# Town of Fairfield, Vermont HAZARD MITIGATION PLAN 2020



Approved by the Town of Fairfield, Selectboard

Originally Adopted: July 13, 2010

Plan Update Approved Pending Adoption: July 6, 2020 Update Adopted: July 13, 2020 FEMA Final Approval Date: September 17, 2020

#### RESOLUTION

Whereas, natural and man-made disasters may occur at any time, we recognize that to lessen the impacts of these disasters we will save resources, property and lives in the Town of Fairfield, Vermont;

And whereas, the Town of Fairfield Hazard Mitigation Plan has been prepared in accordance with FEMA requirements at 44 C.F.R. 201.6;

And whereas the creation of the Town of Fairfield Hazard Mitigation Plan is necessary for the development of a risk assessment and effective mitigation strategy;

And whereas, the Town of Fairfield is committed to the mitigation goals and measures as presented in this plan;

And whereas, the respective officials identified in the mitigation action plan are hereby directed to pursue implementation of the recommended actions assigned to them.

And whereas, the respective officials identified in the mitigation action plan are hereby directed to pursue implementation of the recommended actions assigned to them.

Therefore, the Town of Fairfield Select Board hereby adopts the 2020 Fairfield Hazard Mitigation Plan.

AUTHORIZING SIGNATURES

Date: 13 2020 cn Selectboard Chair Selectboard

Selectboard

Selectboard

Selectboard

### **TABLE OF CONTENTS**

1.	INTRODUCTION	4
2.	METHODOLOGY	4
3.	COMMUNITY PROFILE	8
4.	RISK ASSESSMENT	.12
5.	ASSESSING VULNERABILITY	.32
6.	MITIGATION STRATEGY	.37
7.	PLAN IMPLEMENTATION, MONITORING & EVALUATION	.44

#### ACKNOWLEDGEMENTS

#### **Project Steering Committee**

Tom Howrigan - Fairfield Selectboard

Amanda Forbes - Fairfield Town Clerk (former)

Tim Corey - Fairfield Fire Chief

Jim Smith - Public

Maurice Jette- Fairfield Road Foreman

#### **Project Coordinator:**

Shaun Coleman - Northwest Regional Planning Commission

#### **Project Participants:**

Town of Fairfield Highway Department Town of Fairfield Town Clerk Northwest Regional Planning Commission Northwest Regional Planning Commission GIS Local Emergency Planning Committee (Franklin County) Town of Fairfield Fire Departments Vermont Agency of Transportation District 8 Vermont Emergency Management Vermont Agency of Natural Resources Vermont Homeland Security Department Vermont Fire Academy Northeast States Emergency Consortium Federal Emergency Management Agency National Weather Service Vermont Geological Survey

This plan should be considered a plan in work due to the continual changing environment in which these hazards present themselves. This plan must also be reviewed and adjusted as growth in population, industry, and overall community demographics change.

#### 1. INTRODUCTION

This is the Hazard Mitigation Plan for the Town of Fairfield, Vermont.

The impact of expected, but unpredictable natural and human-caused events can be reduced through community planning. The goal of this plan is to provide an all-hazards local mitigation strategy that makes the communities of Franklin County more disaster resistant.

Hazard Mitigation is any sustained action that reduces or eliminates long-term risk to people and property from natural and human-caused hazards and their effects. Based on the results of previous Project Impact efforts, FEMA and state agencies have come to recognize that it is less expensive to prevent disasters than to repeatedly repair damage after a disaster has struck. This plan recognizes that communities have opportunities to identify mitigation strategies and measures during all of the other phases of Emergency Management – Preparedness, Response and Recovery. Hazards cannot be eliminated, but it is possible to determine what the hazards are, where the hazards are most severe and identify local actions that can be taken to reduce the severity of the hazard.

Hazard Mitigations Strategies and Measures **alter** the hazard by eliminating or reducing the frequency of occurrence, **avert** the hazard by redirecting the impact by means of a structure or land treatment, **adapt** to the hazard by modifying structures or standards or **avoid** the hazard by stopping or limiting development and could include projects such as:

- Flood-proofing structures
- Tying down propane/fuel tanks in flood-prone areas
- Elevating furnaces and water heaters
- Identifying & modifying high traffic incident locations and routes
- Ensuring adequate water supply
- Elevating structures or utilities above flood levels
- Identifying & upgrading undersized culverts
- Proactive land use planning for floodplains and other flood-prone areas
- Proper road maintenance and construction
- Ensuring critical facilities are safely located
- Buyout & relocation of structures in harm's way
- Establish & enforce appropriate building codes
- Public information

#### 2. METHODOLOGY

#### Plan Update Process

This is an update to the 2008 Town of Fairfield, Vermont Hazard Mitigation Plan. The Plan was originally adopted by the Town on January 13, 2010 following notice from FEMA Region 1 that the plan was "Approved Pending Adoption". NRPC staff has worked with the Town to update the Plan.

The Town Emergency Management Coordinator Amanda Forbes, coordinated the Fairfield Local Hazard Mitigation Plan update process. During the process, municipal officials were interviewed including the Selectboard Chair Tom Howrigan, Road Foreman Maurice Jette, Fire Chief Tim Corey, former Transportation District Administrator James Smith, members of the Road Crew and Northwest Regional Planning Commission Planner Shaun Coleman. The interviews identified commonalities related to natural, man-made hazards and identified key long and short-term strategies/activities to reduce risks from these hazards. Preparation of the meeting included a review of the Fairfield Municipal Plan, the Fairfield Hazard Mitigation Plan, Fairfield Zoning Regulations, Fairfield Local Emergency Management Plan and the Town's Road Erosion Inventory. Information from these sources is incorporated into the various sections of this plan.

The first meeting was held with the hazard mitigation committee on September 26, 2019 at the Fairfield Town Office. The committee reviewed the previous plan, including the risk assessment section, provided updates to the status of mitigations actions, reviewed progress on actions since the last plan, disaster resilience initiatives and an overview of the Vermont Emergency Relief Assistance Fund requirements. Several mitigation projects and strategies for implementation were identified. Following the meeting, a draft update was developed. The second meeting was held with the hazard mitigation committee on December 12, 2019 at the Fairfield Town Office. The road crew members and Selectboard Chair were not present. The draft plan update was reviewed. Actions and strategies were finalized.

All meeting agendas were posted at 3 locations in the municipality in compliance with the requirements of Vermont Open Meeting Law. All meetings were chaired by the Town Emergency Management Coordinator Amanda Forbes. Hard copies of drafts discussed at meetings were made available to the public and upon request. No comments were received.

A draft of the plan was posted for public comment on the NRPC and Town websites between February 13, 2020 and February 28, 2020. Draft copies of the Plan were also sent to the town clerks of all neighboring communities of Bakersfield, Enosburgh, Sheldon, St. Albans Town, Fletcher, Fairfax and Swanton on February 13, 2020. Comments were requested to be sent to NRPC Planner Shaun Coleman by February 28, 2020. No comments were received.

#### Incorporation of Existing Plans, Studies, Reports and Technical Information

Mitigation plans from around the country, current State Mitigation Plans, FEMA planning standards, the FEMA Flood Mitigation Assistance Program requirements and the National Flood Insurance Program's Community Rating System were examined. Other materials examined consisted of community plans, including:

- Town of Fairfield, Vermont Town Plan 2015
- Town of Fairfield, Subdivision and Zoning Bylaws 2012
- State of Vermont Hazard Mitigation Plan 2018
- Vermont Agency of Natural Resources Corridor Planning Project and Phase 2 Stream Geomorphic
- Assessment Wanzer Brook Watershed., Fairfield, VT (2005)
- Town of Fairfield Emergency Management Plan 2019
- Town of Fairfield Flood Insurance Rate Maps 1985
- Northwest Regional Planning Commission Regional Plan 2016

A complete list of references may be found in Attachment F.

#### Hazard Specific Research

The project coordinator collected data and compiled research on seventeen hazards: severe winter storm (ice storm), flooding/ fluvial erosion, severe thunderstorms(lightning, high winds, hail) loss of electrical service, structure fire, hazardous materials, hail, drought, water service loss, telecommunications systems failure, tornado, earthquake, major fire – wildland, civil disturbance, terrorism/WMD. Research materials came from local, state and federal agencies including FEMA, NOAA, DOT. Research was also conducted by referencing historical local newspapers, texts, interviewing residents, and scientific documents. Internet references were widely utilized in historical research applications. Current mitigation activities, resources, programs, and potential action items from research materials and stakeholder interviews were also identified.

During the plan development process, municipal officials were interviewed including the Emergency Management Director, Emergency Management Coordinator, Select Board members, Highway Foreman Fire Chief and local residents. The interviews identified commonalities related to natural, man-made and hazardous materials hazards and identified key long and short-term strategies/activities to reduce risk from these hazards.

The draft was then finalized and submitted to Vermont Emergency Management (VEM) and FEMA for review. After receiving FEMA's "Approval Pending Adoption", the plan will go before the Selectboard for adoption.

The Steering Committee recognizes the need for greater public involvement in future updates of the plan. Notices of specific Hazard Mitigation Steering Committee meetings will be warned in local newspapers, websites, etc.

Additionally, continuing efforts will be made to outreach to businesses, nonprofits and other interested parties. Such groups will be encouraged to become involved in the planning process. The Local Emergency Planning Committee (LEPC) for Franklin County is comprised of representatives from these groups. Based on demographics of the county, outreaching to the LEPC would be a logical step. During future plan updates, The LEPC will be briefed during their regularly scheduled meetings and asked to provide comments on the plan. In order to gain greater participation from neighboring communities during future updates of the plan, copies will be made available at the Town Offices of neighboring communities with an open 30-day comment period and neighboring community planning commissions will be asked to review and submit comments to the plan.

The plan has been reorganized with the following sections updated/added during the process:

Section of Plan	Changes Made
1. Introduction	None.
2. Purpose	Purpose explains benefits of plan.
	Note: Section 2 was Methodology. Methodology Section was renamed to Planning Process and moved to Section 4. Methodology for original (2008) LHMP was removed.
3. Community Profile	Census data and other information updated with information from Municipal Plan and US Census. Maps added.
4. Planning Process	Additional details on process including: names of individuals involved, meeting locations and dates, plan update process, added list of sections updated, and table on status of the town's current mitigation actions added.
5. Community Hazard Inventory and Risk Assessment	List of hazards was consolidated. Risk assessment table added, local hazard information updated, data tables added. Maps added.
6. Assessing Vulnerability	Added maps and more information on SFHA, Repetitive Loss Properties, updated critical facilities, updated market value of structures, updated NFIP participation information and added development trends data.

#### Table 2.1 Fairfield, VT LHMP Update

7. Mitigation Strategy	Updated Mitigation goals, cost-benefit, updated town policies and plans table and updated language on Flooding and Development Regulations.
8. Plan Implementation, Monitoring & Evaluation	General updates including details on routine plan maintenance and methods to continue public involvement.
9. Appendices	Maps updated with new data, tables updated, sources updated.

#### Progress Since 2008

The plan update was revised to address changes in priorities however the focus remains on flooding/fluvial erosion, severe winter storms (ice storm) and severe thunderstorms (high winds, lightning, hail). Many of the actions identified in the previous plan were completed or were determined to be response actions and not mitigation actions. Changes in staff and local elected officials have brought a change in priorities. New vulnerabilities were identified and are listed in the Prioritized Mitigation Action Table in Section 6. The following table provides an overview of Fairfield's local hazard mitigation actions from the 2008 along with their current status. Note that mitigation actions which are completed have been deleted from the Mitigation Actions & Projects Table in Section 6 of this plan.

Table 2.2 Status of Hazard Willigation Actions					
Mitigation Action	Status				
Emergency response training for public safety	<b>Removed.</b> This is an on-going "Preparedness" activity and not a "Mitigation" action and has				
personner	been removed from the plan.				
Address Ryan Road (TH31) shoulder failure due to flooding.	Completed.				
Bruso Road (TH71) and bridge (B44) upgrade to address flooding issues	<b>On-Going.</b> Was awarded through FEMA mitigation grant but FEMA required more information on BCA. SHMO was working with BCA engineer to provide FEMA with more information but status with award is still unknown.				
Chester Arthur Road (TH2) steel beam bridge (B51) replacement	<b>Incomplete:</b> Bridge is narrow but is holding up well.				
Construct new fire station in Fairfield Center	Completed.				
Procure and install generator at Fairfield School	Completed.				
Maintain compliance with NFIP regulations	<b>Removed:</b> This action is considered a "Preparedness" activity and not "Mitigation".				
North Road (TH1) culvert replacement. Install pre-cast concrete structure.	<b>Incomplete.</b> Three structures needed along this stretch of road. High cost for replacement.				
Wanzer Road (TH30) steel beam with timber deck bridge (B48) replacement	Completed.				
Paradee Road (TH29) Ponytruss/ Steel beam bridge (B49) replacement	<b>Incomplete.</b> Currently scoped under state structures program.				
Howrigan Road (TH70) drainage improvements	Completed. Ditches stone lined. Turnouts				
and install new culvert	installed. Culverts upgraded.				
Pumpkin Village Road (TH14) drainage	Completed.				
improvements					

#### **Table 2.2 Status of Hazard Mitigation Actions**

Juaire Road (TH41) drainage improvements.	<b>In Progress.</b> Ditches have been stone-lined. Need to install post form on right side.
South Road (TH 1) Concrete Slab Bridge (B14)	Completed.
replacement	
Lapland Road (TH50) culvert replacement near	Completed. 2019
Romar Road (TH62)	
Implement remaining Black Creek floodplain	Completed. 2009-2015
restoration projects	
Elm Brook Road (TH47) steel beam bridge (#46)	Completed.
replacement.	

The Hazard Mitigation Committee recognizes the need for greater public involvement in future updates of the plan. Notices of specific Hazard Mitigation Steering Committee meetings will be warned in local newspapers, websites, etc. Additionally, efforts will be made to outreach to businesses, academia, nonprofits and other interested parties. Such groups will be encouraged to become involved in the planning process. The Local Emergency Planning Committee (LEPC) for Franklin County is comprised of representatives from these groups. Based on demographics of the county and the rural nature of the greater community, outreaching to the LEPC to gain more input from the public sector was a logical step. Future updates should coincide with Town Meeting Day to gain greater involvement from the public as well.

#### 3. COMMUNITY PROFILE

Fairfield is located in the rolling hills of northwestern Vermont in Franklin County. The Town is bounded by Swanton and St. Albans to the west, Sheldon and Enosburgh to the north, Bakersfield to the east, and Fletcher and Fairfax to the south. The total area of the town is approximately 43,385 acres or 68 square miles (U.S. Census of Population and Housing, 2000).

Residents are quite evenly spread throughout the entire town with many homes representing the core



of important farm operations. Except for a concentration of seasonal housing around Fairfield Pond, the only population centers occur in the Villages of Fairfield and East Fairfield. There are zoning regulations in place, including flood hazard regulations.

#### **Population**

The US Census estimated that the population of Fairfield was 1,896 in 2017. According to the 2013-2017 American Community 5-Year Survey Estimate, there were 959 housing units of which 710 were occupied and 249 were vacant. There are 98 mobile homes in Fairfield.

The 2017 Town wide appraised value of structures is 216,966,977.<sup>1</sup> The median value of a housing unit in the Town of Fairfield is \$230,700 according to the 2013-2017 American Community Survey estimate.

#### Existing Land Use

The Town of Fairfield lies within part of the Black Creek Watershed. The Black Creek, a tributary of the Missisquoi River, flows in a northerly direction through the Towns of Fairfield and Sheldon. Wanzer Brook drains a 7.2-square-mile area of land located in the Towns of Fairfield and Sheldon. All but the northern extent (headwaters) of the watershed is located within Fairfield. Wanzer Brook flows into the Black Creek.

Soils in the town range from thick alluviums along the river to thin soils barely covering some of the rock ridges. These ridge areas are located predominantly in the southeast corner of the town with a few also in the northeast corner.

Extending generally north-south across the western side of the town is zone of predominantly wet and marshy land. Over 2,000 acres of wetlands are scattered across Fairfield. The northern part of this zone is occupied by Fairfield Pond, reserve water supply for the Village of Swanton, and the location of several water-based recreational activities. Running southerly from Fairfield Pond, an extensive swamp cuts across the town. A large portion of this swamp is encompassed in the Fairfield Swamp Waterfowl Area, a State Fish and Game Preserve. Fairfield Swamp is part of the St. Albans recreation/conservation district, and, as such, its only permitted uses are forestry, agriculture, and outdoor recreation.

The major portion of the town, representing nearly seven eighths of its total area, is very evenly divided between agricultural land and woodland. Residents are quite evenly spread throughout the entire town with many homes representing the core of important farm operations. There are about 55 working dairy farms in Fairfield with 36% of the total acreage is in agriculture. Except for a concentration of seasonal housing around Fairfield Pond, the only population centers occur in the Villages of Fairfield and East Fairfield.

Fairfield is situated in the hemlock-white pine-northern hardwood sub-region. The dominant species of this forest type are eastern hemlock, sugar maple, American beech, white ash, and yellow birch. Of the softwoods, Fairfield is comprised predominately of eastern hemlock, eastern white pine, black spruce, northern white cedar, and tamarack.

The maple sugar business has been a catalyst for the protection of hardwood forests. Use of sugar maples for making maple syrup, an important agricultural product in Fairfield, have often motivated landowners to manage forest areas in a monoculture fashion.

#### Future Land Use

Fairfield will gradually change as its population increases during the next five years. This process of change will require important decisions be made with respect to land use, the provision of community services and facilities, increased school enrollments, a more heavily traveled road network, recreational opportunities and the land use and availability of energy resources. The Town has identified the following districts

1) Village Residential District – East Fairfield Village and Fairfield Village are the traditional settlement areas of the Town. The purpose of this district is to support the role of the villages in social and economic activities in the community and to provide for residential, commercial and other compatible development that serves the needs of the Town. Such development

<sup>&</sup>lt;sup>1</sup> Town of Fairfield Grand List 2017.

should occur with densities and uses which will maintain the traditional, social and physical character of the villages including their historic and scenic resources, and which will not exceed the capability of lands, waters, services, and the facilities to absorb such densities.

- 2) Conservation and Recreation District The purpose of this district is to protect those areas which have present or potential capability for recreation. Development in this district must be carefully controlled to protect water quality, scenic beauty, conservation of total environment, and related resources. The Fairfield Swamp Waterfowl Area, Fairfield Pond, and Uplands District in the southeast area of town along the Fletcher and Bakersfield town lines.
- 3) Chester A. Arthur Historical District and Scenic Road The purpose of the district is to preserve Fairfield's heritage for current and future generations, preserve the fragile archaeological record, to make possible the preservation of individual buildings and areas of historical value, and to maintain the scenic nature of Fairfield's roads including the protection of scenic vistas and scenic landscapes and, in particular, those associated with Chester A. Arthur Road.
- 4) Flood Hazard District The purpose of this district is to prevent increase in flooding caused by development in flood hazard areas, to minimize future public and private losses due to floods, and to promote the public health, safety and general welfare. Designation of this district is also required for continued town eligibility in the National Flood Insurance Program. Included are all areas subject to a 1% or greater chance of flooding in any given year as shown on the latest Flood Insurance Rate Maps (FIRM).
- 5) Agricultural District The purpose of this district is to provide for and protect residential, agricultural, forestry and compatible commercial and recreational uses in accordance with the Town Plan. Development densities must be in keeping with the physical capabilities of the land and the availability of planned community facilities and services. Development methods to preserve the rural character and protect the agricultural resources of these areas will be enforced.



Additionally, considerable environmental problems may arise from development on steep slopes presenting hazards to those residing within the areas as well as outside. Slopes greater than 25% present considerable constraints to many types of development. These are characteristically covered by shallow soils often having fragipans which make development more difficult. The necessary cuts and slope stabilization for foundations, parking areas, road access and utilities are expense and often, unless well designed, are unattractive.

Development of steep slopes (over15%) may also be at the expense of the municipality as the costs of road maintenance, runoff maintenance and sedimentation problems are much higher on steep slope areas. School bus and fire service may also be difficult, expensive or even impossible depending on weather conditions.

Development on steep slopes may upset the natural slope repose angle and by removal of vegetation and the injection of effluent by on-site sewage disposal will increase runoff, erosion and the possibility of mass movement or slumping. Slippage of foundations in not uncommon in steep slope areas.

Septic tank disposal fields located on slopes greater than 15% may result in partially treated effluent surfacing and seeping onto the downslope surface causing health hazards and possible nutrient enrichment of surface water, not to mention aesthetic problems. Of the effluent which does remain under the shallow soil characteristics of steep slopes, much of it may flow laterally and result in groundwater contamination or the surfacing of effluent at outcrop or fragipan areas.

Furthermore, development on slopes greater than 15% should be avoided or at minimum carefully performed in order to avoid high environmental and social costs. Runoff and erosion should be carefully controlled during all phases of construction and wastes should be treated off of the steep slope area.

#### Emergency Services

Two volunteer fire departments, Fairfield and East Fairfield, provide fire protection services to the Town. Both are privately funded although the Town occasionally contributes to specific equipment purchases. Fairfield has a mutual aid agreement with other communities within Franklin County, but serves only 4 or 5 of those communities on a regular basis. Law enforcement is provided by the State Police and the Franklin County Sheriff's Department. Medical treatment is provided by ambulance services, doctors, dentists, and the Northwest Medical Center hospital in nearby St. Albans.

#### Energy

Three power companies serve the town of Fairfield: the Vermont Electric Coop, serving the western and northeastern areas; Central VT Public Service Corporation, serving the central and southeastern portions; and the Village of Enosburg Falls Electric Light Department, serving a small area in the northeastern corner. According to the 2010 US Census, fuel oil and kerosene are the most popular home heating fuels and were used by 385 homes (62.1%). Wood is the second most popular home heating fuel with 130 homes (21.0%) and bottled, tank or LP gas is the third most popular home heating fuel with 81 units (13.1%) followed by electricity at 11 units (1.8%), other fuel at 8 units (1.3%), utility gas at 3 units and coal or coke at 2 units (<1.0% each).

#### Water Supply

There are two private water districts in Town; one serving Fairfield Village and one serving East Fairfield. Both are funded through user fees and have not traditionally sought assistance from the Town. Both systems were upgraded in the early 1990's and are not facing immediate upgrade or expansion needs. Throughout the rest of the town, homes are served by individual water systems consisting on wells, springs, etc. It has been noted that during dry periods these individual systems prove to be occasionally inadequate. Wastewater is treated onsite by private systems. There is a potential problem in the villages for the proper disposal of sewage. Careful consideration should be given to alternative sewage treatment methods before a costly centralized sewage treatment plant in installed.

#### **Transportation**

There are 10.3 miles of State Highway in Fairfield, 0.23 miles of Interstate 89, 9.99 miles of Vermont State Highway 36 and 0.11 miles of Vermont State Highway 104. There are 19.96 miles of Class 2 Town Highway, 73.78 miles of Class 3 Town Highway and 13.24 miles of Class 4 Town Highway. The town currently participates in the Road Surface Management System (RSMS); a program to inventory, evaluate and monitor road surfaces and road infrastructure such as culverts and signs. All roads having more than one dwelling have been measured. renamed, and marked in conjunction with the state-wide E-911 emergency system, and 24 VSA, Chapter 61.



Rvan Road Post-Flooding. Note debris in middle ground.

#### 4. RISK ASSESSMENT

Identifying hazards, profiling hazards, estimating losses and assessing vulnerability In the last LHMP for the Town of Fairfield, the NRPC emergency planner and Town of Fairfield EMD collected data and compiled research on hazards including: severe winter storm /ice storm, flooding / fluvial erosion, thunderstorms (high winds, lightning, hail), loss of electrical service, structure fire, hazardous materials, drought, telecommunications systems failure, tornado, earthquake, major fire – wildland, civil disturbance, terrorism/WMD. Research materials came from local, state and federal agencies including FEMA, NOAA, NCDC and DOT. Research was also conducted by referencing historical local newspapers, texts, interviewing residents, and scientific documents. Internet references were widely utilized in historical research applications. Current mitigation activities, resources, programs, and potential action items from research materials and stakeholder interviews were also identified.

The information is based on surveys and interviews with local officials and the best available data sources found from federal, state, regional, and local agencies and departments. The risk and/or impact of several hazards were negligible and the state examination was considered sufficient in justifying the time spent on the analysis.

Hazard identification and risk estimation can be a highly complex, time consuming and very costly effort if sophisticated technical and engineering studies are undertaken. The Town of Fairfield does not have the resources to undertake hazard identification and risk assessment studies to this level of detail. The Town of Fairfield and the Northwest Regional Planning Commission used a module of Mitigation 20/20 software which included a hazard profile matrix (Attachment A) that was used to develop a risk rating for each identified hazard. The matrix is intended to be completed by relying on hazard identification and risk evaluation information that is available as well as the knowledge and judgment of planning participants. Health and safety consequences, property damage, environmental damage and economic disruption are classified as consequences of occurrence of each hazard. The following is a description of the risk characteristics used to classify each hazard primarily based on Mitigation 20/20 program:

#### **Frequency of Occurrence:**

- 1. Rare: Unknown likely to occur in the next 500 years
- 2. Unlikely: Unknown and unlikely to occur in the next 100 years
- 3. Possible: Likely to occur in the next 100 years

- 4. Likely: 25 years or less occurrence
- 5. Highly Likely: Likely to occur once a year or more

#### Magnitude or % Community Impacted:

- 0. Negligible: < 10% of properties damaged.
- 1. Limited: 10% to < 25% of properties damages/Loss of essential facilities/services for up to 7 days/few (<1% of population) injuries possible.
- Critical: 25% to 50% of properties damaged/Loss of essential facilities/services for > 7 days < 14 days/Major (< 10% of population) injuries/few deaths possible.</li>
- 3. Catastrophic: > 50% of properties damaged/ loss of essential facilities/services for > 14 days/Severe (> 10% of population) injuries/multiple deaths possible.

#### Health & Safety Impacts:

- 0. No health and safety impact
- 1. Few injuries or illnesses
- 2. Few fatalities but many injuries or illnesses
- 3. Numerous fatalities

#### **Property Damage:**

- 0. No property damages
- 1. Few properties destroyed or damaged
- 2. Few destroyed but many damaged
- 3. Few damaged but many destroyed
- 4. Many properties destroyed and damaged

#### **Environmental Damage:**

- 0. Little or no environmental damage
- 1. Resources damaged with short term recovery practical
- 2. Resources damaged with long term recovery feasible
- 3. Resources destroyed beyond recovery

#### **Economic:**

- 0. No economic disruption
- 1. Low direct and/or indirect costs
- 2. High direct and low indirect costs
- 3. Low direct and high indirect costs
- 4. High direct and high indirect costs

The risk estimation matrix (See Attachment A) for the Town derives a "relative risk score" using a qualitative process in which to compile estimates of the likely **frequency** of occurrence, the **extent** of the community that would be impacted, and the likely **consequences** in terms of public safety, property damage, economic impacts and harm to environmental resources. The total is considered in this plan to constitute the relative risk score. The hazards with the highest risk score are flooding, severe winter storms, fluvial erosion/landslide and high winds/thunderstorm/lightning. It should be noted that the community's overall risk rating is low (187 out of a possible high of 1,785).

#### Vulnerability Scores

Vulnerability assessments build on the identification of hazards in the community and the risk that the hazards pose to the community. The vulnerability assessment process examines more specifically how the facilities and systems of the Town would be damaged or disrupted by the identified hazard.

The combination of the impact of the hazard and the frequency was used to determine the community vulnerability (risk score) as HIGH, MODERATE or LOW. The vulnerability classifications based on risk scores are as follows:

- 0-24 LOW
- 25-49 MODERATE
- 50-75 HIGH

For example, a flood event is *highly likely* (nearly 100% probability in the next year) in many communities within Franklin County but the degree of impact varies, so a *highly likely* flood with *critical* or *catastrophic* impact rates the community vulnerability as HIGH. A community with a *highly likely* or *likely* (at least one chance in the next 10 years) flood with a *limited* impact would receive a vulnerability rating of MODERATE. The vulnerability of a community having the occurrence of an event as *possible* or *unlikely* with *limited* or *negligible* impact would be LOW.

In order to determine estimated losses due to natural and man-made hazards in Fairfield, each hazard area was analyzed; results are shown below. Human losses were not calculated during this exercise, but could be expected to occur depending on the type and severity of the hazard. Most of these figures exclude both the land value and contents of the structure. The median value of a home in Fairfield is \$230,700 according to the 2013 to 2017 American Community Survey estimates.

A full summary of hazards and impacts is provided in Table 4.1.

Hazard Type	Frequency Of Occurrence	Impact/Magnitude	Risk	Estimated Potential Losses (Dollars)	Vulnerability
Severe Winter Storm / Ice Storm	Highly Likely	Limited to Catastrophic	Moderate to High	n/a	Roads, bridges, commercial and residential structures, seasonal homes, public buildings, (Town Office, Center, Library, cemeteries), school, church, and utilities.
Flooding / Fluvial Erosion	Highly Likely	Limited to Catastrophic	Moderate to High	\$1,745,451	Loss of road access, power loss, telecommunications loss. Roads, bridges, commercial and residential structures, seasonal homes and utilities.
Severe Thunderstorm (High Winds, Lightning, Hail)	Highly Likely	Limited	Moderate	\$4,339,339	Falling limbs and/or trees, power loss, church, school, telecommunications loss, structural damage, crop damage. Commercial and residential structures, seasonal homes, public buildings (Town Office), utilities.
Loss of Electrical Service	Rare	Limited to Critical	Moderate	n/a	Pubic building (Town Office), church, utilities, residential and seasonal homes, commercial structures, including commercial farms.

#### Table 4.1 Summary of Hazards and Impacts for the Town of Fairfield

Structure Fire	Unlikely	Limited	Low	\$461,400	All structure types especially those
Hazardous Materials	Unlikely	Limited	Low	n/a	Residential and seasonal homes, commercial structures, public buildings including Town Office, Public Safety Building, Public Works Building/Garage, Recreation Center, Library Buildings, State Garage, church, school, utilities,
Drought	Rare	Limited to Catastrophic	Low	n/a	and the environment. Commercial structures – farms, livestock, private wells, public structures (water reservoir, water pumping station and wastewater treatment plant), residential and seasonal homes and vulnerable populations.
Telecommunication Systems Failure	Rare	Limited	Low	n/a	Residential structures, seasonal homes, commercial, public buildings (e.g. Town Office) elementary school, utilities. Special needs populations.
Tornado	Rare	Limited	Low	\$3,443,483	Falling limbs and/or trees, power loss, telecommunications loss. Structural damage to residential and seasonal homes, public buildings (Town Office, State Garage, Public Works Building/Garage, Public Safety Building, Recreation Center, State Garage, Water Pumping Station) commercial structures and utilities.
Earthquake	Rare	Limited to Catastrophic	Low	\$2,222,483	Infrastructure (roads, bridges), structural damage to residences, seasonal homes, commercial building, public buildings (Town Office, State Garage, Public Works Building/Garage, Public Safety Building, Rec Center, Water Pumping Station, Water Reservoir), utilities
Major Fire - Wildland	Rare	Limited	Low	n/a	Residential and seasonal homes, commercial structures, utility poles and lines, road closures, fires in rural areas lacking fire breaks.
Terrorism/WMD and Civil Disturbance*	Rare	Limited	Low	n/a	School, public building (Town Office, State Garage, Public Works Building/Garage, Public Safety Building, Rec Center, Water Pumping Station).
Extreme Heat*	Rare	Limited	Low	n/a	Fauna, public health.
Extreme Cold* Hurricane*	Rare Rare	Limited Limited	Low Low	n/a n/a	Fauna, public health.Local and state transportationnetworks. Residences, businesses,Town Office, State Garage, PublicWorks Building/Garage, PublicSafety Building, Rec Center, WaterPumping Station and ElementarySchool.
Infectious Disease	Rare	Limited	Low	n/a	Fauna, public health.
Invasive Species*	Rare	Limited	Low	n/a	Agricultural crops. forests.
Rock Cuts*	Rare	Limited	Low	n/a	State highway 242.
Nuclear Power	Rare	Limited to	Low	n/a	All flora and fauna. Public health,
Plant Failure*		Catastrophic			Agriculture.

Rockslide/Landslide	Rare	Limited	Low	n/a	State Highways 242 and 118.
* 1					

\*Has never occurred.

All the hazards identified in the state hazard mitigation plan were considered. Several of the hazards were studies in depth in the previous Fairfield Hazard Mitigation Plan are summarized in Table 4.1. The Committee decided it is not feasible to study each in depth again as many of the hazards were considered unlikely or rare. The hazards not profiled in this plan update are considered to be unlikely or rare in the Town of Fairfield and therefore will not be profiled in this plan update. Those hazards that are not considered in the local plan may have been profiled in the State Hazard Mitigation Plan. The hazards not addressed in this plan update along with the justification for not including them are outlined in the

following table. The asterisk  $\star$  denotes that the hazards were profiled in the previous LHMP for Fairfield.

Hazard Not Profiled	Justification
Loss of Electrical Service *	Rarely occurs and typically a consequence of other hazards such as winter storm (ice storm). Utilities are privately owned and regulated by public safety board. Town has emergency power generators at public safety building, town highway department, school and a portable is available for the Town Hall.
Structure Fire*	There are on average 3 structure fires in town each year according to Fire Department. The Fire Department has set response procedures they follow structure fires. New construction follows state fire marshal codes.
Hazardous Materials *	There are no large-scale hazmat storage sites or manufacturing facilities in town. Hazardous materials are mostly propane and gasoline. The Town Fire Departments follows set hazmat response protocols should a spill occur.
Drought <sup>*</sup>	Has not occurred in memory. Dry conditions occur briefly in late summer if they occur at all.
Loss of Water & Sewer Service*	Most of the Town relies on private wells. None issue.
Telecommunications Systems Failure*	Typically accompanies another hazard such as power loss, winter storm (ice storm). Telecommunications infrastructure that serves town is privately held.
Tornado*	Has never occurred in Town. Generally profiled under high winds.
Earthquake*	A moderate scale earthquake has never occurred in Town. The Town does not lie near any fault zone. Refer to Vermont State Hazard Mitigation Plan for further information regarding earthquake risk.
Major Fire – Wildland <sup>*</sup>	Large wildland fire complex has never occurred in Town. Small grass fire in spring and summer occur rarely and typically less than an acre in size. Town fire department has response procedures to handle hazard.
Terrorism / WMD and Civil Disturbance*	Has never occurred in Town. Vermont State Police would be primary response agency for any terrorist type incident.
Extreme Heat / Extreme Cold	The Committee agreed that extreme temperatures a non-issue because they are brief in duration if they occur at all. Hot spells in summer and cold snaps in winter are just part of life in Fairfield and not a concern.
Hurricane	The Town is too far north from the Atlantic coast. Vermont does not have any coastline. Tropical storms are profiled under High Winds section.
Infectious Disease Outbreak	Has not occurred in Town. Considered rare.

## Table 4.2 Hazards Not ProfiledHazard Not ProfiledJustification

Invasive Species	Considered rare. Town would rely on state to assist individuals and
	commercial ag producers in mitigation and response to invasive outbreak.
Rock Cuts	None in town.
Nuclear Power Plant	Fairfield is approximately 180 miles northwest from the nearest nuclear
Failure	power plant which is the decommissioned VT Yankee Nuclear Power Plant
	owned by Entergy Nuclear Vermont Yankee, LLC.
Rockslide/Landslide	Do not occur in Town. No areas where rockslides are an issue.

The community has identified and chosen to focus mitigation action items on the following hazards: Severe Winter Storm / Ice Storm, Flooding / Fluvial Erosion, and Severe Thunderstorms (High Wind, Lightning, and Hail). These are the hazards that are most likely to occur in Fairfield Town and are the hazards the town has developed mitigation actions around.

#### **Flooding / Fluvial Erosion**

#### Description:

Historically in Vermont, flooding has been the number one natural disaster in loss of life and property damages. In Fairfield, flooding occurs from significant precipitation from rainstorms and thunderstorms and flash flooding when a large amount of precipitation occurs over a short period of time. Snowmelt due to rapidly warming temperatures can cause localized flooding. In the spring, snowmelt can be exacerbated by heavy rainfall. Ice Jam related flooding occurs when water is blocked by ice accumulation. This can happen due to warming temperatures coupled with heavy rain. Fluvial erosion is streambed and streambank erosion associated with physical adjustment of stream channel dimensions (width and depth). Flooding can occur through fluvial erosion. This happens when fast moving flood waters, typically in steep areas, cause areas of erosion around streams and rivers. Both inundation flooding and fluvial erosion occur naturally in stable, meandering rivers and typically occur as a result of any the conditions mentioned previously.

<u>Impact and Geographic Area of the Hazard:</u> Inundation flooding is when water rises and covers the adjacent low-lying land. The Federal Emergency Management Agency (FEMA) defines a floodplain as an area of land adjacent to lakes and streams that is subject to recurring inundation or high water. Inundation and fluvial erosion may both increase in rate and intensity as a result of human alterations to a river, floodplain, or watershed. For instance, when a beaver dam fails there may be significant, rapid inundation which can occur without warning. Public and private structures and infrastructure become vulnerable when they are located on lands susceptible to inundation and fluvial erosion.

Approximately 43,029 acres of Fairfield lies within the Missisquoi River Basin, and 791 acres (approx.) are located in the southwestern corner of Town are within the Upper Champlain Basin. Flooding is an annual, natural hazard to the residents of Fairfield. Fairfield River, Black Creek, Dead Creek and their tributaries flood each year. Flooding is more predominate in the spring as snow melt and spring rains cause overtopping of banks. Most flash flooding is caused by heavy rain from thunderstorms. Smaller creeks and streams are particularly vulnerable to flash flooding.

Typically, agricultural fields are inundated throughout town. Floodwaters typically recede within 24 hours. Increasingly, floodwaters remain on the fields for 2-3 days before receding. For approximately the last fifteen years, the Black River has flooded more frequently. According to local interviews, as an extreme example, overbank flooding was reported to have occurred thirteen times during 2002. The slower recession is detrimental to the crops and prevents the farmers from returning to the fields for planting and harvesting.

#### Floodplain/River Corridor Mapping

To identify areas prone to fluvial erosion hazards, the Vermont Agency of Natural Resource has identified River Corridors in all Vermont municipalities. River Corridors are based on the individual conditions of streams and rivers including topography and the existence of public infrastructure. River Corridors are not mapped for streams that have a watershed of less than 2 square miles. Instead, the Agency advises using a buffer of 50-feet on each side of a stream with the intention of protecting stream stability and natural flow.

Municipalities may adopt River Corridor maps and regulation as a part of their development regulations. Fairfield has adopted a stream buffer regulation that is similar to state administered River Corridor regulation to ensure that land development does not occur in areas prone to erosion.

The Town of Fairfield has adopted floodplain regulations as part of its zoning bylaw, which conforms to federal requirements for participation in the National Flood Insurance Program (NFIP). Restrictions are intended to protect life and property, and to allow property owners to obtain flood insurance, and mortgages, at affordable rates. These regulations restrict development in 100-year flood zones, as mapped on federal Flood Insurance Rate Maps (FIRMs) available for review at the town clerk's office. While this information is the best available, the hydrology that these maps are based on has not been updated since the 1980s and therefore does not account for shifts in shoreline or effects of development.

Figure 5.1 depicts flood hazards in Fairfield. FEMA Flood Insurance Rate Maps were digitized from the original base maps. Black Creek runs from the east then to the north across Fairfield ultimately draining into the Missisquoi River in the town of Sheldon. The Fairfield River runs from south to north before draining into Black Creek. FEMA is currently in process of creating digital FIRMS for the Missisquoi River watershed. The map shows impacts of flooding primarily to transportation infrastructure and driveways.

The Town of Fairfield has not mapped fluvial erosion hazards. Such data could be used in a GIS overlay analysis to estimate potential losses similar to flood losses. Fluvial erosion hazard maps could be used as a tool for Town planners to guide development away from areas that pose a high risk of erosion.

Extent / Probability:

Flash floods, rain storms and fluvial erosion are all are a locally probable hazard events according to plan participants. Flash floods typically occur during summer when a large thunderstorm or a series of rain storms result in high volumes of rain over a short period of time. Higher-elevation drainage areas and streams are particularly susceptible to flash floods. Flash floods are likely in Fairfield, and potential damage to Route 36, North Road, South Road,

Chester Arthur Road or Duffy Hill Road could limit access to town, as they are the major transportation corridors through the community. Flooding and fluvial erosion are considered highly likely by the town.

The Town Highway system experiences erosion events annually due to periods of high precipitation and run-off along roads including the Paradee Road and Chester Arthur Road. As local drainage structures become overwhelmed during periods of high precipitation, there is the potential that roads could be undermined.

Local interviews noted that extensive bank erosion occurred in selected locations along Black Creek, particularly above the Chester A. Arthur Bridge. Bank erosion was reported to have undermined the few remaining trees on the bank and many large trees have been lost into the river. Associated with bank erosion, the channel has become wider and shallower in recent years. Specific extent data is not available.



Following the Agency of Natural Resources geomorphic assessment data for fluvial erosion hazards, the Black Creek was given a "very high" risk rating. Chester Arthur Road is the area that is at greatest risk in Town. There are 12 residences and one commercial business that could be impacted by stream channel erosion in this area. To mitigate the rates of erosion, riparian buffers of woody vegetation could be cultivated along stream banks. Selective armoring of the lower portions of stream banks would very likely be needed until a dense root system develops. Currently, several working farms within Town utilize buffer strips to mitigate erosion along streams.

There are no stream gauges on the Fairfield River or Black Creek.

A GIS based overlay analysis was conducted using FIRM data with the Vermont E-911 data of structure locations. The results found that there are sixty-three (63) structures within the 100- or 500-year flood plain in Fairfield. Forty-one (41) are camp/bungalows, two (2) are mobile homes, one (1) are classified as a commercial farm, sixteen (16) as single family residential and two (2) as "other". This represents 8% of E-911 surveyed structures within the community.

Estimating flood damage of the structures in the flood zone with 20% damage is \$1,745,451. Cost of repairing or replacing the utilities, roads, bridges, culverts, and contents of structures is not included. Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to remain the same.

 Table 4.3 Estimated Damages to Structures from Flooding (excluding transportation infrastructure)

init astracture)						
Туре	Number	Value Including Land	Damage Estimate			
Residential Homes	16	\$3,527,111	\$705,422			
Seasonal Homes	41	\$4,485,409	\$897,082			
Mobile Homes	2	\$261,114	\$52,223			
Farm	1	\$453,618	\$90,724			

Loss estimates for fluvial erosion hazard are unavailable due to insufficient data. Future plan updates will reflect any changes in data for estimating losses. Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to remain the same as the Town if proactive in addressing the impacts of this hazard.

#### Past Occurrences:

The worst natural flood of historic record occurred in November 1927. During that event, 3.2 inches of rain accumulated in 24 hours with 6.35 inches falling for the entire period. Many homes were destroyed. Barns and livestock were washed away. Other floods of minor impact occurred causing relatively minor damage to the community specifically in 1936 and 1940. Based on discussions with local residents, significant flooding occurred in 1984

The January 15, 1996 winter storm (FEMA 1101-DR) triggered flooding throughout the Town and County. The flooding damaged many roads throughout Town.

During the night of July 14 through to the morning of July 15, 1997, heavy rain fell continuously throughout eastern Franklin County (FEMA-1184-DR). Several roads, bridges and culverts were damaged in Town. There are no records of damage costs available.

In 1998, above average precipitation events occurred in January, March and April. On August 11, 1998, a warm air mass produced a torrential downpour causing widespread flooding in Town. Several roads were closed in Town.

Mild weather produced rain and melting snow on January 24, 1999. The conditions resulted in a few rivers reaching or exceeding their banks during Sunday. In particular, flooding was reported in and around the Fairfield and Bakersfield area.

Based on interviews with local residents, there was also a relatively large flood event which occurred on June 5th, 2002. Several roads were flooded. There are no damage costs available.

There were three flood events in 2004. The Burlington Weather Service reports that 2004 was the third wettest summer on record. Two of these three floods forced temporary closure of Pumpkin Village Road, Paradee Road, Wanzer Road, Ryan Road, Chester A. Arthur Road and Route 36 from Fairfield Center to East Fairfield. The Town Clerk estimated \$4,000 in damages due to the August storms. On September 23, 2004 a disaster declaration (FEMA-1559-DR) was declared due to severe storms and flooding from August 12th through September 12th, 2004. Franklin County was included in the disaster declaration. Flooding occurred as a result of heavy rain produced from Tropical Storm Francis.

A two-day heavy rainfall event occurred on May 18th and 19th, 2006 on very wet antecedent conditions due to previous above normal monthly rainfall. Two-day rainfall amounts of 3 to 5 inches were common in Franklin County with locally more than 6 inches along the western slopes of the Green Mountains at nearby Jay Peak. Widespread flooding occurred from May 19th to the 20th resulting in numerous **Figure 4.2ide Along Back Creek** flooded roads, as well as some road and culvert

washouts.

On June 29, 2006, a series of thunderstorms and tropical like showers passed over Fairfield. Soils were well saturated from previous rain events in June. The storm caused several flooded basements and culverts as well as some minor road washouts along Route 36 between Bakersfield and Fairfield.

On June 4, 2007 (FEMA-1698-DR), and August 24, 2007 (FEMA-1715-DR), Franklin County was on the edge of a strong frontal system that brought heavy rain which damaged road infrastructure.

Between June 14 - 17, 2008, a series of storms affected the entire state (DR 1778). Stronger storms on Monday June 16th produced up to 1-inch hail. These storms also produced heavy rainfall, but were moving more quickly and no flooding resulted. On Tuesday June 17th strong thunderstorms produced pea sized hail and heavy rain in the Trout River basin in northwest Vermont. Flash flooding occurred in the eastern parts of Franklin County.

There have been extended periods of rain in Fairfield during May and June 2009. The town experienced flooding along Ryan Road, Bruso Road, Pumpkin Village, North Road, Juaire Road and Ryan Road closed to traffic several times due to flooding. During these events, the road crew made frequent repairs to the road bed. The Town estimated several thousand dollars in local funds were spent on repairs.

The year 2011 was a record year for flooding in the state of Vermont. The first floods occurred over a two-week period in April and May of 2011 (DR 1995, 4043). These floods impacted the northern half of the state, including the counties of Addison, Chittenden, Essex, Franklin, Grand Isle, Lamoille, Orleans, Washington, and Windham. The damage totaled over \$1.8 million in FEMA assistance. In the spring, heavy rains in late March/early April on top of a deep late season snowpack resulted in riverine flooding and sent Lake Champlain well over the 500-year flood elevation breaking the 140-year-old peak stage elevation. Fairfield received approximately \$100,000 in damages from one brief storm event during this period.

Additionally, flooding and fluvial erosion caused by Tropical Storm Irene was catastrophic, destroying property and taking lives, and again eliciting a disaster declaration (DR-4022). Fairfield was one of a few Vermont communities to not be greatly affected by Irene flood events.

During the period of April 15-18, 2014 severe storms and flooding affected n Caledonia, Essex, Franklin, Lamoille, Orange, Orleans, and Washington Counties in Vermont. A federal declaration was made (DR 4178). In Fairfield, some flooding and washouts occurred on local roads.

October 31 – November 1, 2019: Steady rain developed during the mid to late evening of October 31st and became heavy at times through the early morning hours of November 1st. Rainfall amounts 1.5 to 2 inches were common across much of Vermont with a swath of 2 1/2 to 4 inches across northwest and north central Vermont. Numerous flooded streams, flooded and several washed out roads were reported

in northern Vermont beginning just after midnight on November 1st and several larger rivers flooded as well, including the Lamoille and Missisquoi basins and portions of the Winooski and Mad River basins. In Fairfield many roads had some form of damage as local drainage networks were overwhelmed. Several residents had driveways that needed to be rebuilt. Damages were approximately \$100,000 in Town on roads alone and over \$5 million statewide.

Floods are a reminder to Fairfield residents the power inherent in nature and is an urgent reminder of the need for proper management and appropriate use of critical floodplain areas. Development within floodplains poses significant risks and should generally be avoided. River channels and floodplains function as a single hydrologic unit, periodically transferring floodwaters and sediment from one to the other. Appropriate uses of floodplains are those that can accommodate this cycle. Examples of uses that are appropriate to floodplains include agriculture, open space, and recreation.

#### Severe Winter Storm (Ice Storm)

<u>Description:</u> Severe winter storms with snow, ice and freezing temperatures in various combinations are fairly commonplace in Fairfield. Such storms are accompanied by strong winds creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chill. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Winter storms can cause roofs to collapse and limit access to areas and buildings around Town. Extreme cold often accompanies a severe winter storm or is left in its' wake. Prolonged exposure to the cold can cause

#### Figure 4.3 Snow Loads in Vermont



frostbite or hypothermia and become life-threatening.

Impact and Geographic Area of the Hazard The primary impacts of a winter storms / ice storm typically include disruptions to transportation networks due to fallen limbs and trees, school closings and occasionally telecommunications and power outages. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Even small accumulations of ice may cause extreme hazards along roadways.

Winter storms / ice storms affect the entire Town and generally cause disruptions to public and private services. Construction standards for snow load (see map below) indicate that structures in Fairfield should be built to withstand loads of 50 pounds per square foot. This would indicate an average depth of snow of 40 inches or 10 inches of ice on a square foot of roof surface. At that point, design standards would be exceeded and the structure runs the risk of collapse. Given this standard, a snowstorm which dumped 40 inches of snow or

10 inches of ice would likely result in a few collapsed roofs, especially on structures which are not built to these standards.

The primary impacts of an ice storm typically include disruption to transportation networks due to fallen limbs and trees, school closings and occasionally telecommunications and power outages.

Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Even small accumulations of ice may cause extreme hazards along roadways.

Vulnerable populations, such as the elderly, those dependent on medical equipment and specialized health or physical care, are at risk to all types of winter storms. At are farms and livestock. Barns can

collapse due to heavy snow and ice loads. Dairy cattle are susceptible to mastitis<sup>2</sup> if they are unable to be milked. Many larger dairy farms have stationary or portable PTO driven generators as back-up power for automated milking equipment. At risk are people who use electric heat in their homes when associated power outages occur.

Winter storms with snow, ice and freezing temperatures in various combinations are fairly commonplace in Fairfield. The town is equipped to handle most winter emergencies including keeping roads open and repairing downed infrastructure. The town has access to private machinery, including bulldozers, plows, ATVs and snowmobiles, should they be needed in the event of an emergency.

#### Extent and Probability

The National Weather service defines a blizzard as "a storm which contains large amounts of snow or blowing snow, with winds in excess of 35 mph and visibilities of less than 1/4 mile for an extended period of time (at least 3 hours). Some of the worst historical storms in Franklin County have left snow depths of 38" (March 2017), wind speeds up to 40 mph (January 1998), and ice accumulations of 2-4" (January 1998 and December 2013).

Winter storms/ice storms occur annually833.9"in Fairfield, typically in the form of a931.0"Nor'easter. Nor'easters occur most often1030.1"

Table 4.4. Burlington, VT Top 10 Fall Snowfall Totals							
Sep-Nov							
	Highe	est	Lowest				
Ran k	Snowfal 1	Year(s)	Ran k	Snowfal 1	Year(s)		
1	24.0"	1900	1	0	2009 /1948 /1937 /1915		
2	23.0"	1921	2	0.1"	2004		
3	21.9"	1906	3	0.4"	2010 /1953 /1930		
4	20.4"	2002	4	0.5"	2003 /1946 /1941 /1934 /1918		
5	19.4"	1910	5	0.7"	1999 /1960 /1894		
6	19.2"	1971	6	0.8"	1982		
7	18.8"	1968	7	0.9"	1988 /1929		
8	16.1"	1997	8	1.0"	1931		
9	16.0"	1977	9	1.3"	1964		
10	15.6"	1969	10	1.4"	1939		
		E	Dec-Feb				
1	103.4"	2007-08	1	18.4"	1912-13		
2	97.9"	2010-11	2	20.4"	1979-80		
3	96.9"	1970-71	3	21.9"	1928-29		
4	90.1"	2009-10	4	23.6"	1936-37		
5	81.7"	1965-66	5	24.0"	1898-99		
6	80.7"	2003-04	6	25.0"	1904-05		
7	80.0"	1957-58	7	25.6"	1940-41		
8	79.4"	2008-09	8	26.3"	2011-12		
9	78.6"	1946-47	9	27.0"	1900-01		
10	75.7"	1969-70	10	27.4"	1960-61		
		M	ar - May	y			
1	52.7"	1933	1	0.1"	1945		
2	47.8"	2001	2	1.0"	1903		
3	45.7"	1971	3	2.0"	1910		
4	37.7"	1974	4	2.7"	1927		
5	36.4"	1916	5	3.1"	1934		
6	36.1"	1997	6	3.2"	1991		
7	34.4"	1994	7	3.9"	1946		
8	33.9"	1983	8	4.0"	1905		
9	31.0"	2007/1972	9	4.1"	1915		
10	30.1"	2011	10	4 2"	1921		

in the winter and early spring, but also sometimes during the fall. These storms can leave inches of rain or several feet of snow on the region, and sometimes last for several days.

The National Climatic Data Center reports that Franklin County has experienced 2 major Ice Storm events over the past 22 years. The highest recorded damages were incurred during the 1998 Ice Storm (DR-1201)

<sup>&</sup>lt;sup>2</sup> Mastitis is the inflammation of the mammary gland caused by microorganisms, usually bacteria that invade the udder, multiply and produce toxins that are harmful to the mammary gland.

which impacted most of the northeastern US and resulted in \$1 million in damages to properties in Franklin County. On December 12, 2013 (DR-4163), freezing rain accumulated 1 to 1.25 inches across portions of Franklin County, as well as 1 inch of sleet. There was \$1 million in damages mostly to utility companies that service northern Vermont. The Town of Fairfield was not spared from either event.

The Town is equipped to handle most winter emergencies, including maintaining road accessibility through various snow and debris removal equipment. The Town fleet has dump trucks with plows, wings and sanders. The Town has access to private machinery, including bulldozers, plows, ATVs and snowmobiles, should they be needed in the event of an emergency. Heavy wet snows occurring during early fall and late spring, as well as ice storms, are the cause of most power failures.

Fairfield's recent history has not recorded any loss of life due to the extreme winter weather. These random events are difficult to set a cost to repair or replace any of the structures or utilities affected. Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to remain the same.

The Town's Mitigation Committee classified severe winter storms (ice storms) to be highly likely each year. Every winter there is a winter event where Town residents will have to address snow and ice build-up on personal property and the Town's public works department will have to ensure the roads remain clear of snow and ice.

#### Past Occurrences

Date	Location	Severity Remarks / Description of Area Impacted		
	WINTER STORM (ICE ST	ORM) DISASTER DECLARATIONS		
December 9 -14, 2014	Addison, Chittenden, Franklin, Grand Isle, Orange, and Windsor	DR-4207. Rain and wet snow moved into Vermont midday December 9 and changed to a heavy, wet snow during the evening. A band of moderate snowfall impacted much of central and northern Vermont during the afternoon and evening hours of the 10th, then scattered snow showers ending on the 12th. Total snowfall totals across Vermont ranged from 3-6" in Essex County to 12-20" across the Green Mountains into the Champlain Valley. The heavy, wet nature of the snowfall accounted for snow-loaded trees that resulted in more than 175,000 power outages in the region.		
		This was the 2nd most power outages due to weather in Vermont. Over \$4 million in property damages estimated.		
December 16-20, 2013	Addison, Chittenden, Franklin, Grand Isle, Orange, and Windsor	DR-4163. A wide-spread low-pressure system that brought snow and freezing rain through Ontario, Quebec, and Northern New England. These areas experienced an ice storm that brought wide-spread power outages. Many Towns throughout Franklin County, Vermont were affected by the ice storm. Utility companies responded to over 60,000 customer outages during the week and estimated costs of restoring power at \$7,400,000. In Fairfield the highway department was active keeping roads open and removing ice damaged trees and limbs from local roads. Several residents were without power for several days.		
December 1-5, 2010	Franklin, Lamoille and Chittenden Counties	DR-1951. Wind and snow spread across much of Vermont. Snowfall amounts in northern Vermont exceeded 2 feet across in some locations. Some of the highest amounts included 27		

#### Table 4.5 Town of Fairfield Winter Storm (Ice Storm) Summary

		inches nearby at Jay Peak Ski Resort. Numerous vehicle accidents resulted from the snow-covered roadways and over 35,000 people lost power. Much of the damage was in the form of downed limbs, branches, trees, and some isolated structural damage in the form of blown off roof shingles. The prolonged persistence of strong and gusty winds accounted for the scope of damage across the region.
January 19, 1996	Addison, Bennington, Chittenden, Franklin, Lamoille, Orange, Orleans, Rutland, Washington, Windham, and Windsor	DR 1101. A warming trend produced heavy rains causing rapid snow melt that led to flooding. It is not known what the financial impacts of the storm were to the Town. There were \$3,364,711 in federal public assistance funding made available to the state.
January 6, 1998	Addison, Chittenden, Franklin, Grand Isle, Orange, and Windsor	DR 1201. This storm is referred to as the Ice Strom of 1998, but to the residents of Fairfield, the weather was more akin to a traditional winter storm than an ice storm. Snow turned to freezing rain and produced power outages into the area. It is not known what the financial losses were to the Town as a result of the storm. Public Assistance funding was \$5,899,183.
	WINTER S	TORM (ICE STORM)
February 7, 2020	Statewide	Mixed precipitation of freezing rain and snow made for extremely hazardous travel and led to numerous school closing, early closings of businesses and state government. Also, some 10-20,000 people lost power, especially central and eastern parts of the state. Two-day snowfall across the state was generally 10 to 20 inches. Storm total snowfall of 12 to 18 inches fell across the region with more than two-thirds of that occurring with the second phase on February 7th. Approximately \$20,000 in property damages occurred in the county excluding damages to utilities.
January 19, 2019	Northern and Central Vermont	Snow began during the afternoon of the 19th and ended by early afternoon on the 20th with snow accumulations of 8 to 16+ inches. Winds developed and increased to 10 to 20 mph with gusts in excess of 30 mph late Sunday through Monday causing considerable blowing and drifting of the snow. A widespread snowfall of 10 to 16 inches occurred across Franklin County, some including 13 inches in neighboring Swanton. Approximately \$20,000 in property damages occurred in Franklin County.
January 8-10, 2019	Statewide	Precipitation started as light rain, freezing rain and snow across Vermont during the evening of January 8th, changing to accumulating snow after midnight of January 9th. This was a long duration snow event with a wide range of snowfall amounts with the lowest in the valleys and highest totals along northwest faced higher terrain. Snowfall totals ranged from 6 to 20 inches with 20 inches in neighboring Fletcher to 6 inches in nearby Swanton. Approximately \$25,000 in property damages occurred in Franklin County excluding damages to utilities.
November 15-16, 2018	Northern Vermont	A widespread 6 to 10 inches of snow fell across northwest and north central VT with 3 to 7 inches elsewhere. Numerous schools were closed and numerous vehicle accidents as well. Some specific totals include 12 inches in Fairfield and Swanton and 11 inches in neighboring St. Albans. Approximately \$20,000 in property damages occurred in Franklin County.
March 13, 2018	Statewide	Nor'easter swept across eastern New England on March 13th and remained nearly stationary across eastern Quebec/Nova

		Scotia on the 14th-15th. This allowed a long duration snowfall event across Vermont. The event eventually delivered 8 to 18 inches across Franklin County, with the heaviest occurring during the night of March 13th into the morning hours of the 14th. Some specific snowfall amounts in neighboring communities include: 18 inches in St. Albans and 15 inches in Swanton. Approximately \$10,000 in property damages occurred in Franklin County.
January 12-13, 2018	Statewide	Unusual warm air mixed on January 12 <sup>th</sup> mixed with arctic front overnight delivering an inch or more of precipitation in the form of rain, freezing sleet and snow on the 13 <sup>th</sup> . In northwest Vermont, warm temps caused widespread flooding then 4-8 inches of sleet and snow fell including Fairfield. Some local flooding occurred along the Black River and its tributaries and the flash freeze made traveling hazardous. Approximately \$10,000 in property damages occurred in Franklin County.
March 14-15, 2017	Statewide	Snow developed across Vermont by mid-morning on the 14th and intensified to at least 1 to 3 inches per hour for several hours during the late afternoon and overnight hours before gradually diminishing late on the 15th. There were numerous sites that witnessed 4 to 5 inches per hour snowfall rates for more than one hour. In addition, blizzard to near blizzard conditions developed around the time of the heaviest snowfall and lasted for 3-4 hours. Some specific amounts on abutting communities include; 4 inches in Bakersfield, 30 inches in Fairfax, 24 inches in St. Albans, and 19 inches in Swanton. Brisk winds of 20 to 30 mph contributed to white-out conditions at times with considerable blowing and drifting snow. Approximately \$25,000 in property damages occurred in Franklin County.
February 12, 2017	Statewide	Snow began across Vermont between 10 and 1 pm and fell steadily through the evening hours before slowly tapering during the overnight hours. Although a second wave of snow showers fell across the western slopes of the Green Mountains and portions of Northeast Vermont during the 13th. A widespread 6 to 12 inches of snow fell with some localized higher amounts fell across Vermont. In Franklin County, 8 to 15 inches of snowfall were reported, including the neighboring towns of Swanton where 15 inches were reported and 14 inches in St. Albans. Approximately \$20,000 in property damages occurred in Franklin County.
February 2, 2015	Northern Vermont	A storm system tracked out of the Ohio Valley and into New England in late January 2015. Snowfall across Franklin county was 5 to 8 inches with this event. Some specific snowfall totals in bordering towns with Fairfield included; 7 inches in St. Albans and 6 inches in Swanton. Numerous vehicle accidents were reported in western Franklin County. Approximately \$10,000 in property damages occurred in Franklin County.
March 12-13, 2014	Statewide	A major snowstorm with near blizzard conditions at times impacted portions of northern New York and Vermont on March 12th and lingered into the morning hours of March 13th. In addition to heavy snowfall accumulations, strong northeast- north winds with gusts to 35-40 mph at times caused considerable blowing and drifting of the snow. Snowfall totals across Franklin county were 10 to 15+ inches. Some specific amounts included 13 inches in neighboring St. Albans.

		Approximately \$15,000 in property damages occurred in Franklin County.
February 25, 2010	Central and Northern Vermont	Heavy wet snow fell across the State that resulted in snowfall accumulations of 6 to 30 inches. The weight of the heavy snow accounted for widespread power outages across the region that resulted in upwards of 50,000 customers state-wide without power. Approximately \$5,000 in property damages occurred in Franklin County excluding damage to utilities.
January 2-3, 2010	Central and Northern Vermont	Near record snow fell across the county from a powerful Atlantic storm system. Northwest winds of 15 to 25 mph with higher gusts caused considerable blowing and drifting snow with 4 to 5-foot snow drifts reported. A record 33.1 inches of snow fell at Burlington International Airport in South Burlington.
February 19 – 21, 2009	Northern Vermont	A prolonged flow of cool, moist and unstable air created persistent snow showers across the northern Counties during the afternoon of February 20th and continued until the early morning hours of February 21st. There were significant snowfall amounts (more than 12 inches) observed 1at various ski resorts. From 3 to 8 inches of snowfall accumulated across the Champlain Valley. Approximately \$10,000 in property damages occurred in Franklin County excluding damage to utilities.
January 29, 2009	Franklin County	Snow overspread the State early in the morning and continued into the evening hours. Snowfall accumulations with this storm were generally 8 to 14 inches in the County. There were no reported damages. Approximately \$10,000 in property damages occurred in Franklin County excluding damage to utilities.
February 14, 2007	New England	Known regionally as the "Valentine's Day Storm". A winter storm blanketed most of New England. In Vermont, snow fell heavy at times from late morning through early evening before dissipating during the night. Snowfall rates of 2 to 4 inches per hour and brisk winds of 15 to 25 mph caused near whiteout conditions at times, along with considerable blowing and drifting snow, making roads nearly impassable. Temperatures in the single numbers combined with brisk winds created wind chill values of 10 degrees below zero or colder. In Fairfield, there was 26" of snowfall from the event.
October 20, 2006	Town of Fairfield	A low-pressure system brought cold air to the northern portion of the state. Heavy, wet snow accumulation of 3-6 inches occurred in Fairfield damaging many trees and causing power disruptions.
February 13, 2000	Northern Vermont	A storm system over the Ohio Valley tracked across central New England during Monday, February 14th. Heavy snow fell across the area with accumulations generally between 7 and 14 inches.
April 10, 1996	Statewide	A classic Nor'easter, this system spread snow across the region for nearly two days. The snow tapered off to flurries by late evening on the second day. The heaviest snow fell over and east of the Green Mountains with 7 to 14 inches. In the Champlain Valley 2 to 5 inches fell. The wet snow resulted in some power outages and minor automobile accidents across the state.
February 28, 1995	Northern Vermont County	A low-pressure system which developed in the Ohio Valley resulted in a mixture of snow, sleet, and freezing rain across

		Vermont. Snow accumulations ranged from four to eight inches across much of the County.
March 13-14, 1993	State-wide	One of the worst storms of the century. Known as the "Blizzard of 93", it was one of the most powerful storms (Nor'easters) on record. The system moved up the Eastern Seaboard on the 13th and 14th coming close to breaking pressure and snowfall records in many locations. Snowfall amounts ranged from 10 to 28 inches across the state. Due to the weight of the snow that accumulated over March, there were numerous damage reports of barns and building roofs being damaged or at risk of collapsing.
January 3, 1993	Northern Vermont	A combination of a cold surface and warm moist air aloft created freezing rain and freezing drizzle across the state. Road surfaces throughout Fairfield were covered in "black ice".

The Town's Mitigation Committee classified severe winter storms / ice storms to be highly likely each year. Every winter there is a winter event where Town residents will have to address snow and ice build-up on personal property and the Town's public works department will have to ensure the roads remain clear of snow and ice.

Winter storms affect the entire Town and generally cause disruptions to public and private services. The primary impacts of a storm typically include the disruption to transportation networks, school closings and occasionally telecommunications and power outages. Vulnerable populations such as the elderly, those dependent on medical equipment and specialized health or physical care are at risk to winter storms. Also, at risk are farms and associated structures and livestock. Barns can collapse due to heavy snow loads. Dairy cattle are susceptible to mastitis<sup>3</sup> if they are unable to be milked.

Severe winter storms are accompanied by strong winds creating blizzard conditions with blinding winddriven snow, severe drifting, and dangerous wind chill. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Extreme cold often accompanies a severe winter storm or is left in its wake. Prolonged exposure to the cold can cause frostbite or hypothermia and become life-threatening. Infants and elderly people are most susceptible. Severe winter storms can bring heavy accumulations of ice which can down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Even small accumulations of ice may cause extreme hazards along roadways.

The Town's recent history has not recorded any loss of life due to the extreme winter weather. These random events are difficult to set a cost to repair or replace any of the structures or utilities affected. Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to remain the same.

#### Severe Thunderstorms (High Winds, Hail, Lightning)

#### Description

Thunderstorms are caused by an updraft, which occurs when warm, moist air rises vertically into the atmosphere. The updraft creates a cumulus cloud, which will eventually be the thunderstorm cloud. Severe thunderstorm winds are brief in duration and bring gust in excess of 50 mph. Severe thunderstorms are capable of producing high winds, large hail, lightning, flooding, rains, and tornadoes.

<sup>&</sup>lt;sup>3</sup> Mastitis is the inflammation of the mammary gland caused by microorganisms, usually bacteria, that invade the udder, multiply and produce toxins that are harmful to the mammary gland.

Microbursts are downdrafts from thunderstorm that may reach speeds in excess of 80 mph. (State of Vermont Hazard Mitigation Plan 2018).

The National Weather Service (NWS) issues a wind advisory when winds are sustained at 31 to 39 mph for at least one hour or any gusts 46 to 57 mph. Winds of 58 mph or higher cause the NWS to issue a High Wind Warning. In Vermont, high winds are most often seen accompanying severe thunderstorms. In fact, straight-line winds are often responsible for most of the wind damage associated with a thunderstorm. These winds are often confused with tornadoes because of similar damage and wind speeds.

Impact and Geographic Area of the Hazard

The Town has experienced a variety of high winds from storm systems that develop along ridgelines. Typically, high winds accompany strong thunderstorms that often generate lightning and/or hail. Micro bursts with high wind speeds and high precipitation accumulations over brief periods often down trees and branches and power lines and can overwhelm local drainage networks for brief periods. There are rare instances where lightning has caused structure fires (barns) and grass fires during dry periods.

Beaufort Number	Wind Speed Range (mph)	NOAA Terminology	Description
0	0	Calm	Smoke rises vertically.
1	1-3	Light air	Direction shown by smoke but not by wind vanes
2	4-7	Light breeze	Wind felt on exposed skin; leaves rustle.
3	8-12	Gentle breeze	Leaves and small twigs in constant motion; wind extends light flag.
4	13-18	Moderate breeze	Raises dust and loose paper; small branches are moved.
5	19-24	Fresh breeze	Small trees sway.
6	25-31	Strong breeze	Large branches in motion; umbrellas used with difficulty
7	32-38	Near gale	Whole trees in motion, inconvenience felt when walking against the wind.
8	39-46	Gale	Breaks twigs off trees. Cars veer on road. Generally, impedes progress
9	47-54	Severe Gale	Light structural damage.
10	55-63	Storm	Trees uprooted. Considerable structural damage
11	64-73	Violent Storm	Widespread structural damage.
12	74-95	Hurricane	Considerable and widespread damage to structure

#### **Table 4.6 Beaufort Wind Speeds**

High winds track generally occur from weather systems that track west to east over the Champlain Valley. High winds are common along the Trout River corridor in the eastern part of Town, as well as the foothills of the Green Mountain Range on the eastern border of Town. Additionally, strong winds occur in the hills of the southwest part of town known as the Deep Gibou.

There are no loss estimates for lightning because it is extremely difficult to predict where the event will occur and the type of associated structural damage. Damages could come in the form of destroyed electrical appliances, structure fires, or wildland fires. Death or serious injury could occur to individuals exposed to lightning. Private properties in Fairfield have experienced lightning strikes. High elevations and areas around bodies of water such as lakes and ponds are more susceptible. Fairfield's road crew is equipped with associated debris removal equipment.

High winds are a hazardous threat to the Town and most commonly accompany other storm events. Violent windstorms are possible in Fairfield. The Town is far inland and is unlikely to receive a direct hit from a hurricane, however high winds and hail storms have occurred in Town as weakened tropical storms track near the region. High winds associated with severe thunderstorms affect forested areas, utility lines and exposed property.

#### Extent / Probability

There have been 141 thunderstorm events in the region in the past 58 years according to the National Climatic Data Center. Of those, 77 are classified as severe thunderstorms with wind speeds of 50 kts. or greater. Severe thunderstorms can cause power outages, property damage, transportation interruptions, affect businesses and can cause loss of life. Micro bursts with high wind speeds and high precipitation accumulations over brief periods often down trees and branches and power lines and can overwhelm local drainage networks for brief periods. Micro burst have occurred almost annually in the past 10 years according to project participants.

Lightning strikes in western Franklin County average between 4-6 strikes per square mile each year based on data collected by NASA satellites between 1995 and 2002. Within the Town of Fairfield, these numbers would average between 224 -340 lightning strikes per year. There is very little data on lightning strikes in Town. . There are rare instances where lightning has caused barn fires and grass fires during dry periods. Damages from lightning could come in the form of destroyed electrical appliances, structure fires, or wildland fires. Private properties in Fairfield have experienced lightning strikes. High elevations and areas around bodies of water such as lakes and ponds are more susceptible. The Town's Highway Department has appropriate debris removal equipment.

Micro bursts with high wind speeds and high precipitation accumulations over brief periods have become more frequent during summer months in recent years. Micro bursts often down trees and branches and power lines and can overwhelm local drainage networks for brief periods.

Hailstorms usually occur in Vermont during the summer months and generally accompany passing thunderstorms. While local in nature, these storms are especially significant to area farmers, who can lose entire fields of crops in a single hailstorm. Large hail is also capable of property damage. There have been 64 recorded hail events in Franklin County between 1958 and 2015. Hail is considered a relatively infrequent occurrence. Those hail events that do occur tend to be highly localized and limited to a relatively small area and typically occur with thunderstorms.

It is extremely difficult to predict where the event will occur and the type of associated structural damage. The estimated damage from a severe thunderstorm event occurring to 10% of all structures in Town with 20% damage is \$4,339,339. The estimated cost does not include building contents, land values or damages to utilities. There are no known deaths that have occurred in Town due to severe thunderstorms.

#### Past Occurrences

Dates	Туре	Description	Area	Magnitude	Property
					Damages
3/10/2002	High Wind s	A cold front moved across the area from	Franklin	54 kts.	\$5,000
		Canada and brought strong winds. Trees were	County		
		blown down around Town.			
5/30/2002	Thunderstorm /	A cold front moved southeast from Canada	Fairfield	0.75 in.	\$0.00
	Hail	and triggered late afternoon and evening			
		thunderstorms. Dime size hail was reported in			
		Fairfield.			

Table 4.7 Severe Thunderstorms in Fairfield: Source NCDC

6/9/2004	Thunderstorms High Wind	A cold front tracked slowly across northern New York and Vermont. This front was preceded and accompanied by thunderstorms with damaging winds. Trees and power lines were blown down in many towns including Fairfield.	Franklin County	50 kts.	\$5,000
7/5/2005	Thunderstorms / High Winds	Thunderstorms preceded a cold front that moved into Vermont from Canada. Thunderstorms were severe in Franklin County with dozens of trees blown down damaging cars. Winds were estimated between 58 and 72 mph (between 50 and 63 knots). Power outages were reported in the county.	Franklin County	55 kts.	\$100,000
6/19/2006	Thunderstorms High Winds	Thunderstorms intensified during the day as they moved into the Champlain Valley from Canada. These thunderstorms produced severe weather including downed trees.	County Wide	50 kts.	\$10,000
8/16/2007	Thunderstorms High Winds	A cold front moved across the region from Canada and was accompanied by high winds. Many trees were uprooted	State- wide	60 kts.	\$50,000
6/10/2008	Thunderstorms, High Winds	A cold front brought severe thunderstorms to the area. Numerous trees were damaged, downed or uprooted which caused downed power lines and structural damage to numerous buildings and vehicles throughout the state. Tens of thousands of customers lost power due to the storms, with some outages that lasted several days. Numerous trees were down on Route 118 in Fairfield and a power line fell across a truck. No one was injured.	Fairfield	50 kts.	\$10,000
7/8/2008`	Thunderstorms, High Winds.	Several rounds of thunderstorms moved across northern Vermont during the afternoon of July 18th. A developing squall line across the Champlain Valley of New York moved into northwest Vermont by mid-afternoon and continued across the state. Widespread tree and structural damage occurred with this system in Grand Isle, Franklin, Lamoille and Orleans counties.	Northern Vermont	55 kts.	\$50,000
5/26/2011	Thunderstorms High Winds	Unstable air mass travelled across northern Vermont from the west during the late afternoon producing widespread thunderstorms and damaging winds. Many customers were without power due to downed trees on utility lines.	County wide	50 kts.	\$20,000
6/18/2011	Thunderstorms / Hail	A cold front brought scattered thunderstorm activity across Franklin County. A few of the stronger storms produced large hail greater than an inch diameter,	Fairfield	1.00 in.	\$0.00
7/6/2011	Thunderstorms / High Winds	A well-established squall line moved across the state during the afternoon with numerous reports of wind damage as well as lightning strikes. As a result of these storms, more than 15,000 customers in Vermont lost power.	State- wide	50 kts.	\$5,000
9/8/2012	Thunderstorms High Winds	A squall line of severe thunderstorms developed and pushed east into Vermont. There was isolated minor wind damage in the form of large tree branches knocking out powerlines across town.	County wide	50 kts.	\$25,000
10/29/2012	High Winds	Superstorm Sandy brought high winds along the western slopes of the Green Mountain.	State- wide	50 kts.	\$10,000

		Much of the state experience 50 knot wind speeds. Strong east winds of 25 to 35 mph, enhanced by downslope from the Green Mountains caused frequent wind gusts in excess of 45 mph with isolated wind gusts to 60 mph along western slope communities. Scattered tree limbs, branches and small trees were toppled by these winds, which accounted for scattered power outages as well.			
6/1/2013	Thunderstorms High Winds	A weak disturbance, well ahead of a cold front forecast triggered a few scattered thunderstorms. Damaging winds occurred in Fairfield toppling trees in town. There were brief power interruptions.	County- wide	50 kts.	\$2,000
9/11/2013	Thunderstorms / Hail	A weak area of low pressure resulted in a series of thunderstorms that moved across Vermont during the late afternoon and evening. Some of these thunderstorms produced hail and damaging winds that downed trees and utility lines.	Fairfield	1.00 in.	\$5,000
9/11/2016	Thunderstorms / High Winds	A strong front moved into the area from the west generating damaging winds and lightning. Trees were blown down and parts of northern Franklin County were without power overnight.	County- wide	50kts	\$5,000

#### 5. ASSESSING VULNERABILITY

While Fairfield has identified severe winter storm/ice storm, flooding / fluvial erosion and severe thunderstorms (high wind, lightning, and hail) as its most common hazards, only flooding is covered in the following section. Flooding is the easiest hazard to assess specifically in terms of the vulnerability of both public and private property. Winter storm/ice storm and severe thunderstorms are much more unpredictable in terms of how they may impact property in Fairfield.



#### Structures in the SFHA and River Corridor

There are approximately 61 structures within FEMA-designated Special Flood Hazard Areas (SFHAs)<sup>4</sup>. Properties within SFHAs, that have a mortgage, are required to purchase flood insurance. Fairfield's participation in the National Flood Insurance Program (NFIP) gives residents and business owners access to discount flood insurance through the National Flood Insurance Program. Flood insurance can still be purchased privately; however, it is more expensive. Development in SFHAs must meet additional construction standards as outlined in Fairfield's floodplain regulations.

#### Repetitive Loss Properties

<sup>&</sup>lt;sup>4</sup> Flood Hazard Summary Report for Fairfield, available on VT ANR's Floodready website <a href="https://anrweb.vt.gov/DEC/FoFReports/">https://anrweb.vt.gov/DEC/FoFReports/</a>

According to the State Hazard Mitigation Officer, the Town of Fairfield has no repetitive loss properties. The definition of severe repetitive loss as applied to this program was established in the National Flood Insurance Act. An SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and:

(a) That has at least four NFIP claim payments (including building and contents) over \$5,000 each, and the cumulative amount of such claims payments exceeds \$20,000; or

Table 5.1 Market Value of Structures in Fairfield <sup>1</sup>			
Туре	Number	Value Including Land	
Residential Homes	547	\$120,583,120	
Seasonal Homes	138	\$15,097,230	
Mobile Homes – Unlanded	4	\$47,690	
Mobile Homes - Landed	35	\$4,569,500	
Farms	109	\$49,444,330	
Commercial	15	\$4,889,250	
Commercial Apts	2	\$514,210	
Other (Utilities, Woodland and Miscellaneous)	58	\$21,821,647	
Total Listed Value		\$216,966,977	

(b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

For both (a) and (b) above, at least two of the referenced claims must have occurred within any ten-year period, and must be greater than 10 days apart.<sup>5</sup>

Participation and Compliance with the National Flood Insurance Program (NFIP)

The National Flood Insurance Program (NFIP) is a voluntary program organized by the Federal Emergency Management Agency (FEMA) that includes participation from 20,000 communities nationwide and 247 Vermont towns and cities. Combined with floodplain mapping and floodplain management at the municipal level, the NFIP participation makes affordable flood insurance available to all homeowners, renters, and businesses, regardless of whether they are located in a floodplain.

FEMA published a flood hazard study for the Town of Fairfield in 1976. Flood Insurance Rate Maps (FIRMs) were prepared by FEMA in 1985. Flood hazard areas were identified along the brooks and streams that run through the town. The FIRMs and Study are available for review on-line at FEMA.gov.

<sup>&</sup>lt;sup>5</sup> FEMA <http://www.fema.gov/severe-repetitive-loss-program>

Creation of the Flood Hazard District in the Town's Development Regulations enabled Fairfield to be eligible for FEMA's National Flood Insurance Program (NFIP), which permits residents within the Flood Hazard District to purchase flood insurance. The purpose of the district is to prevent increases in flooding caused by development in flood hazard area, to minimize future public and private losses due to floods, and to promote the public health, safety and general welfare. The Town is committed to enforcing floodplain regulations and ordinances to be eligible to participate in the NFIP program and protect the people and property of Fairfield by restricting development in flood prone areas. Fairfield is a member in good standing with the NFIP (CID 500033). The Town will continue to ensure future compliance with the

NFIP by making sure that local regulations meet NFIP minimums and conducting enforcement as necessary.

The Town works with the elected officials, the State, the Northwest Regional Commission, and FEMA to correct existing compliance issues and prevent any further NFIP compliance issues through continuous communications. training and education.

#### **Critical Facilities**

A critical facility is defined as a facility in either the public or private sector that provides essential products and services to the general public, is



Fairfield Town Office

otherwise necessary to preserve the welfare and quality of life in the appropriate jurisdictions, or fulfills important public safety, emergency response, and/or disaster recovery functions. The current scope of this plan is to address these facilities and associated infrastructure. Once this plan is accepted, there is the possibility to expand the plan to cover other facilities and structures within the community. A complete list for the Town may be found in Attachment B.

#### Existing Planning and Regulatory Capabilities

The Town Clerk, Assistant Clerk and Treasurer positions handle numerous administrative functions ranging from dealing with concerns and inquiries, applying for and administering grants and loans, investigating and implementing cost control measures, reviewing and responding to Selectboard correspondence, responding to state and federal requirements, reviewing expenditures and billings, and acting as liaison between town boards and citizens. The Town Clerk attends all Selectboard meetings and performs whatever duties required by the Board and other duties as assigned. The Town is in the process of hiring a Town Administrator to alleviate some of the administrative burdens carried by current staff.

The Town has a Planning Committee made up of a group of volunteers whose duty is to develop the Municipal Plan which will guide future land use goals and policies. The Town has a part-time Zoning Administrator who handles all zoning related issues. This involves attending all meetings of the Zoning Board, reviewing permits, issuing permits, investigating complaints, and enforcement against violations.

The Town Clerk's Office has also experienced an increase in workload over the past ten years. Deed and document recording and research, issuing various licenses, birth and death certificate recording, tax billing, concerns and general inquiries have all increased as the number of new houses and properties has increased.

The Highway Department's workload has increased from past years due in large part to the increased service expectations of residents. Residents now expect their roads to be plowed sooner, and expect road surfaces to be maintained at a higher level, than they did in past years. The increase frequency of storms has also added to the normal day-to-day maintenance

Emergency response is a significant issue in Fairfax because of the presence of several major agriculture operations in town. During the past few years, the numbers of fire calls responded to by the department have increased due to an increase in motor vehicle accidents. The Town has been successful maintaining their volunteer force unlike other all volunteer departments in the state. It is important to note that training and equipment costs have increased considerably in recent years, and that the larger workload have resulted in higher town expenditures.

#### How the Previous Plan was Integrated into Other Planning Mechanisms

There have been and will continue to be many efforts to improve the resiliency of the Town of Fairfield since the Town formalized hazard mitigation planning efforts. The flood identification and risk section of this plan was used in the development of the 2015 Comprehensive Municipal Plan update to address the flood hazard resiliency requirement of Municipal Planning as required under state statute. It was also used to develop the stream buffer regulation within the Town's Zoning bylaws. The hazard mitigation plan was used for capital budgeting for the highway department for road infrastructure projects to reduce impacts from flooding and fluvial erosion. The plan was used in the planning process for Black Creek and Fairfield River watershed stormwater mitigation activities and to improve community wide disaster resilience with an emphasis on reducing flood risk to municipal, state and private infrastructure. The Plan's hazard identification and risk assessment section will also be referenced each year during the update to the Town's Local Emergency Management Plan for identifying critical infrastructure, risk areas and vulnerable sites.

Since the last mitigation plan, impacts from development on the Town's vulnerability have decreased. There have been no new or proposed developments in the flood plain or in hazardous areas. There have been no large commercial or industrial developments projects in town. The new Fire Station and Town Garage was built well outside of any areas of risk. Residential development has typically been single family homes. The Town has worked with the power company to ensure that trees and branches are removed along utility lines. Policies and programs are needed which manage growth rates to lessen land impacts, and to ensure that municipal infrastructure can accommodate growth.

In a growing town, community facilities and services are often in transition. Existing facilities and services become inadequate. In Fairfield it is apparent that both population growth and the increasing expectations of residents regarding community services will continue to result in facility and service expansions and improvements. The Town has done well over the past 15 years with the construction of a new Town Office, Fire Station and Town Garage. While town budgets have not increased substantially, the prospect of future service and facility improvements, as well as need for new services, will undoubtedly have fiscal effects. This plan update was revised to target mitigation actions in areas of town where growth is expected.

#### How this Plan will Improve Existing Capabilities

The Town Emergency Management Coordinator analyzed these programs for their effectiveness and noted improvements needed. Fairfield uses all of the plans listed below to help plan for current and future activities with the town. For example: The Local Emergency Management Plan has a contact list that is used for response purposes in the case of a hazard event, and is updated every year after Town Meeting. The Town Plan directs visions and goals that include Natural Resources and Land-Use decisions. In the development of this plan, the latest 2015 Town Plan was used. Town Road and Bridge Standards are followed by the town and they do an annual culvert and bridge inventory that is mapped by the NRPC.

The town is compliant with the NFIP. The last time the zoning bylaws were updated, the town included Flood Hazard Area Overlay to mitigate damages from flooding and fluvial erosion hazards. The LEMP is updated yearly and was updated last in 2019.

As Fairfield goes through the update process for the planning and regulatory mechanisms outlined in the table below, the Town will look to the Hazard Mitigation Plan's Table of Actions and Risk and Vulnerability Assessments to help guide land use district decisions, and guide goals and policies for those districts. After Town Meeting every March, policies and action items in the Town Plan may be reviewed and integrated into hazard mitigation as needed. The Local Emergency Management Plan contact and resource lists should be updated after Town Meeting each year, including updates to at risk locations, as well as locations of vulnerable populations.

Updates to each of the planning mechanisms outlined Table 5.1 below are handled by the responsible party identified in the table. There is no timeframe for updating the referenced plans, agreements and regulations to better incorporate hazard mitigation, however, as each document is updated the hazard mitigation plan will be reviewed for incorporation. The goals of this hazard mitigation plan will be incorporated in the upcoming town plan update to ensure that emergency preparedness and mitigation planning efforts are included in the Town Plan, with particular attention to the projects in the Mitigation Actions Table. This ensure the Mitigation Plan is utilized and project follow-through occurs.

The following authorities, policies, programs, and resources related to hazard mitigation are currently in place and/or being implemented in the Town of Fairfield. In addition to the NFIP. These programs reduce the effects of hazards to existing, new, and future buildings, infrastructure, and critical facilities by preventing their location in identified hazard areas and ensuring that infrastructure and buildings are designed to minimize damage from hazard events. The Committee analyzed these programs for their effectiveness and noted any improvements that may be needed. Other mitigation/emergency planning related documents and their status are outlined in the below:

Existing	Description	Effectiveness/Enforcement/ Hazard that is
Protection	1	addressed
Town Plan	Policies and vision for future land use. Adopted in 2015)	Policies that provide protection and limited development in wellhead protection areas, wetlands, steep slopes, and shallow soils.
		Addresses: Flooding, fluvial erosion, structure fire, and overview of public safety.
Subdivision and	Land Use Regulation.	Restrictions on development in potentially
Zoning Bylaws	Local provisions related to the division	hazardous areas such as steep slopes, floodplains, and waters source areas.
	of a lot tract or parcel	Fire hydrants, water, sewage, public and private
	of land.	utilities, stormwater management, public health and
	Last amended and adopted 2012	safety.
		Addresses: Flooding, fluvial erosion/landslide,
		structure fire, HazMat, telecommunications, utility
		related.

#### Table 5.1 TOWN OF FAIRFIELD POLICIES AND PLANS

Local Emergency Management Plan	Summary of response and notification procedures. Annually adopted. 2019.	Semiannual updates. List emergency contacts, identifies shelters and EOCs, lists vulnerable sites and populations, and local resources. Address: All-hazards.
Franklin County Mutual Aid Agreement	Franklin County Mutual Aid. 2017	Resource assistance from municipal and first response agencies through the county during an emergency event. Addresses: All-hazards.
School Emergency Response	School Crisis Guide 2017.	Responses by various type of emergency incident. Addresses: Terrorism/WMD, Civil Disturbance.

Through current plans, policies and mitigation actions, Fairfield is working to decrease damages from severe winter storms (ice storms), floods (fluvial erosion) and severe thunderstorms (high winds, lightning, hail).

#### **Flooding and Development Regulations**

The Town of Fairfield has adopted floodplain regulations in order to protect the health, safety, and welfare of its residents and to allow the community to participate in the National Flood Insurance Program (NFIP). In 1985 the Town established an ordinance for special flood hazard areas. The purpose of this bylaw is:

• Minimize and prevent the loss of life and property, the disruption of commerce, the impairment of the tax base, and the extraordinary public expenditures and demands on public services that result from flooding and other flood related hazards; and

• Ensure that the design and construction of development in flood and other hazard areas are accomplished in a manner that minimizes or eliminates the potential for flood and loss or damage to life and property; and

- Manage all flood hazard areas designated pursuant to 10 V.S.A. § 753; and
- Make the state, municipalities, and individuals eligible for federal flood insurance and other federal disaster recovery and hazard mitigation funds as may be available.

The Town Zoning Administrator is responsible for monitoring compliance with the NFIP.

#### 6. MITIGATION STRATEGY

The Hazard Mitigation Goals were developed by the Committee for the Fairfield's Local Hazard Mitigation Plan.

Hazard Mitigation Goals

- Prevent/reduce the loss of life and injury resulting from all-hazards events.
- Prevent/reduce the financial losses and infrastructure damage incurred by municipal, residential, agricultural and commercial establishments due to disasters.
- Include hazard mitigation planning in the municipal planning process including the Town Plan, Capital Improvement Plan and Local Emergency Management Plan.
- Ensure the general public is part of the hazard mitigation planning process.

Town Plan (Adopted 2015) Goals and Policies that support Hazard Mitigation

- To preserve Fairfield's fragile archeological record.
- To make possible the preservation of individual buildings and districts of historical value.
- That all development within the Town is pursued with strict regard to the capability of the land to support it and to limit development in areas which are hazardous or otherwise unsuited for this purpose.
- Continue past and present efforts and programs to preserve productive farmland in the Town of Fairfield.
- To provide a safe and economical transportation effort.
- To provide safe drinking water and sewage disposal.
- To regulate densities and uses within Wellhead Protection Areas in order to prevent the potential contamination of public water supplies.
- To protect the health, safety and welfare of residents and visitors of Fairfield by prohibiting development in areas defined by the FEMA Flood Insurance Rate Maps as being a special flood hazard area.

#### Existing Hazard Mitigation Programs, Projects and Activities

#### Flooding

- The Town has Zoning Bylaws which designates a Flood Hazard District whose purpose is to minimize future public and private losses caused by development in flood hazard areas. The town participates in the National Flood Insurance Program (NFIP). Maintaining compliance with NFIP regulations both now and in the long term is a high priority activity.
- Flood Hazard Areas in Fairfield are identified on Flood Hazard Boundary Maps (FHBMs) and Flood Insurance Rate Maps (FIRMs) produced by FEMA. The purpose of these districts, which are located along the flood plains of rivers and streams throughout the Town, is to prevent increases in flooding caused by excessive development of lands within flood hazard areas.
- 2018-2019 Address erosion issues and upgrade drainage along Ridge Road and Metacalf Pond Road through Municipal Roads General Permit Program
- 2010-2019 implemented flood mitigations actions on Ryan Road, Bruso Road, Wanzer Road, Howrigan Road, Lapland Road, and Elm Brook Road.
- 2008 Riparian planting along Wanzer Brook, State of Vermont Clean and Clear Program.
- 2007 Wanzer Brook Corridor Protection Project (see Fluvial Erosion/Landslide below).
- 2007 Black Creek Floodplain Restoration Project (see Fluvial Erosion/Landslide below).
- Culverts are inspected at least once a year. Seasonal maintenance is developed based on an annual inspection.
- A project sponsored by the State of Vermont River Management Program, the Northwest Regional Planning Commission and the Lamoille County Planning Commission is currently taking place to lower the embankment in several location to re-connect portions of the historic floodplain to Black Creek and the Lamoille River. Removal of the embankment will help reduce flooding and erosion hazards in the area and limit the amount of nutrients and sediment reaching the Missisquoi Bay and Lake Champlain.
- In 2007, two mitigation projects were implemented that resulted in lowering 1,400 feet of embankment to just above the floodplain elevation. The resulted in re-connecting 10 acres of floodplain. The floodplain mitigation project was endorsed by the Vermont Association of Snow Travelers, the Vermont Agency of Transportation and the USDA Natural Resources Conservation Service.

#### Severe Winter Storms (Ice Storm)

- Town Highway Department has snow removal equipment.
- Shelter agreement between Fairfield Elementary School and American Red Cross are renewed on a semi-annual basis.
- Road crews have response equipment to deal with downed trees and branches.

#### Fluvial Erosion

 Phase I Geomorphic Assessments conducted for Wanzer Brook Watershed and Black Creek in 2005 following Vermont Agency of Natural Resources standards. This goal is connected to the larger objective of reducing phosphorus and other pollutants entering the Missisquoi River and Lake Champlain. Study results have also informed landowner and community planning efforts for reducing fluvial erosion hazards and improving aquatic and riparian habitats.



Photo Courtesy VT ANK Wanzer Brook and Boomhower Farm, Fairfield

- Implementation of the Wanzer Brook Corridor Protection Project (2007) with the goal of identifying river corridor protection and restoration strategies to reduce erosion and sediment loading in the Wanzer Brook watershed. Wanzer Brook Corridor Protection Projects objectives included active floodplain reconfiguration, channel armoring, construction of animal crossings and fencing, establishment of healthy riparian vegetation, and conveyance of all channel management rights within the corridor. Projects partners included the Boomhower Farm, the Town of Fairfield, the Agency of Natural Resources, the Natural Resource Conservation Service, and the U.S. Fish & Wildlife Service.
- Implementation of three Black Creek Floodplain Restoration Projects #1, #3 and #4 (2007) with the goal of identifying river corridor protection and restoration strategies and to re-connect portions of the floodplain within the Black Creek watershed. Projects involved embankment removal along Lamoille Valley Rail Bed in 2007. Project 1 was located in East Fairfield north of Morey and Whitney Roads; Project 3 at Bruso Road; and Project 4 at Ryan Road.
- On May 2, 2008 approximately 60 students and staff from Fairfield Elementary School and other community volunteers planted 180 trees at the Boomhower Farm in Fairfield. The trees were planted in the buffer established between floodplain corridor along Wanzer Brook and adjacent pasture and cropland.

#### Structure Fire and Wildland Fire

- Annual ISO inspection
- Fire fighter personal protection equipment upgrades through Federal grant programs
- Upgrades to fire fighting offensive and defensive equipment through Federal grant programs
- Fire fighter training through Vermont Fire Academy
- Member of Franklin County Mutual Aid and Franklin County International Firefighters Association
- NIMS/ICS Training for members to meet state NIMS strategy

#### Loss of Electrical Service

- Town Hall has a portable generator with transfer switches installed at Town Hall
- On-going regularly scheduled road maintenance programs includes cutting vegetation away from utility lines

Hazardous Materials (Fixed Site and Transport)

- Fire department members have attended VT Fire Academy's HazMat awareness course
- Fire department upgrades fire fighter personal protection equipment as necessary
- Town maintains active membership in Local Emergency Planning Committee District 4

Terrorism/WMD/Civil Disturbance

- School has updated State School Response Guide to handle variety of emergency situations
- School Board proactive in addressing school safety issues

**On-Going Community Preparedness Activities** 

- Enforcing flood plain regulations.
- Intersection improvements to VT36 and North Road Intersection.
- Town applies for state grants (Local Roads, Bridge and Culvert) to address road construction/improvement projects.
- Annually adopt Local Emergency Management Plan
- Emergency Responders attend professional training sessions as appropriate including ICS training
- Town continually works towards achieving compliance with State NIMS strategy including having staff and elected officials, as appropriate, attend ICS training
- Town of Fairfield is member of Franklin County Mutual Aid Agreement (NIMS)
- Continue to equip, as appropriate, emergency shelters.
- Regular maintenance of town fleet and emergency equipment.
- Community participates in the Vermont Enhanced 911 System Program.
- Regularly scheduled maintenance programs ongoing (culvert survey & replacement, ditching along roadways, cutting vegetation to allow visibility at intersections).

#### Identified Hazard Mitigation Actions, Programs, and Activities

The following list documents the questions (criteria) considered in establishing an order of priority. Each of the following criteria was rated according to a numeric score of "1" (indicating Poor), "2" (indicating Average) and "3" (indicating Good). The highest possible score is 36. The full scoring matrix used is located at the end of this annex.

- 1) Does the action reduce damage?
- 2) Does the action contribute to community objectives?
- 3) Does the action meet existing regulations?
- 4) Does the action protect historic structures or structures critical to Town operations?
- 5) Can the action be implemented quickly?
- 6) Is the action socially acceptable?
- 7) Is the action technically feasible?
- 8) Is the action administratively possible?
- 9) Is the action politically acceptable?
- 10) Is the action legal?
- 11) Does the action offer reasonable benefits compared to its cost of implementation?
- 12) Is the action environmentally sound?

Mitigation actions are listed in terms of mitigating threat or risk to public health and safety, reduction of hazard to community assets, adherence to Town plan and local ordinances, cost, and feasibility. Actions are classified as either short - term or long - term activities. Short –term action items are activities which the municipality may be capable of implementing within one to two years. Long-term action items may require new or additional resources, funding or authorities. Ongoing action items occur at least once per

year. Recent disasters that have occurred have not caused a change in priorities. The projects have been prioritized as part of the Town's on-going comprehensive planning process following state land use law.

#### Cost-Benefit Analysis

Each project will incorporate a full benefit-cost analysis (BCA) following FEMA's BCA methodology and latest software to ensure cost effectiveness and maximize savings.

There was a rough cost/benefit analysis done for each action listed in the table. The below cost and benefits tables address the priorities for the mitigation strategies that are stated in the Mitigation Actions Table.

#### Cost Estimates

High	=>\$100,000
Medium	= \$25,000 - 100,000
Low	=< \$25,000

#### Benefit Estimates

High	Public Safety
Medium	Infrastructure / Functionality
Low	Aesthetics / General Maintenance

#### Time Frame

Short term	6 months to one year
Medium term	1-3 years
Long term	4+ years

A prioritized mitigation action matrix may be found in Attachment C. Implementation of the mitigation actions is summarized in the below table, as far as who, when and how they will be carried out. Further details about some actions can be found following the mitigation actions table, in text.

Priorit y / Score	Mitigation Action / Hazard Addressed	Responsibi lity/ Oversight	Funding/ Support	Time Frame	Cost Benefi t	Status
High 34	TH1 (North Road) Culvert Replacement. Install pre- cast concrete structure. Addresses: Flooding / Fluvial Erosion, Severe Thunderstorm	Selectboard Road Foreman	Vermont AOT Structures grant, Program. Local Funding.	Medium-term Start: April 1, 2020 – March 31, 2022	Med. / High	Site design. Obtain required permits from governing authorities. Request quotes from materials suppliers and contractors. Construction.
High 34	Upgrade Bridge 13 on TH1 (North Road) Addresses Flooding /Fluvial Erosion, Severe Thunderstorm	Selectboard Road Foreman	Vermont AOT Structures grant, Vermont Better Back Roads Program. Local Funding.	Long – term Start: March 1, 2020 End: September 30, 2025	High / High	Site design. Obtain required permits from governing authorities. Request quotes from materials suppliers and contractors. Construction.

**Table 6.1 Implementation Schedule for Prioritized Mitigation Actions** 

High 34	Upgrade Bridge 3 on TH1 (North Road) Addresses: Flooding /Fluvial Erosion, Severe Thunderstorm	Selectboard Road Foreman	Vermont AOT Structures grant, Vermont Better Back Roads Program. Local Funding.	Long – term Start: March 1, 2020 End: September 30, 2025	High / High	Site design. Obtain required permits from governing authorities. Request quotes from materials suppliers and contractors. Construction.
Med. 33	TH29 (Paradee Road) Pony truss / Steel beam bridge (B49) replacement. Addresses: Flooding / Fluvial Erosion, Severe Thunderstorm	Selectboard Road Foreman	Vermont AOT Structures grant, Program. Local Funding.	Long – term Start: March 1, 2020 End: September 30, 2025	High / High	Scoped under state bridge program. Hydraulic study completed. Engineering. Obtain required permits.
Med. 33	TH12 (Northrup Road) Bridge (B28) Replacement. Addresses: Flooding / Fluvial Erosion, Severe Thunderstorm	Selectboard Road Foreman	Vermont AOT Structures grant, Program. Local Funding.	Long – term Start: March 1, 2020 End: September 30, 2025	High / High	Scoped under state bridge program. Hydraulic study completed. Engineering. Obtain required permits.
High 34	TH1 (South Road) Box Culvert Upgrade Addresses: Flooding / Fluvial Erosion, Severe Thunderstorm	Selectboard Road Foreman	Vermont AOT Structures grant, Program. Local Funding.	Long – term Start: March 1, 2020 End: September 30, 2025	High / High	Scoped under state bridge program. Hydraulic study completed. Engineering. Obtain required permits.
Med. 32	TH26 (Barry Road) Culvert Upgrade	Selectboard Road Foreman	Vermont AOT Structures grant, Program. Local Funding.	Long – term Start: March 1, 2020 End: September 30, 2025	High / High	Scoped under state bridge program. Hydraulic study completed. Engineering. Obtain required permits.
Med. 32	TH70 (Howrigan Road) Drainage Improvements. Addresses: Flooding / Fluvial Erosion, Severe Thunderstorm	Selectboard Road Foreman	Grants-In- Aid Program	Short – term Start: May 1, 2020 – June 30, 2020	Medium / High	Grant secured. Design completed. Construct.
High 36	Procure and install generator for Town Garage and Fire Station building for continuity of municipal operations. / All-Hazards	Selectboard Road Foreman Fire Chief	Local	Medium-term Start: April 1, 2020 – March 31, 2022	Low / High	Electrical Engineer specs, estimates, RFP,
Med. 34	Education and Outreach to Residents for Winter Storm Preparedness. Addresses: Severe Winter Storm (Ice Storm)	EMD, EMC Fire Dept., Library,	Local	Medium-term Start: April 1, 2020 – March 31, 2022	Low / High	Public Outreach programs, Social Media Radio Stations.

High 36	Support Utility Efforts to Protect Utility Corridors Addresses: Severe Winter Storm (Ice Storm), Severe Thunderstorm (High Winds, Hail, Lightning)	Selectboard	Local	On-Going Continued Support Start May 202	Low / High	Support power utility standards in identifying utility corridors in need of tree pruning.
------------	---	-------------	-------	--	---------------	---

*TH1 (North Road) Culvert Replacement* - Current structure has evidence of erosion along the inlet and outlet. Top of road shoulder is high above structure and bank is steep. Structure is undersized to meet the hydraulics of the stream and should be upgraded. The stream is a tributary of Black Creek. The road is a major artery for commuters and farm operations. The Town is concerned the structure could fail during a flood event and would like to install pre-cast concrete structure as replacement.

*Upgrade Bridge 13 on TH1 (North Road)* – Current bridge has evidence of erosion along the inlet and outlet. Top of road shoulder is high above structure and bank is steep. Structure is undersized to meet the hydraulics of the stream and should be upgraded. The stream is a tributary of Black Creek. The road is a major artery for commuters and farm operations. The Town is concerned the structure could fail during a flood event.

*Upgrade Bridge 3 on TH1 (North Road)* – The structure is located in the Saint Rocks area along Dead Creek. Dead Creek flows from west to east through the structure. There is evidence the culvert is restricting the flow of the Creek during high flows. There is evidence of erosion at the inlet and outlet. The road is a major artery for commuters and farm operations. The Town is concerned the structure could fail during a flood event.

*TH29 (Paradee Road) Pony truss / Steel beam bridge (B49) replacement* – The structure is located within Black Creek drainage. The current structure is too narrow for the hydraulics of the stream and for the size of farm equipment that utilizes the road. There is evidence of erosion. During high flows the structure is overtopped. Additionally, the structure was not originally designed to meet current weight loads of farm equipment. The Town is concerned the structure could fail during a flood event.

*TH12 (Northrup Road) Bridge (B28) Replacement* - The current structure is greatly deteriorated. The stone headwall is failing. The tributary is undermining culvert and headwall. The structure is on a tributary of Black Creek. The Town is concerned the structure could fail during a flood event.

*TH1 (South Road) Box Culvert Upgrade* – Culvert is located near Ryan's farm. Culvert is deteriorating as evidenced by sag in road. The culvert is located on an unnamed tributary of the Fairfield River. New box culvert should be installed to mitigate flooding and fluvial erosion at the site. The Town is concerned that a flood event would cause the structure to fail. South Road is a major artery for farm and commuters.

*TH26 (Barry Road) Culvert Upgrade* – Current culvert is failing and showing signs of erosion. Water is undermining culvert and eroding road shoulder. The Town is concerned that a flood event would cause the structure to fail.

*TH70 (Howrigan Road) Drainage Improvements* – The road shoulder in this area is showing evidence of erosion. Ditches are steep and should be stone lined. Bottom of culvert towards outlet has rusted away. Culvert is perched high and causing erosion at outlet.

Education and Outreach to Residents for Winter Storm Preparedness: Inform citizens about winter storm events how to prepare for such events. Indicate locations of shelters and tips for staying at home. Provide

advisories to avoid road travel combined with safe travel tips. Provide information on hazards of unheated houses, guidance on the use of portable and standby generators, fire hazards associated with space heaters, protecting plumbing during a winter storm, and coping with power failures.

Support Utility Efforts to Protect Utility Corridors - The utility lines are privately owned; however, the Town will support the power company's utility line and corridor tree pruning program in order to protect power lines. Trees or branches that are a concern to impact utility lines will be reported to the power company. The power company has improved upon their line corridor tree pruning program to reduce the impacts of ice storms in recent years.

#### 7. PLAN IMPLEMENTATION, MONITORING & EVALUATION

#### Initial Update Approval

In addition to public involvement in the initial development of the plan and update, opportunities for public comment included interviews with the Town Selectboard, Highway Foreman, Town Clerk and updates to the Local Emergency Planning Committee (LEPC) and to the full Northwest Regional Commission Board of Directors. Local citizens were interviewed as well. A copy of the draft will be provided to the Town Road Foreman, Town Emergency Management Coordinator, Town Clerk, Selectboard and Fire Chief for comment. Future updates of the plan will include more opportunities for public comment.

Following consideration of the comments from those forums, the draft Mitigation Plan will be presented to the State Hazard Mitigation Officer (SHMO) for review and comment. When the document meets all the requirements, VEM (FEMA) grants "Approval Pending Adoption" (APA) by notifying the Selectboard Chair. The Highgate Selectboard will then adopt the plan at a public meeting. The Selectboard Chair will return the final plan containing copy of the Adoption Resolution to FEMA (via the SHMO). FEMA will conduct one final review to ascertain that no changes were made to the plan (other than removing watermarks and inserting dates) then the plan is deemed "FINAL".

#### Monitoring and Updating the Plan – Yearly Review

Once the plan is approved and adopted, the Emergency Prep. and Management Director in Fairfield, along with interested and appointed volunteers and stakeholders, will continue to work with the Emergency Planner at the Northwest Regional Commission to monitor, evaluate, and update the plan throughout the next 5-year cycle. The plan will be reviewed annually at the April Selectboard meeting along with the review of the town's Local Emergency Management Plan (LEMP). During the annual review, the Selectboard will evaluate the plan effectiveness at achieving its stated purpose and goals This meeting will allow town officials and the public to discuss the town's progress in implementing mitigation actions and determine if the town is interested in applying for grant funding for projects that can help mitigate future hazardous events; e.g., bridge and culvert replacements, road replacements and grading, as well as buying out any repetitive loss structures that may be in the Special Flood Hazard Area, and revise the plan as needed. Northwest Regional Commission's emergency planner will assist the Fairfield Emergency Management Director with this review, as requested by the Town. Progress on actions will be kept track using a table the NRPC will provide to the Town EMD to update. There will be no changes to the plan, unless deemed necessary by the Town. If so, the post disaster review procedure will be followed.

#### Plan Maintenance (5 Year Update and Evaluation Process)

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

- 1. The Fairfield Selectboard will appoint a team to convene a meeting of the hazard mitigation planning committee. The team will include a Fairfield Emergency Management Director who will chair the meeting. Others members should include local officials such as Selectboard members, Fire Chief, Zoning Administrator, Road Foreman, Road Commissioner, Health Officer and interested stakeholders. The Emergency Management Director will work with the Northwest Regional Planning Commission Emergency Planner and be the point person for the Town.
- 2. The NRPC Emergency Planner will guide the Committee through the update process. This update process will include several publicly warned meetings. At these meeting the Committee will use the existing pan and update as appropriately guided by the NRPC Emergency Planner to address:
  - a. Update of hazard events and data gathered since the last plan update.
  - b. Changes in community and government processes, which are hazard-related and have occurred since the last review
  - c. Changes in community growth and development trends and their effect on vulnerability.
  - d. Progress in implementation of plan initiatives and projects
  - e. Incorporation of new mitigation initiatives and projects.
  - f. Effectiveness of previously implemented initiatives and projects.
  - g. Evaluation of the plan for its effectiveness at achieving its state purpose and goals.
  - h. Evaluation of unanticipated challenges or opportunities that may have occurred between the date of adoption and the date of the report, and their effect on capabilities of the town.
  - i. Evaluation of hazard-related public policies, initiatives and projects.
  - j. How mitigation strategy has been incorporated into other planning mechanisms.
  - k. Review and discussion of the effectiveness of public and private sector coordination and cooperation.
- 3. From the information gathered at these meetings, along with data collected independently during research for the update, the NRPC Emergency Planner will prepare and updated draft in conformance with the FEMA *Local Hazard Mitigation Plan Review Toolkit* document.
- 4. The Selectboard will review the draft report. Consensus reached on changes to the draft. Emphasis in plan updates will be put on critically looking at how the plan can become more effective at achieving its stated purpose and goals.
- 5. The changes will be incorporated into the Plan by the NRPC Emergency Planner.
- 6. The Selectboard will notify the public that the draft is available for public comment and review. The Town will advertise and make available the draft plan for comments both electronically and in hard copy. The draft plan will be distributed electronically to the neighboring municipalities of Sheldon, Swanton, Enosburgh, Bakersfield, Fletcher, Fairfax, and St. Albans Town for review and comment.
- 7. Public comments will be incorporated by the NRPC Emergency Planner. The final draft will be provided to the plan development participants and town staff for final review and

comment with review comments provided to the Emergency Management Director and incorporated into the plan.

- 8. The NRPC Emergency Planner will finalize the plan, with any remaining comments from the plan participants and town staff incorporated, and then submitted electronically to VEM State Hazard Mitigation Officer (SHMO) who will then submit to FEMA Region 1.
- 9. The Plan will be reviewed by the SHMO and FEMA Region 1.
- 10. SHMO and FEMA comments will be addressed in the Plan by the NRPC Emergency Planner.
- 11. The Plan will be resubmitted as needed until the plan is approved pending adoption by FEMA Region 1. Once the plan is approved by FEMA, it will be ready for adoption.
- 12. The Selectboard will adopt the plan and distribute to interested parties.
- 13. The final adopted plan will be submitted by the NRPC Emergency Planner to DEMHS and FEMA.
- 14. FEMA will issue final approval of the adopted plan.

#### Continued Public Involvement

The Fairfield Selectboard is dedicated to involving the public directly in the continual review and updates of the Hazard Mitigation Plan. Copies of the plan will be kept at the Town Office. The existence and location of these copies will be publicized in the media (newspaper, web sites, Town Annual Report, etc.). The plan will also include the Selectboard Chair's contact information to facilitate and track public comments. In addition, any proposed changes will be publicized in the media.

#### Programs, Initiatives and Projects Review

Although the plan should be reviewed in its entirety every five years as described above, the Town may review and update its programs, initiatives and projects more often directly with the State Hazard Mitigation Officer (SHMO) based on changing local needs and priorities.

The Town of Fairfield should incorporate elements of this plan, such as identified projects, into capital planning initiatives and annual budget reviews during Town Meeting.

#### Post-Disaster Review/Update Procedure

Should a declared disaster occur, a special review will occur amongst the Selectboard, the Emergency Management Coordinator, the NRPC Emergency Planner, and those involved in the five-year update process described above. This review will occur in accordance with the following procedures:

1. Within six months of a declared emergency event, the town will initiate a post disaster review and assessment. The State Hazard Mitigation Officer will be notified that the assessment process has commenced.

2. This post disaster review and assessment will document the facts of the event and assess whether existing Hazard Mitigation projects effectively lowered community vulnerability/damages. New mitigation projects will be discussed, as needed.

3. A draft After Action Report of the review and assessment will be distributed to the hazard mitigation committee.

4. A meeting of the committee will be convened by the Selectboard to make a determination of whether the plan needs to be amended. If the committee determines that NO modification of the plan is needed, then the report is distributed to local communities.

5. If the committee determines that modification of the plan IS needed, then the committee drafts an amended plan based on the recommendations and forwards to the Selectboard for public input.

6. The Selectboard adopts the amended plan after receiving approval-pending-adoption notification from FEMA.



#### Attachment A Hazard Identification and Risk Assessment Town of Fairfield

Refer to Section 4 of this plan for a description of the risk characteristics used to classify each hazard.

	Impacted	Frequency Of	<b>Consequence of Occurrence</b>							
Hazard	Area	Occurrence	Health & Safety	Property	Environment	Economic	Total			
Flooding/Fluvial		_		_						
Erosion	2	5	0	1	1	3	35			
Severe Winter Storm		_								
(lce Storm)	3	5	0	1	1	2	35			
Severe Thunderstorm										
(High winds, Hail.		_	0				•			
Lightning)	2	5	0	1	1	2	30			
Structure Fire	0	5	1	1	0	3	25			
Loss of Electrical			0				10			
Service	3	2	0	0	0	2	10			
Drought	3	1	1	1	2	2	9			
Major Fire – Wildland	1	2	0	1	1	1	8			
Hazardous Materials										
(Fixed Site and							-			
Transport)	2	1	0	1	1	2	6			
Tornado	1	1	0	1	1	2	5			
Earthquake	1	1	1	1	1	2	6			
Telecommunication	_									
Systems Failure	3	1	0	0	0	1	4			
Civil Disturbance	1	1	0	0	0	1	2			
Terrorism/WMD	1	1	1	0	0	2	4			
Extreme Heat	1	1	0	0	0	0	1			
Extreme Cold	1	1	0	0	0	0	1			
Hurricane*	1	1	0	0	0	0	1			
Infectious Disease										
Outbreak*	1	1	0	0	0	0	1			
Invasive Species*	1	1	0	0	0	0	1			
Rock Cuts*	1	1	0	0	0	0	1			
Rockslide/Landslide	1	1	0	0	0	0	1			
Nuclear Power Plant										
Failure*	1	1	0	0	0	0	1			
	3	5	3	4	3	4				

#### Attachment B Critical Facilities, Hazmat Storage Facilities, and Vulnerable Sites Town of Fairfield

Facility Name or	Facility Owner /	Function	Street or Location				
Facility Designation	Operator						
East Fairfield Community	Town of Fairfield	Emergency Ops Center	School St.				
Center							
East Fairfield Fire Station	Town of Fairfield	Emergency Services	9461 Route 36				
			East Fairfield				
Fairfield Center School	Town of Fairfield	Education Facility	57 Park St.				
		-					
Fairfield Fire Station	d Fire Station Town of Fairfield		118 Park St.				
Fairfield Town Garage	Town of Fairfield	Government	12 Gilbert Hill Rd.				
C C		Transportation Facility					
		HazMat Storage Site					
Fairfield Town Office	Town of Fairfield	Government Facility	4509 Route 36				
Menard's Market (pumps)	R. L. Vallee	Hazardous Materials	4684 Route 36				
		Facility					
St. Anthony – St. George	Rev. Leonidas Laroche	Place of Worship	9491 Route 36				
Catholic Church			East Fairfield				
St. Patrick's Catholic	Rev. Joseph Sullivan	Place of Worship	114 Church Rd.				
Church							
Stone's Texaco	Carl Stone	Hazardous Materials	9431 Route 36				
		Facility	East Fairfield				

#### Attachment C Town of Fairfield Priority Matrix

1 = Poor, 2 = Average, 3 = Good

Each of the following criteria was rated according to a numeric score of "1" (indicating Poor), "2" (indicating Average) and "3" (indicating Good).

- 1) Do the identified actions and projects address reduce the effects of hazards on existing buildings and infrastructure?
- 2) Does the action contribute to community objectives?
- 3) Does the action meet existing regulations?
- 4) Does the action protect historic structures or structures critical to Town operations?
- 5) Can the action be implemented quickly?
- 6) Is the action socially acceptable?
- 7) Is the action technically feasible?
- 8) Is the action administratively possible?
- 9) Is the action politically acceptable?
- 10) Is the action legal?
- 11) Does the action offer reasonable benefits compared to its cost of implementation?
- 12) Is the action environmentally sound?

**Mitigation Action** 

						Cr	iteria	a					Score
	1	2	3	4	5	6	7	8	9	10	11	12	
TH1 (North Road) Culvert Replacement. Install pre-cast concrete structure.	3	3	3	3	1	3	3	3	3	3	3	3	34
Upgrade Bridge 13 on TH1 (North Road)	3	3	3	3	1	3	3	3	3	3	3	3	34
Upgrade Bridge 3 on TH1 (North Road)	3	3	3	3	1	3	3	3	3	3	3	3	34
TH29 (Paradee Road) Pony truss / Steel beam bridge (B49) replacement.	3	3	3	2	1	3	3	3	3	3	3	3	33
TH12 (Northrup Road) Bridge (B28) Replacement.	3	3	3	2	2	2	3	3	3	3	3	3	33
TH1 (South Road) Box Culvert Upgrade	3	3	3	3	2	2	3	3	3	3	3	3	34
TH26 (Barry Road) Culvert Upgrade	3	3	3	1	2	2	3	3	3	3	3	3	32
TH70 (Howrigan Road) Drainage Improvements.	3	3	3	1	2	2	3	3	3	3	3	3	32
Procure and install generator for Town Garage and Fire Station building for continuity of municipal operations.	3	3	3	3	3	3	3	3	3	3	3	3	36
Education and Outreach to Residents for Winter Storm Preparedness.	2	3	3	2	3	3	3	3	3	3	3	3	34
Utility Efforts to Protect Utility Corridors	3	3	3	3	3	3	3	3	3	3	3	3	36

7E 4 1

#### Attachment D Public Government Participation

Information in the Hazard Mitigation Plan is based on research from a variety of sources. It encompassed research using a historical perspective and future projections for the vulnerability assessment. The research methods and various contributions to the plan included but were not limited to:

- Town of Fairfield Select Board
- Town of Fairfield Emergency Management
- •Town of Fairfield Planning Committee
- Town of Fairfield Highway Department
- Local Emergency Planning Committee #4 (Franklin County)
- Fairfield Volunteer Fire Department
- East Fairfield Volunteer Fire Department
- Northwest Regional Planning Commission
- Franklin County Sheriff's Office
- Vermont Department of Transportation District 8
- Vermont Emergency Management
- Vermont Agency of Natural Resources
- Vermont Homeland Security Unit
- Vermont Fire Academy
- Northeast States Emergency Consortium
- Federal Emergency Management Agency
- National Oceanic Atmospheric Administration
- Vermont Geological Survey

#### Attachment E Town of Fairfield Flood Zone and Wetlands Map



#### Attachment F References

Center for Watershed Protection *et.al.* (1999). <u>Watershed Hydrology Protection and Flood Mitigation</u> <u>Project Phase II-Technical Analysis</u>. Stream Geomorphic Assessment. For Vermont Geological Survey. Waterbury, VT.

Cornell University. (2019). <u>Northeast Regional Climate Data Center</u>. Available: http://www.nrcc.cornell.edu

Ebel, J. E., Bedell, R., & Urzua, A. (1995). A Report on the Seismic Vulnerability of the State of Vermont, submitted to the Vermont Emergency Management Agency. Waterbury, VT.

Federal Emergency Management Agency 44 CPR Parts 201 and 206.

Federal Emergency Management Agency. (Various). Town of Fairfield Flood Insurance Study and Flood Insurance Rate Maps (1980).

Federal Emergency Management Agency (2002). <u>State and Local Mitigation Planning How-to Guides</u> (FEMA 386-1 through 386-9). Washington, DC.

Federal Emergency Management Agency (2019). Mapping Information Portal. Available: https://hazards.fema.gov/femaportal/wps/portal

Ludlum, David. (1985). <u>The Vermont Weather Book.</u> (2nd ed.). Montpelier: Vermont Historical Society.

National Oceanic and Atmospheric Administration. (2019). <u>National Climatic Data Center</u>. Available: http://www.ncdc.noaa.gov/oa/ncdc.html

National Oceanic and Atmospheric Administration. (2019). <u>National Weather Service</u>. Available: http://www.nws.noaa.gov

North American Emergency Response Guidebook. (2018) Neenah, WI: J.J. Keller and Associates, Inc.

Northeast States Emergency Consortium. (2019). <u>Disaster Resistant Communities Resources and Tools</u>. Available: <u>http://www.nesec.org</u>

Northwest Regional Planning Commission. (2017). Regional Plan. St. Albans, VT.

Northwest Regional Planning Commission, (2005). <u>Phase 1 Stream Geomorphic Assessment: Missisquoi</u> <u>Basin</u>. St. Albans, VT.

Town of Fairfield, Vermont. (2019). Local Emergency Management Plan.

Town of Fairfield, Vermont. (2015). Town of Fairfield Municipal Plan.

Town of Fairfield, Vermont. (2012). Town of Fairfield Subdivision and Zoning Bylaws.

U.S. Army Corps of Engineers, New York District. (2005). <u>Black Creek Hydrologic and Hydraulic</u> <u>Assessment Report.</u> Town of Fairfield, Franklin County, Vermont.

U.S. Department of Agriculture, U.S. Forest Service. (2019). <u>USDA Wildland Fire Assessment Map</u>. Available: http://www.wfas.net

U.S. Environmental Protection Agency. (2007). <u>Computer Aided Management of Emergency Operations</u> (<u>CAMEO</u>). Available: http://www.epa.gov/emergencies/content/cameo/index.htm

U.S. Geologic Survey. (2004). National Landslide Hazards Mitigation Strategy, - A framework for loss reduction (Circular 1244). Denver, CO.

U.S. Geologic Survey. (2019). Earthquake Hazards Program. Available: http://eqhazmaps.usgs.gov

Vermont Agency of Natural Resources. (1999). <u>Options for State Control Policies and a Flood Control</u> <u>Program</u>. Waterbury, VT.

Vermont Agency of Natural Resources. (2003). <u>Stream Geomorphic Assessment Handbook</u>. Waterbury, VT.

Vermont Agency of Natural Resources. (2005). <u>Corridor Planning Project and Phase 2 Stream</u> <u>Geomorphic Assessment Wanzer Brook Watershed</u>. Town of Fairfield, VT.

Vermont Agency of Transportation. (2018). <u>Highways and Bridges Handbook for Local Officials</u>. Montpelier, VT.

Vermont Agency of Transportation. (2017). Vermont Long Range Transportation Plan. Montpelier, VT.

Vermont Center for Rural Studies. (2019). Available: http://crs.uvm.edu

Vermont Department of Environmental Conservation. (2001). Fluvial Geomorphology: A Foundation for Watershed Protection, Management and Restoration. Waterbury, VT.

Vermont Department of Environmental Conservation, Water Quality Division. (2004). <u>Stream</u> <u>Geomorphic Assessments Protocol Handbooks</u>. Waterbury, VT.

Vermont Department of Environmental Conservation, Vermont Geologic Survey. (2004). <u>HAZUS-MH</u> <u>Earthquake Reports for Franklin and Grand Isle Counties</u>. Waterbury, VT.

Vermont Department of Public Safety, Vermont Emergency Management. (2018). <u>State of Vermont Hazard Mitigation Plan</u>. Waterbury, VT.

Vermont Department of Public Safety, Vermont Emergency Management. (2018). <u>Repetitive Loss</u> <u>Properties</u>. Waterbury, VT: State Hazard Mitigation Officer.

Vermont Department of Public Safety, Vermont Emergency Management. (2018). <u>Tier II Reports and</u> <u>CAMEO database</u>. Waterbury, VT: Hazardous Materials Compliance Officer.