

**TOWN OF JERICHO, Vermont  
2017 All-Hazards Mitigation Plan**

**Annex 9 to the  
2017 Chittenden County Multi-Jurisdictional  
All-Hazards Mitigation Plan**

**Prepared by:**

**The Chittenden County Regional Planning Commission  
and the  
Town of Jericho, Vermont**

*Adopted by the Town of Jericho Selectboard on  
May 18, 2017*

*Approved by FEMA on July 11, 2017*







Town of Huntington, VT

CERTIFICATE OF ADOPTION  
June 5, 2017

TOWN OF HUNTINGTON VERMONT SELECTBOARD

A RESOLUTION ADOPTING THE 2017 Chittenden County Multi-Jurisdictional All-Hazards Mitigation Plan and Annex #8, the 2017 Town of Huntington All-Hazards Mitigation Plan (Plan).

WHEREAS, the Town of Huntington has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of the hazards profiled in the 2017 Chittenden County Multi-Jurisdictional All-Hazards Mitigation Plan and Annex #8, the 2017 Town of Huntington All-Hazards Mitigation Plan which result in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Huntington has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for the 2017 Chittenden County Multi-Jurisdictional All-Hazards Mitigation Plan and Annex #8, the Town of Huntington All-Hazards Mitigation Plan (Plan) under the requirements of 44 CFR 201.6; and

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

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

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

RESOLVED by the Town of Huntington Selectboard:

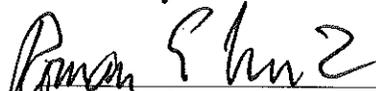
1. The 2017 Chittenden County Multi-Jurisdictional All-Hazards Mitigation Plan and Annex #8, the 2017 Town of Huntington All-Hazards Mitigation Plan (Plan) is hereby adopted as an official plan of the Town of Huntington;
2. The respective officials identified in the mitigation action plan of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as part of this resolution for a period of five (5) years from the date of this resolution; and
4. An annual report on the process of the implementation elements of the Plan will be presented to the Selectboard by the Emergency Management Director or Coordinator.

IN WITNESS WHEREOF, the undersigned have affixed their signature on June 5, 2017.

  
Dori Barton, Chair

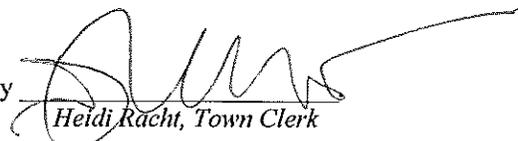
  
Nancy Stoddard, Vice-Chair

  
Andrew Hendrickson

  
Roman Livak

  
Dan Rissacher

Received for record this 6 day of January, A.D., 2017 by

  
Heidi Racht, Town Clerk

## Executive Summary

Hazard Mitigation is a sustained effort to permanently reduce or eliminate long-term risks to people and property from the effects of reasonably predictable hazards. The purposes of this updated Local All-Hazards Mitigation Plan are to:

- Identify specific natural, technological and societal hazards that impact the Town of Jericho;
- Prioritize hazards for mitigation planning;
- Recommend town-level goals and strategies to reduce losses from those hazards; and
- Establish a coordinated process to implement the plan, taking advantage of a wide range of resources.

This plan is a local annex to the *Chittenden County Multi-Jurisdictional All-Hazards Mitigation Plan*. **In order to become eligible to receive various forms of Federal hazard mitigation grants, a Chittenden County municipality must formally adopt its Local All-Hazards Mitigation Plan along with the *Chittenden County Multi-Jurisdictional All-Hazards Mitigation Plan*, or develop and adopt an independent, stand-alone Local All-Hazards Mitigation Plan.**

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

Section 2: Hazard Identification expands on the hazard identification in the *Chittenden County Multi-Jurisdictional All-Hazards Mitigation Plan* with specific municipal-level details on selected hazards.

Section 3: Risk Assessment discusses identified hazard areas in the municipality and reviews previous federally-declared disasters as a means to identify what risks are likely in the future. This section presents a hazard risk assessment for the municipality, identifying the most significant and most likely hazards which merit mitigation activity. The top Hazards by type with the most risk in Jericho are:

Natural Hazards: Severe Winter Storm, Flooding, Fluvial Erosion and Severe Rainstorm

Technological Hazards: Power Loss and Telecommunications Failure

Societal Hazards: Economic Recession and Crime

Section 4: Vulnerability Assessment discusses buildings, critical facilities and infrastructure in designated hazard areas, vulnerable populations and the issue of estimating potential losses.

Section 5: Mitigation Strategies is the heart of this All Hazards Mitigation Plan. This section begins with an overview of goals and policies in the *2016 Jericho Town Plan* that support hazard mitigation. This is followed by an analysis of existing municipal actions that support hazard mitigation, such as planning and zoning and public works. This section presents the following municipal all-hazards mitigation goals:

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

- 3) Maintain and increase awareness amongst the town's residents and businesses of the damages caused by previous and potential future hazard events as identified specifically in this Local All-Hazards Mitigation Plan and as identified generally in the Chittenden County Multi-Jurisdictional All-Hazards Mitigation Plan.
- 4) Recognize the linkages between the relative frequency and severity of disaster events and the design, development, use and maintenance of infrastructure such as roads, utilities and stormwater management and the planning and development of various land uses.
- 5) Maintain existing municipal plans, programs, regulations, bylaws and ordinances that directly or indirectly support hazard mitigation.
- 6) Consider formal incorporation of this Local All-Hazards Mitigation Plan into the municipal comprehensive plan as described in 24 VSA, Section 4403(5), as well as incorporation of proposed new mitigation actions into the municipality's/town's bylaws, regulations and ordinances, including, but not limited to, zoning bylaws and subdivision regulations and building codes.
- 7) Consider formal incorporation of this Local All-Hazards Mitigation Plan, particularly the recommended mitigation actions, into the municipal/town operating and capital plans and infrastructure, utilities, highways and emergency services.

This section includes the following Mitigation Actions planned by the Town:

**Category A: Complete fluvial geomorphology assessment and address identified vulnerable infrastructure to mitigate against Severe rainstorm, Flooding, Fluvial Erosion and Water Pollution**

- Action A-1: Flood Hazard Mitigation Project Implementation

**Category B: Upgrade Existing Road and Stormwater Management Infrastructure to mitigate against Severe Rainstorms, Flooding, Fluvial Erosion and Water Pollution**

- Action B-1: Culvert Upgrades
- Action B-2: Drainage Improvements
- Action B-2: Road Improvement

**Category C: Implement Road Stormwater Management Plan consistent with Vermont Municipal Roads General Permit (MRGP) to mitigate against Severe Rainstorms, Fluvial Erosion and Water Pollution**

- Action C-1: Obtain MRGP and develop Road Stormwater Management Plan
- Action C-2: Implement Road Stormwater Management Plan and file annual reports

Finally, this section includes an Implementation Matrix to aid the municipality in implementing the Mitigation Actions and annual monitoring and evaluation of this Plan.

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[Note: See appendices of Chittenden County Multi-Jurisdictional AHMP for weblinks to the various data sources used to generate many of the tables noted above.]

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## **SECTION 1: INTRODUCTION AND PURPOSE**

### **1.1 Purpose and Scope of this Plan**

The purpose of this Local All-Hazards Mitigation Plan is to assist this municipality in identifying all hazards facing their community and in identifying strategies to reduce the impacts of those hazards. The plan also seeks to coordinate the mitigation efforts of this municipality with those outlined in the *Chittenden County Multi-Jurisdictional All-Hazards Mitigation Plan* as well as efforts of quasi-governmental organizations such as Local Emergency Planning Committee, District #1 and the Chittenden County Regional Planning Commission.

**This annex, when used with the appropriate sections of the Chittenden County Multi-Jurisdictional All-Hazards Mitigation Plan, constitutes an All-Hazards Mitigation Plan for the Town of Jericho.** Community planning can aid in significantly reducing the impact of expected, but unpredictable natural and human-caused events. The goal of this plan is provide hazard mitigation strategies to aid in creating disaster resistant communities throughout Chittenden County.

### **1.2 Hazard Mitigation**

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

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

Hazard mitigation strategies and measures can reduce or eliminate the frequency of a specific hazard, lessen the impact of a hazard, modify standards and structures to adapt to a hazard, or limit development in identified hazardous areas.

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

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

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

There are several implications if the plan is not adopted.

- Flood Mitigation Assistance Grant Program (FMAGP) funds will be available only to communities that have adopted a local Plan
- A community without a plan is not eligible for HMGP project grants but may apply for planning grants under the 7% of HMGP available for planning.
- For the Pre-Disaster Mitigation (PDM) program, a community may apply for PDM funding but must have an approved plan in order to receive a PDM project grant.
- Under Vermont's Emergency Relief Assistance Fund rules, contributions from the State to cover the non-Federal share of a municipality's FEMA Public Assistance project costs varies depending on whether a community has a plan. A community without a plan would have to cover 17.5% of the overall project cost, but a community with a plan would have to cover only 7.5% to 12.5% of the cost.

## **1.4 Benefits**

Adoption and maintenance of this Plan will:

- Make certain funding sources available to complete the identified mitigation initiatives that would not otherwise be available if the plan was not in place.
- Ease the receipt of post-disaster state and federal funding because the list of mitigation initiatives is already identified.
- Support effective pre- and post-disaster decision making efforts.
- Lessen each local government's vulnerability to disasters by focusing limited financial resources to specifically identified initiatives whose importance has been ranked.
- Connect hazard mitigation planning to community planning where possible, such as in emergency operations plans, comprehensive plans (aka "town plans"), capital improvement plans and budgeting, open space plans, and stormwater master plans.

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

The Chittenden County Multi-Jurisdictional All-Hazards Mitigation Plan establishes the following general goals for the county as a whole and its municipalities:

- 1) Hazard mitigation planning should take into account the multiple risks and vulnerabilities of the significant hazards in the County due to its mixed urban-suburban-rural nature, its economic importance to the State and its significant presence of public and private infrastructure.

- 2) Promote awareness amongst municipalities, residents and business in the county of the linkages between the relative frequency and severity of disaster events and the design, development, use and maintenance of infrastructure such as roads, utilities and stormwater management and the planning and development of various land uses.
- 3) Ensure that regionally-initiated mitigation measures are consistent with municipal plans and the capacity of municipalities to implement them.
- 4) Encourage municipalities to formally incorporate their individual Local All-Hazards Mitigation Plan into their municipal plan as described in 24 VSA, Section 4403(5), as well as incorporate their proposed mitigation actions into their various bylaws, regulations and ordinances, including, but not limited to, zoning bylaws and subdivision regulations and building codes.
- 5) Encourage municipalities to formally incorporate elements of their Local All-Hazards Mitigation Plan, particularly their recommended mitigation strategies, into their municipal operating and capital plans and programs, especially, but not limited to, as they relate to public facilities and infrastructure, utilities, highways and emergency services.
- 6) Educate regional entities on the damage to public infrastructure resulting from all hazards and work to further incorporate hazard mitigation planning into the regional land use and transportation planning program conducted by the Chittenden County Regional Planning Commission.
- 7) Maintain existing mechanisms, develop additional processes, or explore funding mechanisms and sources to foster regional cooperation in hazard mitigation, specifically and emergency management planning, generally.

## 1.6 Town of Jericho: Demographics and Development Characteristics

The Town of Jericho is located in eastern Chittenden County and is bounded on the west by Essex and Williston, on the south by Richmond, on the east by Bolton and Underhill and on the north by Westford. It encompasses 35.39 square miles. The town was first granted in 1763, and had its first town meeting in 1794.

Based on U.S. Census data, the University of Vermont’s Center for Rural Studies reports a population of 5,009 people in 2010. Selected population characteristics are as follows:

*Table 1-1 Town of Jericho, selected population characteristics, 2010*

Category	Number	%
Total Population	5,009	--
Median Age	42.6 years	--
Population age 65 years and over	530	10.6
Population (and %) under 10 years old	594	11.9
Population (and %) in group quarters	0	0.0

*U.S. Census Bureau, 2010 Census of Population and Housing, Population and Housing Unit Counts*

The following shows the types of housing within Jericho, also based on the 2010 U.S. Census data:

Table 1-2 Town of Jericho, selected housing unit data, 2010

Category	Number	%
Total Housing Units	1,948	--
Occupied housing units	1,881	96.5
Vacant housing units	67	3.4
Vacant housing units used for seasonal, recreational or occasional use	25	1.3
Detached 1-unit housing units	1,549	79.6
Housing units with 5 or more units in structure	32	1.6
Mobile homes	19	0.1
Housing structures built in 1939 or earlier	301	15.5

U.S. Census Bureau, 2010 Census of Population and Housing, Population and Housing Unit Counts

This population is distributed relatively evenly throughout the town, with the exception of the Ethan Allen Firing Range (cf. Figure 1.2). Denser population concentrations occur along VT Route 15, Plains Rd., Browns Trace Rd., and Raceway Rd. The concentration of residential and commercial/ industrial development in Jericho is shown in *Map 1-1*. Although there is limited commercial development along VT Route 15 and in Jericho Center, the overwhelming use of the landscape in Jericho is for residential and agricultural purposes.

Table 1-3 Town of Jericho, Historic Population Trends

Year	Population
1980	3,575
1990	4,302
2000	5,015
2010	5,009
2014	5,074

Source: April 1 Census Counts for 1980-2010, July 1 ACS Estimates for 2014

## 1.7 Summary of Planning Process

As noted above, the update of this municipal All Hazard Mitigation Plan (AHMP) was part of the planned update of the Chittenden County Multi-Jurisdictional All-Hazards Mitigation Plan and the municipal AHMPs that are annexes to the Multi-Jurisdictional Plan. The CCRPC, with funding provided by the State of Vermont via a FEMA Hazard Mitigation Grant, began this update process in the spring of 2015.

### 1.7.1 Development of the 2017 Jericho All Hazards Mitigation Plan

CCRPC staff met several times with various Town staff and officials during the course of the development of this plan. Initial Meetings focused on the following issues:

1. Reviewing the matrix used in 2011 to identify and prioritize hazards facing Jericho, and determining whether the overall scoring still makes sense

2. Discussing any newly significant hazards in Jericho and identifying any new actions that could be taken to address them.
3. Discussing any progress that has been made on the strategies and tasks from the 2011 plan.

In August 2015, CCRPC Staff met with the Town Administrator (Todd Odit) for Jericho. In January 2016, CCRPC Staff met with the Highway Foreman (Doug Siple) for Jericho.

In addition, the following materials were reviewed:

1. The 2016 Jericho Town Plan
2. River corridor plan for the Browns River
3. Phase II SGA report for Alder Brook
4. Information on previous disasters
5. Information from Vermont Agency of Natural Resources on fluvial erosion hazards and flood hazards
6. Information from the Vermont Agency of Transportation on town roads, bridges, culverts and high crash locations.
7. Information from the Vermont Department of Emergency Management and Homeland Security on prior disaster and hazardous materials reporting.

Demographic information for this Plan was updated by a CCRPC interns in 2015. New information, relative to the 2011 AHMP, from review of the Land Development regulations and the Comprehensive Plan was incorporated into Section 5. Information on prior disasters, fluvial erosion hazards and flood hazards and various transportation data was incorporated into Sections 2, 3 and 4. Throughout the plan development process CCRPC staff sent rough drafts of the plan to numerous town staff to review for accuracy and conferred with these same staff regularly via phone and email. CCRPC staff produced new versions of the 2011 maps and also produced new maps desired in this 2017 update.

#### 1.7.2 Opportunities for involvement in the planning process and formal public review and governing body approval

Emergency management planners are obligated to provide opportunities for the general public, neighboring communities, local, regional and state agencies, development regulation agencies and other interests to be involved in the review and development of Hazard Mitigation Plans. Additionally, the CCRPC, as a public agency is obligated to provide public notice and opportunities for input into its programming and processes. With regard for public involvement in the develop of the first drafts of this Municipal AHMP *prior to release of public drafts*, there was no formal solicitation process to recruit or invite the public to come to staff level meetings wherein the first process of updating data in the old 2011 Plan. That being said, however, the public has been free to review the 2011 Plans on the CCRPC website since they were first posted in 2011. Additionally as noted in Section 1.10.2.4 of the Multi-Jurisdictional AHMP, in the period before the first municipal draft AHMPs were publicly released in August 2016 (see below) there were twelve public meetings held by the CCRPC Board and the Plan Update

Committee wherein the overall Hazard Mitigation planning process was discussed including the content and purpose of the local, Municipal AHMPs as well as the planned timeline for their development starting in 2015 and extending well into 2016. [ Note that opportunities for public review and development of the Multi-Jurisdictional AHMP are described in Section 1.10.2 of the that document.]

Commencing with an August 5, 2016 press release and with a comment deadline of August 19, 2016, the CCRPC repeated the public notice process note above to solicit and receive comments on the second draft Chittenden County Multi-Jurisdictional AHMP. On August 5, 2016, emails to the same state agency staff and executive directors of neighboring Regional Planning Commissions as noted above, were also sent to encourage their review and comment. The public, agency staff and RPC staff were directed to provide comments to Dan Albrecht, Senior Planner at the CCRPC.

With regards to opportunities for public involvement and input from neighboring communities in development of individual Local All-Hazards Mitigation Plans including this Plan for the **Town of Jericho**, opportunities were as follows:

- a) On August 5, 2016, the CCRPC posted all the first drafts of the 18 local AHMPs on the CCRPC website and via various means (press release, electronic newsletter, etc) made the public aware of the opportunity to comment. The public was advised to send comments directly to Dan Albrecht, CCRPC Senior Planner by August 19, 2016.
- b) On August 5, 2016 the CCRPC staff sent direct emails to the Agency staff noted above notifying them as well of the opportunity to review the 18 local AHMPs posted on the CCRPC website and encouraging them to send any comments directly to Dan Albrecht, CCRPC Senior Planner by August 19, 2016.
- c) On August 5, 2016 direct emails were also sent to the municipal Mayors/ Managers/ Administrators and/or Clerks of the abutting 12 communities outside of Chittenden County (South Hero, Georgia, Fairfax, Cambridge, Stowe, Waterbury, Duxbury, Fayston, Lincoln, Starksboro, Monkton and Ferrisburgh) that about the County notifying them of the opportunity to review the 18 local AHMPs posted on the CCRPC website and encouraging them to send any comments directly to Dan Albrecht, CCRPC Senior Planner by August 19, 2016.

No comments were received on the draft Town of Jericho AHMP prior to the August 19<sup>th</sup> deadline. Additionally, no inquiries were received concerning this AHMP after August 19<sup>th</sup> through December 31, 2016 while the Plan was posted on the CCRPC website.

### 1.7.3 Submission of drafts to VDEMHS and FEMA for Review and final adoption process

On June 12, 2016, the first draft of this local Town of Jericho AHMP was sent to the Vermont Department of Emergency Management and Homeland Security (VDEMHS) for review. Comment and required revisions were received from VDEMHS on August 8, 2016. CCRPC staff, working in concert with municipal staff, then made revisions to the Plan to address the required revisions and formal submissions to VDEMHS and FEMA then progressed as follows:

On February 28, 2017, the revised final draft annex was submitted to VDEMHS for review and forwarding to FEMA for formal review and approval pending municipal adoption

On April 25, 2017 FEMA Region One issued a notice that the Town of Jericho AHMP was approved pending adoption by the relevant municipal governing body.

On May 4, 2017, CCRPC staff provided the final versions of the Multi-Jurisdictional Plan and this Municipal Annex to the Town manager for distribution to the Town of Jericho Selectboard members and also provided draft language for a resolution of adoption to be discussed at a regularly scheduled and properly warned Town of Jericho Selectboard meeting

On May 18, 2017 the revised annex was adopted by the Selectboard and a copy of the resolution sent to VDEMHS and FEMA Region One on June 20, 2017.

On July 11, 2017 FEMA issued a letter that the Town of Jericho's Plan was approved.

#### 1.7.4. Monitoring, Evaluation and Updating of the Plan

Section 6 of the Multi-Jurisdictional AHMP document provides extensive details on the role each municipality and the Chittenden County RPC will play to be certain that progress on the implementation of this local AHMP is monitored and evaluated and that the AHMP is updated as needed and no later than its anticipated expiration in early 2022. In short, the Town of Jericho will:

- in the fall of 2017 and each fall thereafter, the municipal departments as noted in Section 5.5 as the conclusion of this document shall respond to CCRPC's questionnaire seeking information on the status (progress, problems if any, etc.) of each identified mitigation strategy detailed in Section 5;
- in the fall of 2018 and the fall of 2020, provide information to aid CCRPC in its more comprehensive review of the Multi-Jurisdictional AHMP and this local AHMP which will address issues such as goals, risks, resources, implementation problems, and partners; in partnership with the municipalities, the CCRPC will make the public aware of the availability of these review documents (via press releases, posting on the CCRPC website, electronic newsletters, one formal announcement in a paper of general circulation in the County, and other mechanisms) and provide detailed instructions on how to provide comment on these reviews;
- provide at least one representative of the municipality to participate as a member of the Chittenden County Multi-Jurisdictional All-Hazards Mitigation Plan Update and Review Committee which, after the current Plan update process is completed, to resume meeting in 2018; and
- participate in the Plan update process (assumed to commence in 2020 and conclude by early 2022).

Finally, it should be reemphasized that the Town of Jericho may review and update their own programs, initiatives and projects more often by working directly with the State Hazard Mitigation Officer (SHMO) based on changing local needs and priorities. Formal changes to individual municipal annexes may be made at any time by each municipality's governing body in

order to reflect changing conditions, priorities, and opportunities during the 5-year life cycle of their single jurisdiction plan.

## SECTION 2: HAZARD IDENTIFICATION

Detailed descriptions of the natural, technological, and societal hazards affecting the municipalities of Chittenden County are contained in Section 2 of the Multi-Jurisdictional All-Hazards Mitigation Plan (MJAHMP). Designated and non-designated hazard areas are described in Section 3 of this annex. Vulnerability of structures and infrastructure to hazards is also described in Section 4 and depicted in Figure 4.1.

### 2.1.1 Profiled Hazards

This Plan profiles six (6) Natural Hazards: Severe Winter Storm, Flooding, Fluvial Erosion, Severe Rainstorm, Extreme Temperatures and Wildfire. Prior to this discussion of Hazards and the subsequent analysis of Risk and Vulnerability, it will be first helpful to summarize the general state of knowledge regarding Location, Extent and Impact in the Town of Jericho for these hazards:

<b>Hazard</b> (section of MJAHMP where discussed)	<b>Are Location data available?</b>	<b>Are Extent data available?</b>	<b>Are Impact data available?</b>
<b>Severe Winter Storm (2.1.1.1)</b>	No, occurs across the municipality and not mapped	No, only long-term data is at single point of National Weather Service station in South Burlington	Yes, if FEMA declares disaster. See 3.3 below.
<b>Flooding (2.1.1.3)</b>	Yes, 100 & 500 year flood areas delineated in the municipality (See Figure 2.1)	*Yes but only at a few discrete locations with gauge data such as U.S. Army Corps of Engineers for Lake Champlain or a USGS gauge on the Winooski River	Yes, if FEMA declares disaster but co-mingled with fluvial erosion and severe rainstorm hazards events. See 3.3 below.
<b>Fluvial Erosion (2.1.1.4)</b>	Yes, fluvial erosion hazards areas (now termed river corridor protection areas) are mapped in the municipality (See Figure 2.1)	Though fluvial erosion is considered a significant hazard in the municipality, the number of feet-acres of soil lost in any one event has not been recorded nor is there a record with such data.	Yes, if FEMA declares disaster but data co-mingled with flood and severe rainstorm events. See 3.3 below.
<b>Severe Rainstorm ( 2.1.1.2 )</b>	No, occurs across the municipality and not	*Yes but only long-term data is at single	Yes, if FEMA declares disaster but

	mapped. Damage locations are mapped but damages can just as easily be a function of poorly designed road and/or driveway drainage as it is a function of heavy rain exceeding infrastructure capacity.	point of National Weather Service station in South Burlington.	data co-mingled with flood and fluvial erosion events. See 3.3 below.
<b>Extreme Temperatures (2.1.1.5)</b>	No, occurs across the municipality and not mapped.	*Yes but only at single point of National Weather Service station in South Burlington	†Data not systematically collected on impacts.
<b>Wildfire (2.1.1.6)</b>	No, occurs across the municipality and not mapped.	Some compiled data on a countywide basis as shown in the Multi-Jurisdictional Plan but no systematic data collected after 2010.	‡Data not systematically collected on impacts.

*\* It is useful to note that while this NWS data is reliable it represents one discrete location in a county that has an area of 620 square miles in area. Likewise, while there are likely other systematic point-specific records being collected by individuals, business or organizations these data do not appear to be easily accessible. Finally, even if such data were accessible, only if the data was collected by mutually compatible means would it be useful.*

*†An intensive search of municipal public works records may reveal documentation of some prior repair or labor costs associated with frozen or burst sewer and/or water pipes caused by Extreme Cold. However, such analysis would show where past events happened not the location of inadequately buried pipes which might be vulnerable to future events.*

*‡ An intensive search of fire department records may reveal documentation of locations and acres burned caused by Wildfire. However, such analysis would show where past events happened but would not show the location of areas susceptible to future events (warnings by the US Forest Service and local fire departments are not location-specific) nor the location of individuals who are likely to unwisely burn trash or leaves or fail to extinguish a campfire during dry conditions.*

**This Plan profiles several Technological Hazards.** Prior to this discussion of Hazards and the subsequent analysis of Risk and Vulnerability, it will be first helpful to summarize the general state of knowledge regarding Location, Extent and Impact in Town of Jericho for these hazards:

<b>Hazard</b> (section of MJAHP where discussed)	<b>Are Location data available?</b>	<b>Are Extent data available?</b>	<b>Are Impact data available?</b>
<b>Water Pollution ( 2.2.1 )</b>	Impaired streams that lack adequate biota are identified.	Phosphorus-loading for general locations is known but non-point sources are	Annual budgetary impacts to individual municipalities are significant but vary

		varied and dispersed. A road erosion inventory was performed in 2016 but data analysis is not yet complete and projects have not yet been prioritized or scoped.	depending upon location and whether they are an MS4 permitted community. The municipality is not an MS4 community but is subject to the requirements of the pending Municipal Roads General Permit.
<b>Hazardous Materials Incident ( 2.2.2 )</b>	Storage locations are known (see listing below of addresses). Incidents occurring during transportation could occur anywhere.	Rough estimates of spill amounts are recorded.	No formal data readily available on cleanup costs.
<b>Power Loss ( 2.2.3 )</b>	Outage locations not mapped	During an actual outage some data is recorded on duration although typically this is stated as “x,000 customers within the power company’s service area”.	Outage data is broad and refers to total customers within a county.
<b>Invasive Species ( 2.2.4 )</b>	Several species known to occur in upland and agricultural areas, but no systematic mapping has taken place.	No formal damage has been documented to date	No formal damage has been documented to date
<b>Multi-Structure Fire ( 2.2.5 )</b>	Could happen anywhere within the more developed portions of the municipality	Data not formally collated across agencies	Data not formally collated across agencies
<b>Major Transportation Incident ( 2.2.6 )</b>	Depending upon type of incident, could happen anywhere	No formal database of damages.	Varies depending upon type of incident.

<b>Water Supply Loss ( 2.2.7 )</b>	Water distribution systems are mapped. Most residences and businesses use private wells	Data not formally collated across agencies	Data not formally collated across agencies
<b>Sewer Service Loss ( 2.2.8 )</b>	Residences and businesses use private septic systems.	Data not formally collated across agencies	Data not formally collated across agencies
<b>Natural Gas Service Loss ( 2.2.9 )</b>	No natural gas service	Information for this rare occurrence not publicly available.	No formal damage has been documented to date.
<b>Telecommunications Failure ( 2.2.10 )</b>	Depending upon type of incident, could happen anywhere	Information for this rare occurrence not publicly available.	No formal damage has been documented to date
<b>Other Fuel Service Loss ( 2.2.11 )</b>	Distribution points of fuels such as firewood, fuel oil and propane are individual addresses and not mapped nor publicly available.	No formal loss of service has been documented.	No formal damage has been documented to date

**The following discussion of societal hazards** is based upon qualitative information from discussions with Chittenden County law enforcement professionals as well as quantitative data from the State of Vermont.

<b>Hazard</b> (section of MJAHP where discussed)	<b>Are Location data available?</b>	<b>Are Extent data available?</b>	<b>Are Impact data available?</b>
<b>Crime ( 2.4.1.1 )</b>	Significant incidents could happen anywhere in the municipality.	Data collection is not standardized across municipalities.	Significant socio-economic impacts
<b>Economic Recession ( 2.4.1.2 )</b>	Would occur across the community.	Historic data on unemployment levels & poverty rates	Longer lasting impacts hard to measure below county level
<b>Terrorism ( 2.4.1.3 )</b>	The FBI does not share a list of potential targets.	Unknown but assumed to be significant if incident occurs	Unknown but assumed to be significant if incident occurs
<b>Civil Disturbance</b>	County-wide.	No formal damage	No formal damage

<b>( 2.4.1.4 )</b>	Significant incidents can happen anywhere. The likelihood of an event may not be geographically likely but rather related to the type of event (political event, sporting event, protest, etc.)	has been documented to date	has been documented to date
<b>Epidemic ( 2.4.1.5 )</b>	Could happen anywhere	Data not formally collated across agencies	Other than 1917 Influenza epidemic no formal damage has been documented to date
<b>Key Employer Loss ( 2.4.1.6 )</b>	Depending upon type of employer	No formal database of damages.	No formal database of key employer loss is maintained

## **SECTION 3: RISK ASSESSMENT**

### **3.1 Mapped Hazard Areas**

#### 3.1.1 Flood Hazard Areas

In 1981, Jericho began participation in the NFIP. The Town has been issued official FEMA Floodplain maps, including most recently issuance of Digital Flood Insurance Rate Maps (DFIRM) by FEMA in 2011. The town is participating in the regular NFIP as of January 2017. Jericho's most recent Zoning Regulations, adopted in 2015, designate a River Overlay District, which minimizes development in FEMA-defined floodplains plus a 100 foot buffer, all FEH areas mapped and defined by the Vermont DEC, and the area 35, 50 or 100 feet from top-of-bank on waterways, depending on size. Only Accessory structures (in stream buffer areas only) and general recreation agriculture, silviculture, farmers' markets, passive recreation and wildlife management are permitted in the River Overlay district. Accessory structures (within stream buffer areas only) and general recreation are conditional uses.

A simple GIS intersection analysis reveals that portions of town roads are also located within the 100-year floodplain as well as culverts and bridges and utility poles. Unfortunately, this level of analysis does not take into account the fluvial geomorphology (volume, velocity, direction, etc.) nor, most critically, does it factor in the elevation of the road relative to flood elevation. Analysis also reveals farmland located within the floodplain, however, without detailed studies at each location it is not currently possible to predict how many cubic yards of productive soils would be a net loss during a flood event.

Figure 2.1 shows the current extent of the FEMA-FIRM flood hazard area in Jericho, as well as structures, infrastructure, and critical facilities located in the flood hazard area.

The only systematic data on river flow in Chittenden County is collected on the Winooski River at a gauge at a location straddling South Burlington and Essex Junction (cf. Section 2.1.1.3 of the MJAHMP). While the data has been collected since the massive 1927 flood, once dams were constructed by the mid-1930s, water flows became more tightly regulated for flood control and electricity generation and therefore recorded peak flows may not accurately measure total rainfall or total discharge.

#### 3.1.2 Fluvial Erosion Hazard and River Corridor Areas

During development and adoption of both the 2005 and 2011 Multi-Jurisdictional Plan and the municipal AHMPs, threats from stream erosion were identified as Fluvial Erosion Hazard (FEH) Areas through the analytical lens of Stream Geomorphic Assessment (SGA). The SGA approach is still used by the Vermont Agency of Natural Resources but the Vermont General Assembly adopted two related terms that are now used in managing fluvial erosion hazards. ANR now identifies and maps:

- *River Corridor* which is the land area adjacent to a river that is required to accommodate the dimensions, slope, planform, and buffer of the naturally stable channel and that is necessary for the natural maintenance or natural restoration of a dynamic equilibrium condition, as that term is defined in 10 V.S.A. §1422, and for minimization of fluvial erosion hazards, as delineated by the Agency in accordance with the ANR Flood Hazard Area and River Corridor Protection Procedures.

- *River Corridor Protection Area* which is the area within a delineated river corridor subject to fluvial erosion that may occur as a river establishes and maintains the dimensions, pattern, and profile associated with its dynamic equilibrium condition and that would represent a hazard to life, property, and infrastructure placed within the area. The river corridor protection area is the meander belt portion of the river corridor without an additional allowance for a riparian buffer to serve the functions of bank stability and slowing flood water velocities in the near-bank region.

SGA work has been completed on the Browns River, the Lee River, Alder Brook and Mill Brook, as well as on portions of Abby Brook and The Creek and portions of the Governor Peck tributary of the Winooski. Phase 2 SGA based River Corridor Protection Areas (formerly Fluvial Erosion Hazard Areas) were developed for those portions of streams where SGA was completed. Map 3 shows the progress of geomorphic assessments and identified Phase 2 SGA based River Corridor Protection Areas (RCPA) in Jericho. Other tributaries to the Winooski River, the Lee River and the Browns River, along with additional portions of Abby Brook and The Creek that did not have Phase 2 SGA work, but have a watershed area greater than 2 sq. miles, would also be included in the River Corridor Protection Area and/or River Corridor. Figure 2.1 indicates all portions of the streams in Jericho that would be captured by the RCPA and/or RC.

### 3.1.3 Repetitive Loss Properties and National Flood Insurance Program

Repetitive loss properties are public or private buildings insured under the National Flood Insurance Program that have made at least two insurance claims of more than \$1,000 each during a ten year period.

According to the National Flood Insurance Program there is one repetitive loss property located in Jericho—a condominium located on Cilley Hill Road.

The status of the town participation’s in the National Flood Insurance Program is as follows:

Initial Flood Hazard Boundary Map	Initial Flood Insurance Rate Map	Current effective Map Date	Date of joining Regular NFIP	Date of most recent Community Assistance Visit
6/14/74	6/1/81	8/4/14	6/1/81	1/22/93

The Town Zoning Administrator and the Town’s Development Review Board (DRB) monitor compliance with the National Flood Insurance Program. The DRB reviews and adjudicates applications for development within the floodplain including any proposed new construction in the SFHA which is highly regulated. The Town also works with DEC to respond to any local requests for Floodplain identification including questions about mapping.

## **3.2 Other Information**

The following hazards are not formally analyzed nor mapped due to the random nature of where such damage occurs. However, they occur with some frequency and therefore are discussed here.

### 3.2.1 1998 Ice Storm Damage

The town and residents suffered no significant damage from this event, as the town's higher elevation kept temperatures below freezing.

### 3.2.2 Severe rainstorms

In prior versions of this Annex and the County Plan, damage to roads, culverts and bridges from thunderstorm events was discussed as either the result of flooding or fluvial erosion. It was assumed that overflowing nearby streams, rivers or lakes were the cause of the damage. Analysis has shown that this damage is caused by intense, localized thunderstorms which cause excessive and rapid water flows on and over paved and gravel roads, roadside ditches, driveway culverts, stormwater systems, etc. In many cases, damaged infrastructure is located nowhere near a formally mapped Floodplain or Fluvial Erosion Hazard Area or River Corridor. This was the case in more recent FEMA-declared disasters in the summer of 2013 and 2015. Because of this new information, CCRPC has decided to add "Severe Rainstorm" to the 2016 Update to the County Plan and its annexed local AHMPs. While past damage locations can sometimes be mapped (depending upon the degree and accuracy of data collection efforts) this may or may not provide any degree of predictability of the potential locations for future events.

The Town of Jericho's road infrastructure as well as the driveways of private homes and businesses consist primarily of gravel and/or dirt and are therefore susceptible to damage from intense rainstorms. Damage occurring in DR#-4120 (noted below) included significant damage from rainstorms.

Ridgeline and hilltop homes as well as homes located in the midst of mature forests are the most vulnerable to damage from falling trees and tree limbs in high wind events. According to the National Climatic Data Center, lightning has struck and damaged structures in Jericho once since 2000, although local officials indicate that many more lightning incidents have occurred in that timeframe. Six high wind events have been specifically identified as affecting Jericho by the National Climatic Data Center since 1993, though, as with lightning, local officials indicate that there are numerous unrecorded high wind incidents.

### 3.2.3 High Crash Locations

The following High Crash Locations have been identified by the Vermont Agency of Transportation in Jericho.

*Table 3-1 Town of Jericho, high crash road sections, 2010-2014*

<b>Road</b>	<b>Road Type</b>	<b>Section (miles)</b>	<b>Severity Index (\$/crash)</b>
VT 117	Minor Arterial	0.269-0.569	\$40,718

*Source: Vermont Agency of Transportation*

### 3.2.4 Road Infrastructure Failure

Of the 20 bridges inventoried by VTTrans for Jericho, 7 are rated functionally deficient, and 1 is considered structurally deficient. These ratings do not mean that the bridges are in imminent danger of collapse, however. Two bridges in Jericho are rated Scour Critical with regards to

fluvial undermining of bridge structure. For a listing of culverts identified as “geomorphically-incompatible” either due to inadequate size or improper alignment, see Section 4.2.2.

### 3.2.4 Hazardous Substances

Hazardous material release is discussed as a possible hazard in the Multi-Jurisdictional All-Hazards Mitigation Plan. According to Vermont Emergency Management, there are several reported hazardous material storage sites in Jericho. Sites that contain large amounts of fuel or store what VEM calls Extremely Hazardous Substances are more likely to cause significant problems in a hazardous materials incident.

According to the 2007 hazardous materials data obtained from VEM, the following sites in Jericho stored either fuel in excess of 10,000 lbs or extremely hazardous substances.

*Table 3-2 Town of Jericho, fuel storage sites in excess of 10,000 lbs.*

<b>Owner / Facility</b>	<b>Type of Substance</b>
CHITTENDEN MILLS BEVERAGE	GASOLINE
GENERAL DYNAMICS ARMAMENT AND TECHNICAL PRODUCTS	FUEL OIL, [NO. 2]
GENERAL DYNAMICS ARMAMENT AND TECHNICAL PRODUCTS	PROPANE
JERICO CENTER MARKET	GASOLINE
VERMONT ARMY NATIONAL GUARD - ETHAN ALLEN FIRING RANGE	GASOLINE
VERMONT ARMY NATIONAL GUARD - ETHAN ALLEN FIRING RANGE	PROPANE
VERMONT ARMY NATIONAL GUARD - ETHAN ALLEN FIRING RANGE	DIESEL FUEL
VERMONT ARMY NATIONAL GUARD - ETHAN ALLEN FIRING RANGE	HEATING FUEL OIL
S.B. COLLINS (JOLLEY RIVERSIDE)	DIESEL FUEL
S.B. COLLINS (JOLLEY RIVERSIDE)	FUEL, GASOLINE
S.B. COLLINS (JOLLEY RIVERSIDE)	KEROSENE
COMCAST	LEAD
GREEN MOUNTAIN POWER UNDERHILL SUBSTATION	LEAD

*Source: Vermont Emergency Management*

*Table 3-3 Town of Jericho, Extremely Hazardous Substances storage sites*

<b>Owner / Facility</b>	<b>Type of Substance</b>
GENERAL DYNAMICS ARMAMENT AND TECHNICAL PRODUCTS – ETHAN ALLEN FIRING RANGE	BATTERY ACID
RCC JERICO	LEAD ACID BATTERIES
RCC JERICO	SULFURIC ACID
VERIZON WIRELESS	SULFURIC ACID

*Source: Vermont Emergency Management*

### 3.3 Previous FEMA-Declared Natural Disasters and Snow Emergencies

#### 3.3.1 Public Assistance

Since 1990, Jericho has received public assistance funding from FEMA for the following natural disasters:

*Table 3-4 Town of Jericho, FEMA-declared disasters and snow emergencies, 1990-2016*

Date (FEMA ID#)	Type of Event	Total repair estimates
June 1990 (DR 875)	flooding	\$313,774
January 1996 (DR 1101)	flooding	\$13,030
April 2001 (EM 3167)	Snow emergency	\$9,723
December 2010 (DR 1951)	Severe storm	\$5,937
April 2011 (DR 1995)	Severe storms and flooding	\$81,316
May 2013 (DR 4120)	Severe storms and flooding	\$83,885
June 2013 (DR 4140)	Severe storms and flooding	\$173,191

*Sources: Vermont Department of Housing & Community Affairs; Vermont Agency of Transportation.*

*Dollar value figures represent the total estimated repair costs for damages suffered to municipal resources. This table does not include damage claims submitted to FEMA by non-municipal organizations or by private individuals or businesses.*

The Town of Jericho was reimbursed at a rate of 75 percent by FEMA for the estimated repair costs coupled with additional dollars from the State’s Emergency Relief Assistance Fund (ERAF) typically averaging 17.5%. Funds provided in response to these natural disasters were used as follows:

- June 1990: Money was used to repair gravel roadways, culverts and ditching on Fitzsimmons Road, Alpine Drive, Governor Peck Road, Fields Lane, Brown Trace Road, Milo White Road, Leary Road, Fields Lane and Gravell Road. Extension damage was caused by Mill Brook.
- January 1996: Money was used to repair gravel roadways, culverts and ditching on Fitzsimmons Road, Hanley Lane, Snipe Island Road and Palmer Lane.
- April 2001: Money was used for extra costs associated with snow removal.
- December 2010: Money was used to remove debris blocking roads. Additionally, the Jericho Underhill Fire Department received money for emergency protective measures, and the Jericho Elementary School received money to repair damaged roof, windows and fences.
- April 2011: Money was used to repair gravel, ditching, riprap and culverts on Orr Road, Shillhammer Road, Plains Road, Varney Road, Fitzsimmons Road, Bolger Road, Packard Lane, Tarbox Lane, Raceway Road, Barber Farm Road, Old Farm Road and Hanley Road.
- May 2013: Money was used to repair a culvert headwall on Cilley Hill Road, repairing roadways, ditching and culverts on Skunk Hollow, Lawrence Heights Road, Fitzsimmons Road, Alpine Road, Cilley Hill Road and Hanley Road. The Jericho Underhill Fire Department also received funding for emergency protective measures.
- June 2013: Money was used to repair gravel roadway, ditching and culverts on Milo White Road, Bolger Hill Road, Fields Lane and Barber Farm Road.

See *Figure 3.1.* to see locations where repairs funded in part with FEMA Public Assistance took place for disasters between 2001 and 2015. As the map shows, damage has tended to be concentrated in upland areas. Note that some Debris Removal and Protective Measures locations are shown at the location of the municipal office. This indicates assistance was at various locations throughout the municipality, not that damages were incurred at the office.

### 3.3.2 Individual Assistance funds

As noted in Section 3.3 of the County Plan, due to privacy concerns, the individual homes or businesses which received Individual Assistance funds in connection with the two Federal disasters in 2011 (Spring flooding and Tropical Storm Irene in September) are not public information. However, the names of the streets of such homes or businesses from which claims are filed is available as are the funds provided. With regards to the Town, individual claims were filed at residences or business located on the following streets. As the data show, in some cases, on numerous streets, several properties were damaged in connection with the Spring 2011 flooding and Tropical Storm Irene in the Fall of 2011. These sheets are shown in Figure 3.1.1.

*Table 3-5 Town of Jericho, location of individual assistance claims, Spring 2011 flood & Tropical Storm Irene, September 2011*

<b>Disaster</b>	<b>Damaged Address Street</b>	<b>Amount</b>
Spring 2011	BOLGER HILL ROAD	\$2,843.12
Spring 2011	BROWNS TRACE RD	\$10,353.52
Spring 2011	CILLEY HILL RD	\$0.00
Spring 2011	FIELDS LN	\$915.06
Spring 2011	GABAREE LN	\$400.13
Spring 2011	HANLEY LN	\$868.71
Spring 2011	LAFAYETTE DR	\$696.88
Spring 2011	SUNNYVIEW DR	\$7,138.83
Tropical Storm Irene	FIELDS LN	\$160.73

### **3.4 Future Events**

Although estimating the risk of future events is far from an exact science, CCRPC staff used best available data and best professional judgment to conduct an updated Hazards Risk Estimate analysis, which was subsequently reviewed and revised by town officials in Fall 2015. This analysis assigns numerical values to a hazard’s affected area, expected consequences, and probability. This quantification allows direct comparison of very different kinds of hazards and their effect on the county, and serves as a rough method of identifying which hazards hold the greatest risk. CCRPC staff applied the following scoring system:

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

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

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

Probability of Occurrence (scored 1-5) estimates an anticipated frequency of occurrence.

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

As explained in detail in Section 3.4 of the Multi-Jurisdictional Plan, for the 2011 Plan, the following Hazards were considered to occur or have the potential to occur with sufficient frequency and/or severity to be profiled for Risk Estimation in that Plan:

**Natural Hazards:**

- Drought
- Flooding
- Fluvial erosion
- High winds
- Landslide
- Lightning
- Multi-structure urban fire
- Radiological (natural)
- Wildfire
- Winter storm

**Technological Hazards:**

- Gas service loss
- Hazardous materials incident
- Major transportation incident
- Military ordnance incident
- Power loss
- Radiological incident
- Sewer service loss
- Telecommunications failure
- Water service loss

**Societal Hazards:**

- Crime
- Civil disturbance
- Economic recession
- Epidemic
- Key employer loss
- Terrorism

For the 2016 update, the CCRPC and its All-Hazards Mitigation Plan Update Committee made slight changes to this list by consolidating some hazards or delineating hazards with more specificity as follows:

**Natural Hazards:**

- Flooding
- Fluvial erosion
- Severe Rainstorm
- Wildfire

**Technological Hazards:**

- Hazardous materials incident
- Major transportation incident

**Societal Hazards:**

- Crime
- Civil disturbance
- Economic recession
- Epidemic

- Winter storm
- Extreme temperatures
- Multi-structure urban fire
- Natural gas service loss
- Pollution
- Power loss
- Sewer service loss
- Telecommunications failure
- Water service loss
- Other fuel service loss
- Invasive Species
- Key employer loss
- Terrorism

### 3.4.1 Natural Hazards

For the 2011 Hazard and Risk Estimation analysis for Jericho, the following natural hazards received the highest risk ratings out of a possible high score of 80:

- Severe Winter Storm (50)
- Flooding (24)
- High Winds (20)
- Fluvial Erosion (20)

For the 2017 update, the following natural hazards received the highest risk ratings out of a possible high score of 80 (see Table below):

- Severe Winter Storm (55)
- Flooding (36)
- Fluvial Erosion (36)
- Severe Rainstorm (30)

While flooding and fluvial erosion are likely to have a significant impact over a smaller area, severe winter storms tend to affect the entire town and are more common, hence the higher rating.

Table 3-6 Natural hazards risk estimation matrix, Jericho

Risk Characteristic		Winter Storm	Flooding	Fluvial Erosion	Severe Rainstorm	Extreme Temperatures	Wildfire
	0 = No developed area impacted					0	
<b>Area Impacted</b>	1 = Less than 25% of developed area impacted		1	1	1	1	
	2 = Less than 50% of developed area impacted						
	3 = Less than 75% of developed area impacted						
	4 = Over 75% of developed area impacted	4					
<b>Health and Safety Consequences</b>	0 = No health and safety impact						0
	1 = Few injuries or illnesses	1	1	1	1	1	
	2 = Few fatalities but many injuries and illnesses						
	3 = Numerous fatalities						
<b>Property Damage</b>	0 = No property damage					0	
	1 = Few properties destroyed or damaged						1
	2 = Few destroyed but many damaged	2	2	2	2		
	2 = Few damaged and many destroyed						
	3 = Many properties destroyed and damaged						
<b>Environmental Damage</b>	0 = Little or no environmental damage						
	1 = Resources damaged with short-term recovery				1	1	1
	2 = Resources damaged with long-term recovery	2					
	3 = Resources destroyed beyond recovery		3	3			
<b>Economic Disruption</b>	0 = No economic impact						
	1 = Low direct and/or indirect costs				1	1	1
	2 = High direct and low indirect costs	2	2	2			
	2 = Low direct and high indirect costs						
	3 = High direct and high indirect costs						
<b>TOTAL SCORE</b>		11	9	9	6	4	3
<b>Probability of Occurrence</b>	1 = Unknown but rare occurrence						
	2 = Unknown but anticipate an occurrence						
	3 = 100 years or less occurrence						3
	4 = 25 years of less occurrence		4	4		4	
	5 = Once a year or more occurrence	5			5		
<b>TOTAL RISK RATING</b>		55	36	36	30	16	9

### 3.4.2 Technological Hazards

In the 2011 Hazard and Risk Estimation analysis for Jericho, the following technological hazards received the highest risk ratings out of a possible high score of 80:

- Power Loss (40)
- Telecommunications Failure (30)

For the 2016 update, the following technological hazards received the highest risk ratings out of a possible high score of 80 (see Table below):

- Power Loss (20)
- Telecommunications Failure (20)

Jericho is vulnerable to power loss and telecommunications failure because the population is dispersed and repairing utility infrastructure in rural areas can take more time. Only a limited portion of Jericho has municipal water service, and many town residents and businesses rely on well water, so it should be noted that a power loss also results in a water service loss.

Power loss and telecommunications failure were both identified as the most significant technological hazards in the 2011 plan. Though cellular service is somewhat more reliable than it was five years ago, both issues remain significant for residents of rural areas.

Table 3-7 Technological hazards risk estimation matrix, Jericho

Risk Characteristic		Power Loss	Telecommunications Failure	Pollution (legal etc.)	Water Service Loss	Invasive Species	Hazardous Materials Incident	Major Transportation Incident	Multi-Structure Urban Fire	Other Fuel/Service Loss	Gas Service Loss	Sewer Service Loss
<b>Area Impacted</b>	0 = No developed area impacted											0
	1 = Less than 25% of developed area impacted			1		1	1	1	1	1	1	
	2 = Less than 50% of developed area impacted	2	2		2							
	3 = Less than 75% of developed area impacted											
	4 = Over 75% of developed area impacted											
<b>Health and Safety</b>	0 = No health and safety impact					0						0
	1 = Few injuries or illnesses	1	1	1	1		1	1		1	1	
	2 = Few fatalities but many injuries and illnesses							2				
<b>Consequences</b>	3 = Numerous fatalities											
	0 = No property damage		0	0	0	0					0	
<b>Property Damage</b>	1 = Few properties destroyed or damaged	1					1	1	1		1	1
	2 = Few destroyed but many damaged											
	2 = Few damaged and many destroyed											
	3 = Many properties destroyed and damaged											
<b>Environmental Damage</b>	0 = Little or no environmental damage	0	0		0			0	0	0		
	1 = Resources damaged with short-term recovery						1	1				1
	2 = Resources damaged with long-term recovery			2		2						
	3 = Resources destroyed beyond recovery											
<b>Economic Disruption</b>	0 = No economic impact	0										
	1 = Low direct and/or indirect costs		1		1	1	1	1		1	1	
	2 = High direct and low indirect costs			2						2		
	2 = Low direct and high indirect costs											
	3 = High direct and high indirect costs											
<b>TOTAL SCORE</b>		4	4	6	4	4	5	6	4	5	3	3
<b>Probability of Occurrence</b>	1 = Unknown but rare occurrence								1	1	1	
	2 = Unknown but anticipate an occurrence							2	2			
	3 = 100 years or less occurrence			3			3					
	4 = 25 years of less occurrence				4		4					
	5 = Once a year or more occurrence	5	5									
<b>TOTAL RISK RATING</b>		20	20	18	16	16	15	12	8	5	3	3

### 3.4.3 Societal Hazards

In the 2011 Hazard and Risk Estimation analysis for Jericho, the following societal hazards received the highest risk ratings out of a possible high score of 80:

- Epidemic (21)
- Economic Recession (21)

For the 2016 update, the following societal hazards received the highest risk ratings out of a possible high score of 80 (see Table below):

- Economic Recession (28)
- Crime (20)

Economic recession is highly ranked for both its direct impacts and its secondary effects on health, safety, and the environment. In a recession, property owners may not be able to maintain their properties, which are then more vulnerable to natural hazards. Major crime is rare in the town, but small crimes are very common.

Epidemic and economic recession were both identified as threats in the 2011 plan, and the risk of them remains low but still exists. The risk of crime is perceived as being higher now. This is related to Vermont's opioid epidemic. Drug use and crimes related to drug use, while still rare compared to the situation in major cities, are a major point of discussion in Vermont. Residents of small towns no longer feel immune to crime, increasing the ranking of this hazard.

Table 3-8 Societal hazards risk estimation matrix, Jericho

Risk Characteristic		Economic Recession	Crime	Epidemic	Key Employer Loss	Civil Disturbance	Terrorism
<b>Area Impacted</b>	0 = No developed area impacted						
	1 = Less than 25% of developed area impacted		1	1	1	1	1
	2 = Less than 50% of developed area impacted						
	3 = Less than 75% of developed area impacted	3					
	4 = Over 75% of developed area impacted						
<b>Health and Safety Consequences</b>	0 = No health and safety impact			0			
	1 = Few injuries or illnesses	1	1		1		
	2 = Few fatalities but many injuries and illnesses			2			2
	3 = Numerous fatalities						
<b>Property Damage</b>	0 = No property damage	0		0	0		
	1 = Few properties destroyed or damaged		1			1	1
	2 = Few destroyed but many damaged						
	2 = Few damaged and many destroyed						
	3 = Many properties destroyed and damaged						
<b>Environmental Damage</b>	0 = Little or no environmental damage		0	0	0	0	
	1 = Resources damaged with short-term recovery	1					1
	2 = Resources damaged with long-term recovery						
	3 = Resources destroyed beyond recovery						
<b>Economic Disruption</b>	0 = No economic impact						
	1 = Low direct and/or indirect costs		1			1	
	2 = High direct and low indirect costs						
	2 = Low direct and high indirect costs	2		2	2		
	3 = High direct and high indirect costs						3
<b>TOTAL SCORE</b>		7	4	5	3	4	8
<b>Probability of Occurrence</b>	1 = Unknown but rare occurrence						
	2 = Unknown but anticipate an occurrence						
	3 = 100 years or less occurrence			3			
	4 = 25 years of less occurrence	4			4		
	5 = Once a year or more occurrence		5				
<b>TOTAL RISK RATING</b>		28	20	15	12	0	0

#### 3.4.4 Hazard Summary

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

##### Natural Hazards

- Severe Winter Storm (55)
- Flooding (36)
- Fluvial Erosion (36)

##### Technological Hazards

- Power Loss (20)
- Telecommunications Failure (20)

##### Societal Hazards

- Economic Recession (28)
- Crime (20)

It should be noted that the four natural hazards on the list—flooding, fluvial erosion, severe rainstorm, and severe winter storm—could be the cause of the highest-rated technological hazards, power loss and telecommunications failure. Winter storms are the highest rated hazard for Jericho, due in large part to their widespread nature and frequent occurrence.

## SECTION 4: VULNERABILITY ASSESSMENT

As discussed in Section 4 of the County Plan, typical vulnerabilities from the County’s common hazards consist primarily of:

- Damage to public infrastructure especially roads and culverts;
- Temporary closures of roads and bridges including from debris;
- Temporary loss of power and/or telecommunications
- Temporary isolation of vulnerable individuals such as the elderly or those in poverty.

More specifically, these vulnerabilities typically occur in association with the Profiled Natural Hazards as follows:

*Table 4-1 Town of Jericho: Natural Hazards and typical vulnerabilities*

<b>Hazard</b>	<b>Typical vulnerabilities</b>	<b>Occasional additional vulnerability</b>
<b>Severe Winter Storm</b>	-temporary closures of roads and bridges including from debris; -temporary loss of power and/or telecommunications, and -temporary isolation of vulnerable individuals	-budget impacts from debris cleanup
<b>Flooding</b>	-temporary closures of roads and bridges including from debris; -temporary loss of power and/or telecommunications, and -temporary isolation of vulnerable individuals -damage to public infrastructure	-budget impacts from road/bridge closures and repairs to public infrastructure -damages to individuals’ properties and businesses
<b>Fluvial Erosion</b>	-temporary closures of roads and bridges including from debris; -temporary loss of power and/or telecommunications, and -temporary isolation of vulnerable individuals -damage to public infrastructure	-budget impacts from road/bridge closures and repairs to public infrastructure -damages to individuals’ properties and businesses
<b>Severe Rainstorm</b>	-temporary closures of roads and bridges including from debris; -temporary loss of power and/or telecommunications, and -temporary isolation of vulnerable individuals -damage to public infrastructure	-budget impacts from road/bridge closures and repairs to public infrastructure -damages to individuals’ properties and businesses
<b>Extreme Temperatures</b>	-damage to public infrastructure -loss of water service	-budget impacts due to needed repairs
<b>Wildfire</b>	-damage to private property	

**Relative to the County as a whole the Town of Jericho has a higher vulnerability to:**

- Severe Rainstorms, Fluvial Erosion due to high amount of gravel roads and mountainous terrain.
- Flooding due to the presence of the Browns River

Vulnerabilities with regard to Technological Hazards are harder to project as these incidents occur with less frequency and less predictability.

*Table 4-2 Town of Jericho: Technological Hazards and typical vulnerabilities*

<b>Hazard</b>	<b>Typical vulnerabilities</b>	<b>Occasional additional vulnerability</b>
<b>Major Transportation Incident</b>	-temporary closures of transportation infrastructure -injuries, deaths	-if major event, potential long term closure of infrastructure.
<b>Power Loss</b>	-temporary loss of electrical service -temporary impacts to vulnerable individuals -damage to public infrastructure	-if extended event, damage to perishable goods or business income. -if extensive loss, potential budget impacts to service providers.
<b>Hazardous Materials Incident</b>	-temporary closures of roads and bridges during cleanup.	-if large event, potential high cleanup costs. -injuries to persons
<b>Water Service Loss</b>	-temporary loss of service -temporary impacts to vulnerable individuals	-if extensive loss, potential budget impacts to service providers.
<b>Gas Service Loss</b>	-temporary loss of service -temporary impacts to vulnerable individuals	-if extensive loss, potential budget impacts to service providers.
<b>Telecommunications Failure</b>	-temporary loss of service -temporary impacts to vulnerable individuals	-if extensive loss, potential budget impacts to service providers.
<b>Other Fuel Service Loss</b>	-temporary loss of service -temporary impacts to vulnerable	-if extensive loss, potential budget

	individuals	impacts to service providers.
<b>Sewer Service Loss</b>	-temporary loss of service -temporary impacts to vulnerable individuals	-if extensive loss, potential budget impacts to service providers.
<b>Water Pollution</b>	-ongoing budgetary impacts due to permit requirements.	-if repeat events, impacts to tourism-based businesses
<b>Invasive Species</b>	-small but ongoing cost to monitoring level of occurrence	-unknown at this point.

**Relative to the County as a whole the Town of Jericho has a slightly higher vulnerability to:**

- Power Loss and Telecommunications Failure due to its rural nature

With regard to Societal Hazards, vulnerabilities are typically more dispersed among individuals and societal sectors compared to the natural environment and to technology which is fixed.

*Table 4-3 Town of Jericho: Societal Hazards and typical vulnerabilities*

<b>Hazard</b>	<b>Typical vulnerabilities</b>	<b>Occasional additional vulnerability</b>
<b>Crime</b>	-increased demands on police services and social services	-injuries -deaths
<b>Epidemic</b>	-temporary closures of schools, businesses, places of assembly -increased demand on medical services	-if an epidemic is widespread and long-lasting, impact could be severe
<b>Key Employer Loss</b>	-loss of economic activity -loss of portion of tax base -increased demands on social services	-effects increased if employer is of significant size
<b>Economic Recession</b>	-loss of economic activity -increased demands on social services -some loss of tax revenue	-effects increased if event is of extended duration
<b>Civil Disturbance</b>	-injuries to persons -damage to public and private property	-budget impacts to police services depending upon severity of event -deaths

<b>Terrorism</b>	-injuries to persons -damage to public and private property	-budget impacts to police services depending upon severity of event -deaths
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**Relative to the County as a whole there are insufficient data to conclude whether the Town is more vulnerable to one of the six Societal Hazards noted above.**

With regard to the vulnerability of critical facilities, infrastructure and vulnerable populations, quantitative and locational data for the Town are available as follows.

### 4.1 Critical Facilities

The Center for Disaster Management and Humanitarian Assistance defines critical facilities as: “Those structures critical to the operation of a community and the key installations of the economic sector.” Figure 1.4 shows the geographic distribution of some critical facilities and utilities. Table 4-1 identifies critical facilities in Jericho, excluding critical facilities designated as hazardous materials and petroleum storage sites, which are shown in Section 3.2.5. This list includes all critical facilities, not only the facilities located in designated hazard areas.

*Table 4-4 Critical facilities in the Town of Jericho*

Facility Type	Number of Facilities
Veterinary Hospital / Clinic	1
Education Facility	4
Fire Station	1
Emergency Operations Center	1
Energy	1
Government and Military	2
Mail and Shipping	2
Public Attractions and Landmark Buildings	1
Water Supply and Treatment	1

*Source: VCGI*

One school, which serves as an emergency shelter, and the fire station are both in the mapped Flood Hazard Areas. None of these facilities are located in mapped River Corridors. None of these facilities are located in mapped River Corridor Protection Areas.

### 4.2 Infrastructure

#### 4.2.1 Town Highways

The following is a statistical overview of roads in the Town of Jericho. These tables show the range of road types within the town, from state highway to unimproved unpaved roads. Different

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

Municipal highways, bridges and dams are well mapped in Chittenden County. The following three tables show the diversity of municipal highways and road surface in the Town of X

The Vermont Agency of Transportation divides municipal (town) highways into various classes as follows:

Class 1 town highways are subject to concurrent responsibility and jurisdiction between the municipality and VTrans. Class 1 town highways are state highways in which a municipality has assumed responsibility for most of the day to day maintenance (pot hole patching, crack filling, etc.). The state is still responsible for scheduled surface maintenance or resurfacing. In Chittenden County Class 1 highways are generally paved.

Class 2 town highways are primarily the responsibility of the municipality. The state is responsible for center line pavement markings if the municipality notifies VTrans of the need. The municipality designates highways as Class 2 with approval from VTrans. These are generally speaking the busier roads in a given town second to Class 1. In Chittenden County, most Class 2 highways are generally paved although in the more isolated areas these are gravel roads.

Class 3 town highways are the responsibility of and designated by the municipality. These are to be maintained to an acceptable standard and open to travel during all seasons. In Chittenden County, Class 3 roads are both paved or gravel.

Class 4 town highways are all other highways and the responsibility of the municipality. However, pursuant to Vermont State Statutes, municipalities are not responsible for maintenance of Class 4 town highways. These are generally closed during the winter and minimally maintained and almost exclusively dirt.

*Table 4-5 Town highway mileage by class, Town of Jericho*

Class 1	Class 2	Class 3	Class 4	State Hwy	Fed Hwy	Interstate	Total 1, 2, 3, State Hwy
	20.470	41.460	2.920	6.680			68.610

*Source: derived from VTrans TransRDS GIS data – surface class and arc length*

*Table 4-6 Town highway mileage by surface type, Town of Jericho*

Paved	Gravel	Soil or Graded	Unimproved	Impassable	Unknown	Total
34.837	50.884	4.704	0.099	2.115	4.221	96.860

Total Known	Total Unpaved	% Paved	% Unpaved
92.639	57.802	37.6%	62.4%

*Source: derived from VTrans TransRDS GIS data – surface class and AOTmiles, 2015*

See Figure 3.2 for locations of paved vs. gravel and/or soil roads.

#### 4.2.2 Bridges, Culverts, and Dams

There are a variety of bridges, culverts and dams located in the municipality. The following bridges are contained in an inventory maintained by VCGI, VTrans and the CCRPC. A GIS intersection was performed to determine which bridges are located in the designated flood hazard area (aka Special Flood Hazard Area or 100-year floodplain.) and /or the River Corridor Protection Area (aka Fluvial Erosion Hazard Area).

*Table 4-7 Bridges located in SFHA and RCPA*

# of Structures in RCPA (FEH)	# of Insufficient Structures in RCPA	# of Structures in River Corridor	# of Insufficient Structures in RC	# of Structures in SFHA	# of Insufficient Structures in SFHA
24	8	20	3	22	6
A structures could be a bridge, culvert or arch. Data came from ANR DMS. A structure is insufficient if its % bankfull width is 50% or less.					

As noted in Section 4 of the County Plan, a large portion of the County’s stream have had detailed Phase II Stream Geomorphic Assessments conducted. With regards to Jericho, studies identify specific stream reaches where fluvial erosion is a concern as well as where infrastructure, primarily culverts, as noted in the table below is at risk

*Table 4-8 Culverts with a geomorphic compatibility rating of “Mostly Incompatible” or “Incompatible”*

Bankfull Width	Compatibility Score	Location	Road Name	Stream Name
41.67	5	.5 Miles NW Brown Trace rd.	PLAINS RD	Unnamed
45.75	6	Governor Peck Rd. Crossing	GOVERNOR PECK RD	Governor Peck Rd. tributary
64.71	7	@ junction of Skunk Hollow Road & Route 117	ROUTE 117	Trib to Winooski River
55.08	7		GOVERNOR PECK RD	Trib to Winooski River
22.22	8	Jct. W/ Laffayette	LEE RIVER RD	Unnamed
31.00	8	.1 Miles W Brown Trace Rd.	PACKARD RD	Unnamed
62.94	8	Just above Chicken Farmer	BARBER FARM RD	Trib to Mill Brook
62.73	9	Junction with No Main st.	ROUTE 15	Unnamed
38.22	9	At bridge # 6 sign	ROUTE 117	Trib to Winooski River
19.43	9	Junction with Hanley Ln	CILLEY HILL RD	Unnamed
16.40	9	Jct with entrance to school	BROWNS TRACE	Unnamed
18.52	9	.5 Miles S VT-15	BROWNS TRACE	Unnamed
33.12	9	Farm field below route 117 culvert	Private Farm Field	Trib to Winooski River
28.57	10	Upper-most crossing of Governor Peck Rd.	GOVERNOR PECK RD	Governor Peck Rd Tributary
28.18	10	.75 Miles N Cilley Hill rd	HANLEY LN	Unnamed

Information on dams is available from two sources: a database of dams regulated by the Vermont Department of Environmental Conservation and the National Dam Inventory maintain by the U.S. Army Corps of Engineers. No information is available from DEC on dams in Jericho. The National Dam Inventory identifies one dam in Jericho:

*Table 4-9 Dams located in the Town of Jericho*

Name	Owner	River	Description	Maximum Storage	Hazard Potential
Jericho-1	Unknown	Browns River	no other data inventoried		Unknown

*Source: National Dam Inventory*

#### 4.2.3 Water, Wastewater and Natural Gas Service Areas

There are no town owned or operated wastewater facilities in Jericho. The village water district operates a water system that provides services to residents and businesses in the village area.

Other residents and businesses in the town receive water from wells and dispose of wastewater through septic systems. Most have individual systems although homes in some of the newer subdivisions utilize a community well and/or septic system. Vermont Gas has recently expanded service to include Jericho. Gas lines run along Route 15 (cf. Figure 1.4).

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

A VELCO high-tension power transmission line runs from south to north through the western part of Jericho, paralleling River Rd. (VT 117). A second high-tension line runs north into Underhill from the VEC Underhill Substation on VT 15 (cf. Figure 1.4).

### **4.3 Estimating Potential Losses in Designated Hazard Areas.**

A simple GIS intersection of e-site data with the 2010 FIRM floodplain (cf. Figure 1.4) data indicates the following with regards to structures located in mapped flood hazard areas:

- There are a total of 2023 structures in Jericho.
- 10 residential structures and no commercial/industrial structures are located within the 100-year floodplain. Based on the 2014 median grand list values, the estimated potential loss due to a major flood event inundating the floodplain is \$11,599,679.
- Note that this estimate only takes structures into account, however. It does not account for personal property or business losses.

A simple GIS intersection of esite data with the 2016 River Corridor Protection Area data (cf. Figure 2.1) indicates the following with regards to structures vulnerable to Fluvial Erosion:

- There are a total of 2023 structures in Jericho.
- There are 25 residential structures and 3 commercial/industrial structures located in the RCPA. Based on the 2014 median grand list values, the estimated potential loss due to an event in a river corridor is lower: \$7,859,901.

- This estimate only takes structures into account. It does not account for personal property or business losses.

At this time, a more detailed analysis of potential losses to structures, infrastructure, and agricultural lands cannot be made. Such an analysis would require individual site visits and analysis conducted by both river geomorphologists and structural engineers which is beyond the capacity of the CCRPC due to funding limitations.

#### 4.4 Vulnerable Populations

Like most of the County’s rural communities, census data more detailed than the town boundaries is not available to see if there are concentrations of either elderly populations or low-income populations. In other words, the town’s boundaries form one single census tract. Demographic information on the relative percentages of vulnerable populations is as follows:

*Table 4-10 Vulnerable populations, Jericho*

	Jericho	Chittenden County	Vermont	National
Percent Minority (non-white) <sup>1</sup>	1.4%	7.7%	4.8%	26.7%
Children <18 in poverty <sup>1</sup>	4.1%	11.1%	14.8%	21.6%
Families w/children in poverty <sup>1</sup>	2.0%	10.5%	13.4%	17.8%
Families w/ female householder, no husband present w/children in poverty <sup>1</sup>	8.5%	37.0%	37.4%	40%
Population, age 65+ in poverty <sup>1</sup>	3.0%	6.5%	7.5%	13.4%

<sup>1</sup>US Census Bureau, 2010-2014 5-Year Estimates, American Community Survey

Given the coarseness of the available data, CCRPC is not able to determine specific locations with a concentration of vulnerable individuals within individual municipalities. However, a useful analysis known as a Social Vulnerability Analysis has been prepared by the Vermont Department of Health. Data for the Town is shown in *Figure 4.1*.

The Social Vulnerability Index (SVI) draws together 16 different measures of vulnerability in three different themes: socioeconomic, demographic, and housing/transportation. The 16 individual measures include poverty, unemployment, per capita income, educational attainment, health insurance, children/elderly, single parent households, disability, minority, limited English, location of apartment buildings, mobile homes, crowding, no vehicle access, and population living in group quarters. The measures are combined to create relative vulnerability index. For every vulnerability measure, census tracts above the 90th percentile, or the most vulnerable 10%, are assigned a flag. The vulnerability index is created by counting the total number of flags in each census tract. It is important to remember that this Social Vulnerability Index is just a first

step in screening for populations that may be more or less vulnerable to a variety of hazard. Depending on the situation, different measures could be more or less important and should be looked at more closely. These data are NOT saying that one census tract is more vulnerable than another. Rather it is saying that there is a higher concentration of various vulnerable populations living within a tract and seeks to identify the conditions that make a population vulnerable.

#### 4.5 Land Use and Development Trends Related to Mitigation

As noted in the Introduction, Jericho’s land use is primary residential and agricultural. An analysis of GIS data shows the following percentages for land use and the percentages of land allocated to each zoning district.

*Table 4-11 Structures compared to zoning, Town of Jericho*

<b>Jericho Structures</b>	<b>Percent</b>	<b>Jericho Zoning</b>	<b>Percent</b>
Residential	91.55%	Agriculture	36.87%
Commercial	2.03%	Commercial	0.65%
Industrial	0.20%	Forestry	14.19%
Institutional / Infrastructure	2.67%	Open Space	26.72%
Mass Assembly	0.79%	Rural Residential	12.24%
Leisure / Recreation	0.00%	Village	5.26%
Natural Resources	0.10%	Village Center	4.08%

*Source: 2015 e911 Data and 2015 Town of Jericho Zoning Regulations, Note: The structure categories relate to the Land Based Classification System (LBCS) used in the 2011 AHMP not E-911 site types. E-911 site types were assigned to each LBCS category to create synergy between the 2011 AHMP and 2017 AHMP.*

##### 4.5.1 Conserved or Undevelopable Parcels

There are a handful of conserved parcels in Jericho. Most parcels have been conserved for their scenic, agricultural or natural resource values.

*Table 4-12 Conserved Land, Town of Jericho*

<b>Acres</b>	<b>Acres of Public Land</b>	<b>Percent Public</b>	<b>Acres of Conserved Land</b>	<b>Percent Conserved</b>	<b>Total Public &amp; Conserved</b>	<b>Percent Conserved Land</b>
22,725.65	1,512.31	7%	1,084.17	5%	2,596.54	11%

*Source: VLT Data and ANR Public Lands*

The town funds conservation through the Open Space Fund. Additionally, the Jericho-Underhill Land Trust is a private, non-profit organization that conserves land in both Jericho and Underhill. The trust is funded only by donations. Additionally, as noted below in Table 5.1, the Town’s zoning bylaws include a River Overlay District which precludes the construction of new homes or businesses in flood plains, FEH areas and river corridors, and effectively acts as conserved lands.

#### 4.5.2 Recent and Future Development

At present and for the foreseeable future the current development pattern will continue. Development in Jericho is largely characterized by denser subdivision development within the Village and Village Center districts coupled with construction of either single, scattered homes on large lots or cluster developments in the Agricultural or Rural Residential Districts. Commercial development will likely occur at a slower pace as residents obtain most goods and services outside the town. At this time, the main way CCRPC has to predict future development is by analysis of municipal zoning bylaws. As the municipality participates in the NFIP, zoning bylaws heavily regulate development in designated flood hazard areas. As a result, little to no development is likely to take place in flood hazard areas. These zoning requirements mitigate flood hazards to future structures. Additionally, the Town has adopted a River Overlay District to prevent building in areas prone to fluvial erosion.

From 2011 through 2014, the municipality has seen 35 housing units (in single family and multi-family structures) and one new commercial/industrial building constructed. One housing unit was constructed in the River Corridor. Besides that unit, none of these units or structures were constructed in the Special Flood Hazard Area nor in the River Corridor Protection Area.

As best can be ascertained based upon data maintained by the Chittenden County RPC and the Town of Jericho, since the adoption of the last municipal AHMP in 2011, development activity in the Town has not significantly increased vulnerability. Additionally, through at least 2021, there is no known or projected development of new buildings or infrastructure anticipated to be constructed in areas known to be particularly vulnerable to Natural Hazards.

## **SECTION 5: MITIGATION STRATEGY**

The Town considered a range of mitigation actions across the categories of Planning and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, and Education and Awareness Programs. As is demonstrated in the discussion that follows the Town carries out numerous efforts as part of its day-to-day operations that fit within these categories and address and serve to mitigate the impacts of various hazards. The section concludes within an analysis of which vulnerabilities need additional attention and therefore stipulates discrete tasks to be carried out by the Town during the 5-year period this Plan is in effect to address these vulnerabilities.

### **5.1 Existing 2016 Jericho Town Plan Implementation Tasks That Support Hazard Mitigation**

These tasks are described in the 2016 Jericho Town Plan. The following selected excerpts illustrate how mitigation planning and activities is formally promoted and supported through the Town Plan.

*04.1.1.2: Continue to enforce regulations that will prevent development (including but not limited to structures, filling, or substantial grading) within the 100 year floodplain and Fluvial Erosion Hazard Areas. Update these existing regulations based on best practices determined by local, state, and federal authorities.*

*04.1.1.3: Monitor all of the fluvial erosion areas to see how best to accommodate fluvial equilibrium and natural erosion processes while minimizing undue damage to property.*

*04.1.1.4 Plan culvert replacements for any undersized culverts in conjunction with roadway improvements.*

*04.1.1.5: Review the Hazard Mitigation Plan on a regular basis and follow-up on action steps.*

*04.1.1.6: Update existing regulations to ensure new infrastructure in proximity to waterways avoids encroachment on areas prone to flooding.*

*04.1.1.9: Maintain undeveloped, unmowed, naturally vegetated buffer zones along the boundaries and in the riparian zones of streams, wetlands, vernal pools and ponds to provide protection against flooding and erosion. Minimum buffer widths should be 50 feet for first and second order streams, and 100 feet for third order streams and greater. Monitor and enforce regulations that protect these buffer zones.*

*04.1.1.11: Consider revisions to the Zoning Regulations to require Low Impact Development and stormwater Infrastructure for all developments.*

*04.1.5.1: Avoid development on land with extreme slopes of 25% or greater and minimize impacts from development on slopes between 8 and 24%.*

*04.1.5.2: Review regulations requiring conditional use approval for development on slopes of 25% or greater, and consider if similar review should be required for slopes between 8 and 24%.*

*09.1.2.4: Periodically evaluate LOS and safety at major intersections. Prioritize improvements based on safety rather than Level of Services. Service Levels lower than C can be acceptable in Village Centers when the delay provides for traffic calming and/or improves pedestrian safety, or where upgrades would negatively impact the surrounding built or natural environment.*

## 5.2 Existing Town of Jericho Actions That Support Hazard Mitigation

The following table illustrates how mitigation activities and plans are carried out by various municipal departments, and whether such capabilities are adequate to address hazard vulnerabilities and whether the department, if needed, has the ability to improve policies and programs and programs to unmitigated vulnerabilities.

Table 5-1 Existing municipal capabilities addressing hazard mitigation, Town of Jericho

Types of Programs & Policies	Description / Details	1) Adequacy of municipal capabilities to address hazards 2) and ability to expand upon or improve policies & programs
Highway Services	Town Highway Department	1) Generally adequate with regards to mitigating the impacts of common hazards. 2) However, the Public Works Department, through the strategies noted below is taking on a stronger role to mitigate against damages caused by Severe Rainstorm, Fluvial Erosion and Water Pollution.
Highway personnel	5 FTE field personnel	1) Generally adequate with regards to mitigating the impacts of common hazards. 2) However, the Public Works Department, through the strategies noted below is taking on a stronger role to mitigate against damages caused by Severe Rainstorm, Fluvial Erosion and Water Pollution.
Water / Sewer Department	Water provided by Jericho Village Water District	1) Generally adequate with regards to mitigating the impacts of common hazards. 2) However, the Public Works Department, through the strategies noted below is taking on a stronger role to mitigate against damages caused by Severe Rainstorm, Fluvial Erosion and Water Pollution.
Water / Sewer Personnel	.4 FTE personnel in Water District	1) Generally adequate with regards to mitigating the impacts of common hazards.. 2) No need to expand upon or improve policies & programs with regard to hazards under its purview.
Planning and Zoning personnel	1 FTE Town Planner; .5 FTE zoning administrator	1) Generally adequate with regards to mitigating the impacts of common hazards.. 2) No need to expand upon or improve policies & programs with regard to hazards under its purview.
Residential Building Code / Inspection	No local building code.	1) Generally adequate with regards to mitigating the impacts of common hazards.. New construction must obtain a zoning permit. 2) No need to expand upon or improve policies & programs with regard to hazards under its purview. 3) Note that commercial properties open to the public and all multi-family buildings of 3 units are more must be inspected and permitted by the Vermont Division of Fire Safety.
Town / Municipal Comprehensive Plan	2016	1) As noted at the start of Section 5, several elements of the municipal Comprehensive Plan promote Hazard Mitigation. 2) The Town is currently updating its Plan and will be referencing this 2017 AHMP accordingly.

Zoning Bylaws and Subdivision Regulations	2015	1) Generally adequate with regards to mitigating the impacts of common hazards.. 2) No need, at this time, to expand upon or improve policies & programs with regard to hazards under its purview.
Hazard Specific Zoning (slope, wetland, conservation, industrial, etc.)	Conservation, Open Space, River	1) Generally adequate with regards to mitigating the impacts of common hazards.. 2) No need, at this time, to expand upon current flood hazard bylaws. 3) Over the next five years, Town may consider adoption of River Corridor or River Corridor Protection Area zoning regulations.
Participation in National Flood Insurance Program (NFIP) and Floodplain/ Flood Hazard Area Ordinance	Yes / Yes	1) New DFIRMS adopted in 2014. The Town Zoning Administrator and the Town's Development Review Board (DRB) monitor compliance with the National Flood Insurance Program. The DRB reviews and adjudicates applications for development within the floodplain. 2) No need, at this time, to expand upon NFIP participation
Open Space Plans; Conservation Funds	Open Space Fund receives annual appropriation of approximately \$2,500 in municipal budget.	1) Yes 2) Municipality considers regulatory programs and voluntary conservation efforts as adequate to address any hazard mitigation concerns. However, various areas may be conserved in the future by the use of the Fund but as of now, specific parcels conducive to hazard mitigation have not yet been targeted.

The following table illustrates how Emergency Preparedness, Response & Recovery actions are carried out in the Town.

*Table 5-2 Existing municipal emergency services & plans, Town of Jericho*

Type of Existing Protection	Description /Details/Comments
<b>Emergency Services</b>	<b>Emergency response personnel may have overlapping responsibilities with other town response organizations.</b>
Police Services	Vermont State Police, emergency assistance by Essex, Richmond, Williston Police Departments
Police Department Personnel	Vermont State Police Personnel
Fire Services	Jericho-Underhill FD (private)
Fire Department Personnel	2 FTE duty officer, 44 Volunteers
Fire Department Mutual Aid Agreements	various
EMS Services	Richmond Rescue, Essex Rescue, Williston Rescue
EMS Personnel	various through VT EMS District #3

EMS Mutual Aid Agreements	Jericho-Underhill FD (private)
<b>Emergency Plans</b>	
Local Emergency Operations Plan (LEOP)	2016
Primary Shelter	Mt. Mansfield Union High School
Replacement Power, backup generator	Yes
Secondary Shelter	Browns River Middle School (540 capacity); Jericho Elementary School (400 capacity)
Replacement Power, backup generator	A generator is available at Browns River Middle School, but not at Jericho Elementary School

### 5.3 Town of Jericho All-Hazards Mitigation Goals

The following goals were first approved by the Town in its 2005 and 2011 AHMPs and approved by Town of Jericho officials during the development of this 2017 annex.

- 1) Reduce at a minimum, and prevent to the maximum extent possible, the loss of life and injury resulting from all hazards.
- 2) Mitigate financial losses and environmental degradation incurred by municipal, educational, residential, commercial, industrial and agricultural establishments due to various hazards.
- 3) Maintain and increase awareness amongst the town's residents and businesses of the damages caused by previous and potential future hazard events as identified specifically in this Local All-Hazards Mitigation Plan and as identified generally in the *Chittenden County Multi-Jurisdictional All-Hazards Mitigation Plan*.
- 4) Recognize the linkages between the relative frequency and severity of disaster events and the design, development, use and maintenance of infrastructure such as roads, utilities and stormwater management and the planning and development of various land uses.
- 5) Maintain existing municipal plans, programs, regulations, bylaws and ordinances that directly or indirectly support hazard mitigation.
- 6) Consider formal incorporation of this Local All-Hazards Mitigation Plan into the municipal comprehensive plan as described in 24 VSA, Section 4403(5), as well as incorporation of proposed new mitigation actions into the municipality's/town's bylaws, regulations and ordinances, including, but not limited to, zoning bylaws and subdivision regulations and building codes.
- 7) Consider formal incorporation of this Local All-Hazards Mitigation Plan, particularly the recommended mitigation actions, into the municipal/town operating and capital plans & programs especially, but not limited to, as they relate to public facilities and infrastructure, utilities, highways and emergency services.

With regard to a more formal process by which the Town will integrate the requirements of this mitigation plan into the Town's Comprehensive Plan, as required by Vermont law,

municipalities must update their Comprehensive Plans every eight years. During any update process undertaken while this Plan document is in effect, the Town will review the recommended Actions detailed below to see if formal incorporation within the Comprehensive Plan (or any Plan implementation tasks) is warranted. Note that the Town will be updating its Comprehensive Plan in 2024.

Additionally, as the CCRPC is tasked with also reviewing and approving each such municipal comprehensive plan for consistency with various requirements in state statute and consistency with the Chittenden County Regional Plan (aka the ECOS 2013 Plan). This review includes a detailed staff critique with recommendations for improvement. This CCRPC review provides another opportunity to formally integrate elements of this local AHMP into the Town’s Comprehensive Plan.

With regard to a more formal process by which the Town will integrate the requirements of this mitigation plan while developing the Town’s annual capital improvement plans/budgets, for periods, the Town will review the recommended Actions detailed below to see if formal incorporation within these annual capital plans is warranted prior to annual review and voting by Town residents. Additionally, CCRPC staff can assist the town with drafting grant applications to fund mitigation projects.

## 5.4 Mitigation Actions

The table below records the strategies from the 2011 Plan and progress on their implementation. This table also encapsulates the Town’s decision making with regards to which Actions to continue, which to establish as new actions and which to discontinue. During the development of this Municipal AHMP and its parent Multi-Jurisdictional AHMP, FEMA staff indicated to the CCRPC a need to separate out or remove strategies which are more properly considered to be Preparedness, Response or Recovery strategies rather than Mitigation. Additionally, upon revisiting and reviewing the 2011 actions and devising action for this 2017 local AHMP CCRPC and municipal staff thought it would be best to focus on known and likely actions with a high likelihood of implementation versus consideration of more expansive but largely aspirational strategies.

*Table 5-3 Progress on the actions of the 2011 Jericho All-Hazards Mitigation Plan*

Action	Task	Brief Description	Progress since 2011 and recommendations for 2017 Plan
<b>Primary Responsible Entity</b>			
<b>#1 Complete fluvial geomorphology assessment and develop strategies in response to identified risk</b>			
CCRPC, Vermont ANR	River Corridor Management Plans	Where Phase I and II assessments are complete, develop a River Corridor Management Plan.	River Corridor Plan has been completed for the Browns River.  <b>COMPLETED, REMOVE FROM 2017 PLAN</b>

Town Manager, Town Planner	Fluvial Erosion Hazard Mitigation Implementation	Implement strategies from above referenced Corridor Management Plan to mitigate losses from identified fluvial erosion hazards.	River Overlay District was added to the Town's development regulations.  <b>COMPLETED, REMOVE FROM 2017 PLAN</b>
Town Manager, Town Planner	Flood Insurance Rating Map Updates	Review draft FIRM data. Develop strategies to mitigate losses from identified flood hazards.	New flood regulation maps, based on FEMA's FIRMs, went into effect August 2014 and review was completed.  <b>COMPLETED, REMOVE FROM 2017 PLAN.</b>
<b>#2 Evaluate capabilities of existing road and stormwater management infrastructure</b>			
Road Foreman	Infrastructure Assessment for Stormwater Vulnerability	Assess the vulnerability and operational capability of municipal roads, culverts and stormwater infrastructure.	The town plans to begin an assessment of whether culverts are undersized.  <b><u>ASSESSMENT IS NOT CONSIDERED MITIGATION. REMOVE FROM 2017 PLAN</u></b>
Road Foreman	Infrastructure Assessment for Fluvial Erosion/Landslide Vulnerability	Assess the vulnerability and operational capability of municipal roads, culverts, bridges and other infrastructure to fluvial erosion.	The town is currently working with CCRPC to develop a Capital Improvement Plan. Part of this effort will involve assessing the vulnerability and operational capability of all municipal infrastructure. <b><u>ASSESSMENT IS NOT CONSIDERED MITIGATION. REMOVE FROM 2017 PLAN</u></b>
Road Foreman	Culvert Upgrades	Upgrade culverts and ditching along roads to mitigate against repeated damages from stormwater or spring snowmelt.	Culverts are automatically upsized when they are replaced. A culvert inventory was undertaken in 2014, and the town is working with CCRPC to prioritize culverts for replacement. <b>CONTINUE FOR 2017 PLAN</b>
Road Foreman	Continued Monitoring of Vulnerable Infrastructure	Monitor bridges and culverts with erosion and scouring concerns.	Monitoring is ongoing. <b><u>MONITORING IS NOT CONSIDERED MITIGATION. REMOVE FROM NEW PLAN</u></b>
Road Foreman	Road Improvement	Consider paving certain road sections to lower overall maintenance costs, improve snow plowing speeds and improve overall capability of roads to handle current and projected traffic volumes.	Skunk Hollow Road has been paved. <b>CONTINUE FOR 2017 PLAN</b>
Road Foreman	Erosion/Landslide Mitigation	Undertake erosion or landslide mitigation projects where roads regularly incur damage from adjacent rivers/streams and hillsides.	A project is currently underway to combat bank sloughing on a private property along Governor Peck Road. The town hopes to find a mitigation strategy for this issue.  <b>RENAME AS DRAINAGE IMPROVEMENTS FOR 2017 PLAN</b>

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

The Town Comprehensive Plan’s policies and programs that support hazard mitigation and the progress noted above demonstrate the variety of policies and actions forming the foundation of this All Hazards Mitigation Plan. As detailed in the Table below, generally, the Town considers its existing capabilities, regulatory structure and programs as adequate to address its vulnerabilities however continuation of existing mitigation actions or the implementation of new actions are warranted for the 5-year period this plan would be in effect.

*Table 5-4 Town of Jericho: Capabilities to address vulnerabilities from natural hazards*

<b>Hazard</b>	<b>Adequacy of Municipal Capabilities to address associated vulnerabilities ( Excellent, Good, Average, Below Average)</b>	<b>Additional expansion or improvement in policies &amp; programs needed to address hazard given long-term vulnerability</b>
<b>Severe Winter Storm</b>	Excellent	No
<b>Flooding</b>	Excellent	<b>Yes, see actions below.</b>
<b>Fluvial Erosion</b>	Good	<b>Yes, see actions below</b>
<b>Severe Rainstorm</b>	Good	<b>Yes, see actions below.</b>
<b>Extreme Temperatures</b>	Good	No, rare occurrence and extent, impact & vulnerabilities are limited.
<b>Wildfire</b>	Excellent	No, rare occurrence and extent, impact & vulnerabilities are limited.

*Table 5-5 Town of Jericho: Capabilities to address vulnerabilities from technological hazards*

<b>Hazard</b>	<b>Adequacy of Municipal Capabilities to address vulnerabilities ( Excellent, Average, Below Average)</b>	<b>Additional expansion or improvement needed to address hazard given long-term vulnerability</b>
<b>Major Transportation Incident</b>	Good + State agencies provide support	No, rare occurrence and extent, impact & vulnerabilities are limited.
<b>Power Loss</b>	Average. Private utilities are primarily responsible	No given that events are limited in duration and vulnerabilities are short-lived.
<b>Hazardous Materials Incident</b>	Good + State agencies provide support	No, rare occurrence and extent, impact & vulnerabilities are limited.
<b>Water Service Loss</b>	Excellent.	No, rare occurrence and extent, impact & vulnerabilities are limited.
<b>Gas Service Loss</b>	N/A	N/A

<b>Telecommunications Failure</b>	Private utilities are primarily responsible	No, rare occurrence and extent, impact & vulnerabilities are limited.
<b>Other Fuel Service Loss</b>	Private businesses are primarily responsible	No, rare occurrence and extent, impact & vulnerabilities are limited.
<b>Sewer Service Loss</b>	N/A	N/A
<b>Water Pollution</b>	Good	<b>Yes, see actions below</b>
<b>Invasive Species</b>	Average	No, rare occurrence and extent, impact & vulnerabilities are limited.

*Table 5-6 Town of Jericho: Capabilities to address vulnerabilities from societal hazards*

<b>Hazard</b>	<b>Adequacy of Municipal Capabilities to address vulnerabilities ( Excellent, Average, Below Average)</b>	<b>Additional expansion or improvement in policies &amp; programs needed to address hazard given long-term vulnerability</b>
<b>Crime</b>	No police department	N/A
<b>Economic Recession</b>	Good +State Agencies provide support	No Diversity of county economy mitigates vulnerabilities. The Town considers its municipal plan as also supportive of the goal of economic diversification.
<b>Terrorism</b>	Good +State & Federal agencies provide support	No, rare occurrence.
<b>Civil Disturbance</b>	No police department	N/A
<b>Epidemic</b>	Average +State & Federal agencies provide support	No, rare occurrence. The Town’s abilities to mitigate an epidemic are limited The Town relies on state and school efforts related to epidemic preparedness, prevention and mitigation, and medical facilities and services in neighboring communities for response.
<b>Key Employer Loss</b>	Good +State agencies provide support	No. Diversity of employers in municipality mitigates vulnerabilities.

Note that this Plan does not recommend a discrete mitigation action regarding “future development.” Our justification for this is as follows:

- The municipality’s regulations, programming and staffing have prevented and will prevent new buildings and infrastructure being constructed in areas vulnerable to hazards. As documented in detail in section 4.6.2, despite active residential and commercial development, no structures and infrastructure subject to municipal regulation, have been

constructed in either the Special Flood Hazard Areas or mapped River Corridor Protection Areas.

- For the next five years, there are NO known or anticipated plans for the construction of municipal infrastructure in areas vulnerable to hazards.
- There is no evidence that unwise or poorly regulated development in the municipality has been a significant contributor to putting people or property in harm's way.

**Therefore, the reader will note that the proposed Mitigation Actions for the next five years represent a much more focused and achievable list of actions focused on those hazards (e.g. Severe Rainstorm, Flooding, Fluvial Erosion, Water Pollution, etc.) that cause more frequent if less dramatic damages..** It is these more mundane damages of erosion along road beds, damaged small culverts and the ongoing struggle to maintain and improve water quality (which cost the municipality and its taxpayers both time and money) that deserve the most attention rather than hazards that could hypothetically cause damage but which are rare and wherein the benefit-to-cost ratio for potential mitigation actions is weak (e.g. Major Transportation Incident, Hazardous Material Incident, Terrorism). No new discrete action is recommended with regard to Education & Awareness as the Town does not have adequate funds or staff to undertake such an effort nor is such an effort warranted given the identified vulnerabilities. **Lastly, it is also worthwhile to note that in comparison to the 2011 Plan the priorities for this 2017 Plan have not changed. The hazards and vulnerabilities remain the same as well. Indeed, the only real change is that there is a more heightened awareness due to the severity of recent disasters starting in 2011 to the present.**

#### **5.4.2 Specific Mitigation Actions**

The Town plans to conduct the following mitigation actions during the 5 year period this Plan is in effect.

#### **CATEGORY A: Complete fluvial geomorphology assessment and address identified vulnerable infrastructure**

Hazards Addressed: Severe Rainstorm, Flooding, Fluvial Erosion and Water Pollution

Vulnerabilities Addressed: Damage to new/existing public infrastructure and buildings; temporary closures of roads and bridges including from debris; temporary loss of power and/or telecommunications and temporary isolation of vulnerable individuals such as the elderly or those in poverty.

Status: Ongoing

Primary Responsible Entity: Town of Jericho Highway Foreman

Timeframe: **Month 2017** through March 5, 2022 **(update after FEMA approval date)**

Funding Requirements and Sources: FEMA or other hazard mitigation grants; FHWA grants; VTrans grants; Municipal Operating and Capital budgets only if sufficient. Contingent on available resources and funding.

Rationale/Cost-Benefit Review: Because of past work to identify fluvial erosion hazard (FEH) zones and to map river corridors, Jericho now has a better understanding of the hazard areas in the community, where they are located and what structures or infrastructure are impacted by

them. Implementing the new River Overlay District is a relatively low-cost, highly effective strategy to mitigate fluvial erosion hazards.

**Specific Identified Actions:**

**Action A-1: Flood Hazard Mitigation Project Implementation**

The Jericho Development Review Board will continue to implement the River Overlay District, which prohibits most development in areas at risk from fluvial erosion.

**CATEGORY B: Improve capabilities of existing road and stormwater management infrastructure**

Hazards Addressed: Severe Rainstorm, Flooding, Fluvial Erosion and Water Pollution

Vulnerabilities Addressed: Damage to new/existing public infrastructure and buildings; temporary closures of roads and bridges including from debris; temporary loss of power and/or telecommunications and temporary isolation of vulnerable individuals such as the elderly or those in poverty.

Status: Ongoing

Lead Responsible Entities: Town of Jericho Highway Foreman; Jericho Town Planner

Potential Partner Entities: VT ANR; Vermont Agency of Transportation (VTrans); CCRPC

Timeframe: Month 2017 through March 5, 2022 (update after FEMA approval date)

Funding Requirements and Sources: Various Federal and State grants; municipal operating funds only if sufficient. Contingent on available resources and funding.

Rationale/Cost-Benefit Review: These areas suffer low-level but consistent damage during heavy rains and snowmelt. Mitigating these problems would reduce short and long term maintenance costs and improve the flow of traffic for personal and commercial purposes during damage events.

**Specific Identified Actions:**

**Action B-1: Culvert Upgrades**

Upgrade culverts and ditching along roads to mitigate repeated damages from stormwater or spring snowmelt. Future projects will include projects identified by the town after inventories are completed by CCRPC.

**Action B-2: Drainage Improvement**

For 2017-2021, the Town anticipates rebuilding approximately 2 miles of gravel roads each year to ensure good quality of the base and top layers which will improve drainage and reduce the likelihood of damage in hazard events.

- Likely roads to be improved are Nashville Road and Lee River Road

**Action B-3: Road Improvement**

Within political and financial restraints, consider re-engineering certain sections of roads to lower overall maintenance costs and improve overall capability of roads to handle current and projected traffic volumes. Research costs and options and consider paving certain road sections to lower overall maintenance costs, improve snow plowing speeds and improve overall capability of roads to handle current and projected traffic volumes. Several roads in town would be candidates for paving as they are gravel roads connecting two paved roads.

- A project is currently underway to combat bank sloughing on a private property along Governor Peck Road. The town hopes to find a mitigation strategy for this issue.

**CATEGORY C: Implement Roads Stormwater Management Plan**

Hazards Addressed: Water Pollution, Fluvial Erosion, Severe Rainstorm,

Vulnerabilities Addressed: damage to public infrastructure especially roads and culverts; impairment of local waterways and Lake Champlain, budgetary impacts

Status: Ongoing

Lead Responsible Entities: Town of Jericho Highway Foreman

Potential Partner Entities: VT ANR; Vermont Agency of Transportation (VTrans); CCRPC

Timeframe: Month 2017 through March 5, 2022 (update after FEMA approval date)

Funding Requirements and Sources: Various Federal and State grants especially VAOT Better Roads Grants and VANR Ecosystem Restoration Grants; municipal operating and capital budget funds if necessary.

Rationale / Cost-Benefit Review: The Vermont Clean Water Act, signed into law in the summer of 2015, authorized the development of a new Municipal Roads General Permit (MRGP) to lessen erosion from roads that have “hydrologically-connected” segments. This action is required by the Act. Additionally, the plans and their implementation will assist municipalities in mitigating erosion of connected infrastructure.

**Specific Identified Actions:**

**Action C-1 Develop Roads Stormwater Management Plan**

The Town will first complete an Inventory of Priority Road Segments (PRS)[ aka “hydrologically-connected” road segments ] both currently meeting and not meeting MRGP standards. The CCRPC has already conducted an inventory of Jericho’s in the summer of 2016 and has hired a consultant to begin to develop cost estimates for various erosion-reduction projects. The Town will then apply for MRGP coverage starting in July 2018. After issuance of the permit by the State, the Town will then work to use this information to develop a formal Roads Stormwater Management Plan for submission to the VT-DEC in 2019. The Plan will include a remediation plan (capital budget) and implementation schedule for each site not currently meeting standards.

**Action C-2 Begin Roads Stormwater Management Plan implementation**

Obtain funding for and complete projects as identified in the Roads Stormwater Management Plan. Submit annual reports to DEC, documenting progress in remediation efforts towards meeting schedule to be in compliance with the MRGP. Reports will briefly describe which segments have been improved, practices installed, and whether segments now meet MRGP standards. The MRGP standards must be implemented on all priority road segments as soon as possible, but no later than 20 years from permit issuance.

**5.4.3 Prioritization of Mitigation Strategies**

The above mitigation actions were listed in order of priority. Descriptions of specific projects, where available, are listed in Section 5.4.2 and in Table 5-3 below. Because of the difficulties in quantifying benefits and costs, it was necessary to utilize a simple “Action Evaluation and

Prioritization Matrix” in order to effect a simple prioritization of the mitigation actions identified by the jurisdiction. The following list identifies the questions (criteria) considered in the matrix so as to establish an order of priority. Each of the following criteria was rated according to a numeric score of “1” (indicating poor), “2” (indicating below average or unknown), “3” (indicating good), “4” (indicating above average), or “5” (excellent).

- Does the action respond to a significant (i.e. likely or high risk) hazard?
- What is the likelihood of securing funding for the action?
- Does the action protect threatened infrastructure?
- Can the action be implemented quickly?
- Is the action socially and politically acceptable?
- Is the action technically feasible?
- Is the action administratively realistic given capabilities of responsible parties?
- Does the action offer reasonable benefit compared to its cost of implementation?
- Is the action environmentally sound and/or improve ecological functions?

The ranking of these criteria is largely based on best available information and best judgment, as many projects are not fully scoped out at this time. The highest possible score is 45.

It is anticipated that, as municipalities begin to implement the goals and actions of their Mitigation Strategies, they will undertake their own analysis in order to determine whether or not the benefits justify the cost of the project. Also, all proposed FEMA mitigation projects will undergo a benefit-cost analysis using a FEMA BCA template and approved methodology.

Based on feedback from FEMA, CCRPC Staff have concluded that several strategies previously identified in 2011 by the Town of Jericho as mitigation strategies are more accurately classified as preparedness, response and recovery strategies. These strategies are not intended to mitigate against the hazards identified in Section 3, and should not be evaluated as such. As such, these strategies are not included in the prioritization below, or discussed elsewhere in the plan.

Other than the reclassification of some strategies as non-mitigation strategies, there have not been significant changes in the prioritization of strategies between 2011 and now, with one notable exception. Strategies related to landslide assessment have been removed from the plan. CCRPC and municipal staff, in consultation with FEMA, have concluded that landslides are not a discrete threat in Chittenden County and are adequately captured in the plan’s discussion of fluvial erosion. Additionally, further work on the development of a Vermont-specific landslide risk estimation protocol has not progressed making landslide-specific strategies inappropriate at this time for inclusion in the County plan and its annexes.

Note that these priorities are within categories as this is more appropriate rather than ranking project that address different hazards.

Table 5-7 Jericho action evaluation and prioritization matrix

Mitigation Category & Actions	Responds to significant (likely or high risk) hazard	Likelihood of funding	Protect threatened infrastructure	Implemented quickly	Socially / Politically acceptable	Technically Feasible	Administratively Realistic	Reasonable cost to benefit	Environmentally sound	TOTAL SCORE
<b>CATEGORY A: Complete fluvial geomorphology assessment and address identified vulnerable infrastructure</b>										
<b>Action A-1: Flood Hazard Mitigation Implementation</b>	4	3	4	3	5	3	3	4	5	<b>34</b>
<b>CATEGORY B: Improve capabilities of existing road and stormwater management infrastructure</b>										
<b>Action B-1: Culvert Upgrades</b>	4	3	4	3	5	3	3	4	5	<b>34</b>
<b>Action B-2: Drainage Improvement</b>	5	3	5	3	4	4	3	3	5	<b>35</b>
<b>Action B-3: Road Improvement</b>	5	5	5	5	4	5	5	5	5	<b>44</b>
<b>CATEGORY C: Implement Roads Stormwater Management Plan</b>										
<b>Action C-1: Develop Roads Stormwater Management Plan</b>	4	3	4	3	5	3	3	4	5	<b>34</b>
<b>Action C-2: Begin Roads Stormwater Management Plan implementation</b>	4	3	4	3	5	3	3	4	5	<b>34</b>
5 = Excellent; 4=Good; 3=Average; 2=Below Average or Unknown; 1=Poor										

## 5.5 Implementation and Monitoring of Mitigation Strategies

The following Table is intended to aid municipal officials in implementing their mitigation actions and to facilitate the annual monitoring & evaluation of the plan as outlined in Section 1.7.4 above.

*Table 5-8 Town of Jericho Mitigation Actions: Implementation Monitoring Worksheet*

<b>CATEGORY A: Complete fluvial geomorphology assessment and address identified vulnerable infrastructure to mitigate Severe Rainstorm, Flooding, Fluvial Erosion and Water Pollution and their associated vulnerabilities of:</b> <ul style="list-style-type: none"> <li>• Damage to new/existing public infrastructure and buildings</li> <li>• Temporary road and bridge closure</li> <li>• Budgetary impacts</li> <li>• Temporary loss of power and/or telecommunications</li> <li>• Temporary isolation of vulnerable individuals</li> </ul>	
<b>Action</b> <b>(Primary Responsible Entity)</b>	<b>Report on Progress since Plan adoption</b> <i>See Section 5.4 for details on locations identified during Plan development.</i>
<b>Action A-1: Flood Hazard Mitigation Project Implementation</b> (Town Manager & Town Planner)	-note progress on implementing River Corridor bylaws.
<b>CATEGORY B: Improve capabilities of existing road and stormwater management infrastructure to mitigate Severe Rainstorm, Flooding, Fluvial Erosion and Water Pollution and their associated vulnerabilities of:</b> <ul style="list-style-type: none"> <li>• Damage to new/existing public infrastructure and buildings</li> <li>• Temporary road and bridge closure</li> <li>• Budgetary impacts</li> <li>• Temporary loss of power and/or telecommunications</li> <li>• Temporary isolation of vulnerable individuals</li> </ul>	
<b>Action</b> <b>(Primary Responsible Entity)</b>	<b>Report on Progress since Plan adoption</b> <i>See Section 5.4 for details on locations identified during Plan development.</i>
<b>Action B-1: Culvert Upgrades</b> (Town Road Foreman)	-note year and road location of culvert upgrades
<b>Action B-2: Drainage Improvements</b> (Town Road Foreman)	-note year and road location of drainage improvements such as ditching, rock lining, etc.
<b>Action B-3: Road Improvement</b> (Town Road Foreman)	-note any options scoped/costed out -note any sections of roads paved
<b>CATEGORY C: Implement Roads Stormwater Management Plan to mitigate Severe Rainstorm, Fluvial Erosion and Water Pollution and their associated vulnerabilities of:</b> <ul style="list-style-type: none"> <li>• Damage to new/existing public infrastructure</li> <li>• Impairment of local waterways and Lake Champlain</li> <li>• Budgetary impacts</li> </ul>	
<b>Action</b>	<b>Report on Progress since Plan adoption</b>

<b>(Primary Responsible Entity)</b>	<i>See Section 5.4 for details on locations identified during Plan development.</i>
<b>Action C-1 Develop Roads Stormwater Management Plan</b> (Town Road Foreman)	-MRGP obtained from State? -note projects developed and scoped with costs -Roads Stormwater Management Plan filed with State
<b>Action C-2 Begin Roads Stormwater Management Plan implementation</b> (Town Road Foreman)	-note which RSMP projects underway/completed -note annual MRGP reports filed with State