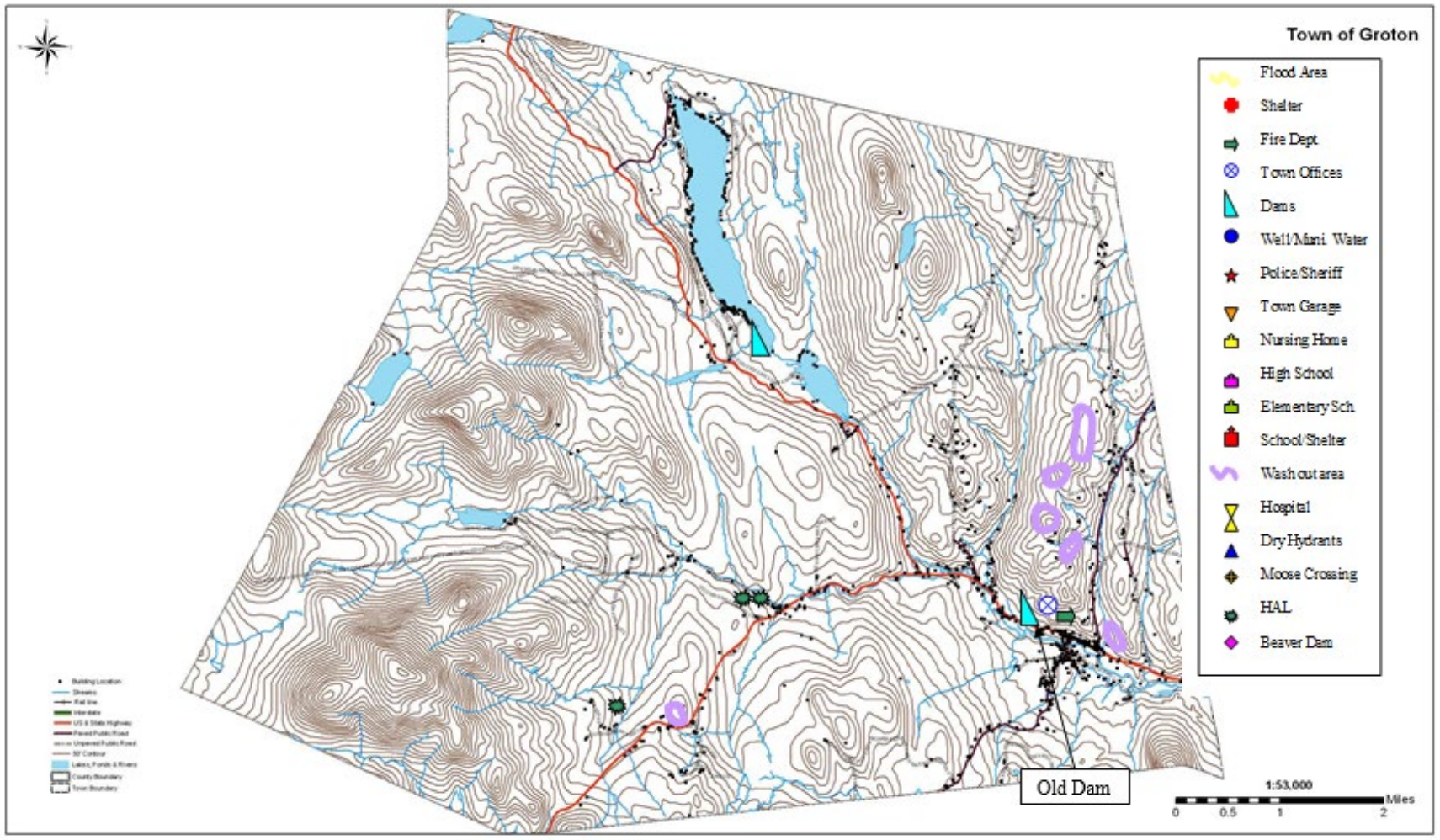
APPENDICES

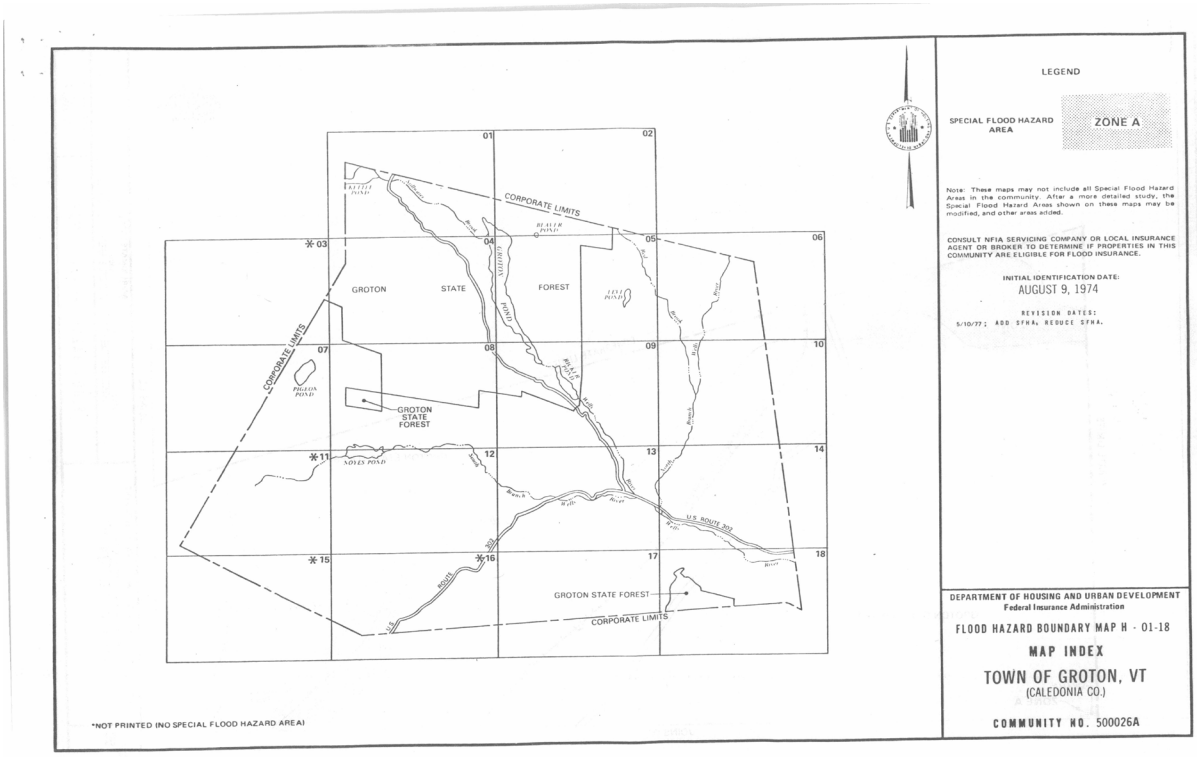
Appendix A: Local Areas of Concern Map and Essential Facilities and Floodplain Map

Appendix B: Community Survey

Appendix A: Local Areas of Concern Map and Essential Facilities and Floodplain Map: Town of Groton

Local Areas of Concern Map and Essential Facilities Map:




LEGEND
SPECIAL FLOOD HAZARD AREA
ZONE A
Note: These maps may not include all Special Flood Hazard Areas in the community. After a more detailed study, the Special Flood Hazard Areas shown on these maps may be modified, and other areas added.
CONSULT NFIA SERVICING COMPANY OR LOCAL INSURANCE AGENT OR BROKER TO DETERMINE IF PROPERTIES IN THIS COMMUNITY ARE ELIGIBLE FOR FLOOD INSURANCE.
INITIAL IDENTIFICATION DATE:
AUGUST 9, 1974
REVISION DATES:
5/10/77; ADD SFHA, REDUCE SFHA.
CORPORATE LIMITS
GROTON STATE FOREST
GROTON STATE FOREST
CORPORATE LIMITS
U.S. ROUTE 302
ROUTE 232
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
*NOT PRINTED INO SPECIAL FLOOD HAZARD AREA)
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration
FLOOD HAZARD BOUNDARY MAP H - 01-18
MAP INDEX
TOWN OF GROTON, VT
(CALEDONIA CO.)
COMMUNITY NO. 500026A

Appendix B: Community Survey (Select Questions Presented)

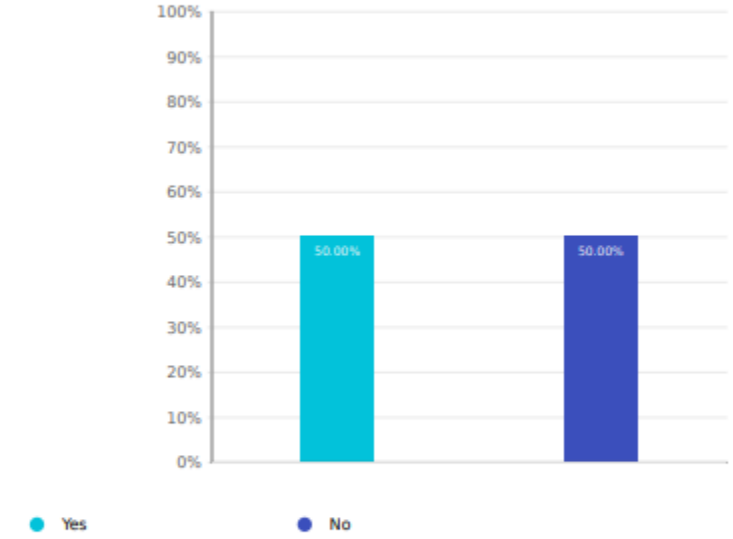
Groton Hazard Mitigation Survey

Our aim is to gather community input on natural disaster in the town of Groton and their impact on the citizens of Groton.

Q1

Have you ever been impacted physically or financially by a natural disaster in Groton?

Answered: 2 Skipped: 0

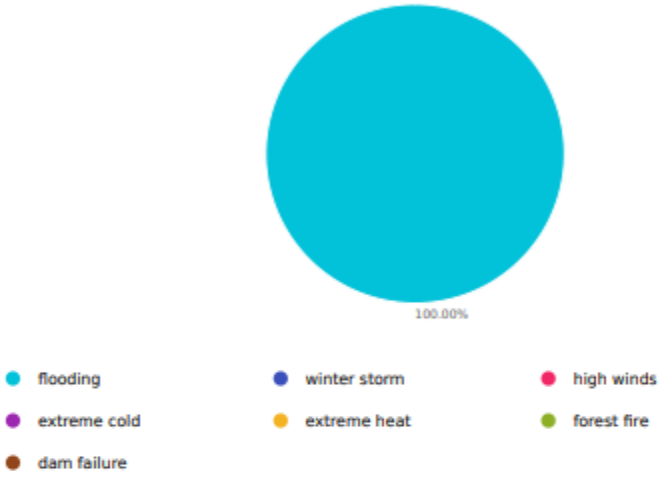


Choices	Response percent	Response count
Yes	50.00%	1
No	50.00%	1

Q2

Which Hazard was the cause of the disaster you experienced in Groton?

Answered: 1 Skipped: 1



Choices	Response percent	Response count
flooding	100.00%	1
winter storm	0.00%	0
high winds	0.00%	0
extreme cold	0.00%	0
extreme heat	0.00%	0
forest fire	0.00%	0
dam failure	0.00%	0

Q6

In terms of vulnerability to hazards, how concerned are you about the following categories?

1. Not concerned
2. Maybe concerned
3. Concerned
4. Very concerned
5. Extremely concerned

Answered: 2 Skipped: 0