

*Adopted by the Town of Charleston Selectboard on
_____, 2014*

**TOWN of CHARLESTON, Vermont
All-Hazards Mitigation Plan**

**Selectboard
5063 VT Route 105
Charleston, VT 05872
802-895-2814**

Prepared by:

**OPHCS, NVDA and the
Town of Charleston, Vermont**

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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 Charleston.
- Prioritize hazards for mitigation planning.
- Recommend town-level goals and strategies to reduce losses from those hazards.
- Establish a coordinated process to implement the plan, taking advantage of a wide range of resources.

In order to become eligible to receive various forms of Federal hazard mitigation grants, an Orleans County municipality must formally adopt its Local All-Hazards Mitigation Plan.

This plan is organized into 5 Sections which are described below:

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 Charleston Town Plan (2013) 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 most significant identified hazards for Charleston are broken down in the grid below:

Severe winter storm	Power loss	Flooding
Telecommunications failure	Major transportation incident	Epidemic

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

Section 5: Mitigation Strategies begins with an overview of goals and policies in the **2013 Charleston Town Plan** that support hazard mitigation and utilizes the town's comprehensive **2014 Road Inventory and Capital Budget Plan**. This is followed by an analysis of existing municipal actions that support hazard mitigation, such as planning, emergency services and public works. The following all-hazards mitigation goals are summarized below:

- 1) Reduce at a minimum, and prevent to the maximum extent possible, the loss of life and injury resulting from all hazards.
- 2) Mitigate financial losses and environmental degradation incurred by municipal, educational, residential, commercial, industrial and agricultural establishments due to various hazards.
- 3) Maintain and increase awareness amongst the town's residents and businesses of the damages caused by previous and potential future hazard events as identified specifically in this Local All-Hazards Mitigation Plan and the Town Plan.

- 4) Recognize the relationship between the relative frequency and severity of disaster events and the design, development, use and maintenance of infrastructure such as roads, utilities and storm water management.
- 5) Maintain existing municipal plans and programs, adherence to state standards 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 operating procedures.
- 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.

Section 5 also identifies and provides a detailed discussion of the following Mitigation Actions:

- Action #1: Evaluate capabilities of existing road and storm water management infrastructure. Continue and improve highway, culvert and bridge maintenance programs.
- Action #2: Maintain and improve capabilities of existing and potential public shelters.
- Action #3: Work to enhance response times of emergency medical services in areas of town where there is a known deficit.
- Action #4: Review and modify evacuation and sheltering plans based on the results of drills and exercises or procedures implemented in an actual incident.
- Action #5: Ensure town and school emergency plans are fully coordinated.
- Action #6: Raise public awareness of hazards, hazard mitigation and disaster preparedness.
- Action #7: Complete fluvial geomorphology (in coordination with state recommendations and protocol) assessment and develop strategies in response to any identified risk

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

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SECTION 1: INTRODUCTION AND PURPOSE

1.1 Purpose and Scope of this Plan

The purpose of this Local All-Hazards Mitigation Plan is to assist this municipality in identifying all hazards facing their community and in identifying strategies to begin to reduce the impacts of those hazards. The plan also seeks to better integrate and consolidate efforts of this municipality with those outlined in the Town Plan as well as efforts of NVDA, the Local Emergency Planning Committee and the State Hazard Mitigation Plan.

This document constitutes an All-Hazards Mitigation Plan for the Town of Charleston. Community planning can aid significantly in 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 Orleans County.

1.2 Hazard Mitigation

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

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

Hazard mitigation strategies and measures can reduce or eliminate the frequency of a specific hazard, lessen the impact of a hazard, modify standards and structures to adapt to a hazard, or limit development in identified hazardous areas. This plan aligns with the 5 goals accomplished as a State since 2010 and as referenced in Section 5 of the State’s 2013 Hazard Mitigation Plan and as part of the newly created Emergency Relief Assistance Funding (ERAF) requirements set to go in effect in October, 2014.

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

Hazard mitigation planning is the process that analyzes a community’s risk from natural hazards, coordinates available resources, and implements actions to reduce risks. According to 44 CFR Part 201, Hazard Mitigation Planning, this planning process establishes criteria for State and local hazard mitigation planning authorized by Section 322 of the Stafford Act as amended by Section 104 of the *Disaster Mitigation Act of 2000*. Effective November 1, 2003, local governments now must have an approved local mitigation plan prior to the approval of a local mitigation project funded through federal Pre-Disaster Mitigation funds. Furthermore, the State of Vermont is required to adopt a State Pre-Disaster Mitigation Plan in order for Pre-Disaster Mitigation funds or grants to be released for either a state or local mitigation project after November 1, 2004.

There are several implications if the plan is not adopted:

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

1.4 Benefits

Adoption and maintenance of this Hazard Mitigation Plan will:

- Make certain funding sources available to complete the identified mitigation initiatives that would not otherwise be available if the plan was not in place.
- 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.

1.5 All-Hazards Mitigation Plan Goals

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

- 1) Recognize the characteristics that make the Town of Charleston unique within Orleans County and incorporate these findings into the hazard mitigation planning process.
- 2) Promote awareness of the relationship between the relative frequency and severity of disaster events and the design, development, use and maintenance of infrastructure such as roads, utilities and storm water management and the planning and development of various land uses, when applicable.
- 3) Ensure that mitigation measures are consistent with municipal plans and the capacity of the town to implement them.
- 4) Encourage Charleston to formally incorporate their individual Local All-Hazards Mitigation Plan into their municipal plan as described in 24 VSA, Section 4403(5).
- 5) Encourage Charleston to formally incorporate elements of their Local All-Hazards Mitigation Plan, particularly their recommended mitigation strategies, into their municipal operating and capital plans & 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 incorporate hazard mitigation planning into regional land use and transportation planning conducted by NVDA.
- 7) Maintain existing mechanisms or develop additional processes to enhance regional cooperation in hazard mitigation and emergency planning.

1.6 Town of Charleston: Population and Housing Characteristics

Population:

The Town of Charleston covers 24,662 contiguous acres. The 2010 U.S. Census reports a total population of 1023 residents, 51% male and 49% female, indicating a population density of about 1 person per 26 acres. The Town’s population has shown slow to moderate growth over the past 50 years—a rate that has increased somewhat over the past decade. About 22% of the population is younger than 20 years, about 20% is between 20 and 40 years of age, about 31% is between 40 and 60 years, and 27% is aged 60 or older. The median age is 49 years.

Table 1-1 Town of Charleston, selected population characteristics, 2010 Census

Category	Number	%
Total Population	1023	100
Median Age	49	--
Population age 60 years and over	276	27
Population under 20 years old	225	22
Population between 20 and 40	205	20
Population between 40 and 60	317	31

Housing:

The entire population of Charleston is housed, with more than half living in traditional nuclear families, a third living in non-family households, and about one-quarter living alone. The average family size is 2.7 and the average household size is 2.2. About 63% of Town residents are in the civilian labor force and 37% are not, with an unemployment rate of 5%, that is lower than state and national unemployment rates. About 30% of households have annual incomes below \$25,000, about 40% between \$25,000 and \$50,000, 12% between \$50,000 and \$75,000, and 18% above \$75,000. The average annual household income is about \$45,000.

About one-third of the Town’s housing stock was built before 1950. Almost half was built between 1960 and 1990. About 12% has been built since 2000. About half of the housing is valued between \$50,000 and \$150,000, with another half valued between \$150,000 and \$300,000. More than 80% of the housing is owner-occupied, with about 20% rented. Rental costs range from \$500 to \$1500 per month.

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

Table 1-2 Town of Charleston, selected housing unit data, 2010 Census Block Group 2

Category	Number	%
Total Housing Units	672	--
Occupied housing units	447	66.5
Vacant housing units	225	33.5
Owner-Occupied	363	54
Renter Occupied	84	12.5
Population in Renter-occupied	201	19.6
Households with individuals under 18	110	10.8

1.7 Summary of Planning Process

1.7.1 Planning and Development of the 2014 All-Hazards Mitigation Plan

In July, 2014, NVDA selected OPH Consulting Services (OPHCS) to draft the plan for the town. An initial meeting between NVDA, OPHCS and Charleston select board Chair, Tom Jenson was held to discuss the planning process and development of a planning team. On July 24th, 2014, OPHCS attended the select board meeting to explain the planning process and goals. A survey was drafted asking for community input and made available on the town's website along with an outline and spreadsheet concerning the importance and informational needs of a HMP and more town-specific concerns the public may have, respectively. This information was sent to 175 property owners in the town that had previously self-identified as being open to correspondence. While discussion and coordination of plan development remained ongoing from the onset with the individuals that would populate the planning team and the derived community surveys, the final roster was approved and adopted by the select board on November 13th, 2014. This meeting was warned with special notice inviting public comment on the draft Hazard Identification and Mitigation Strategies developed up to that date. Notices were posted at the Town Clerk's, Charleston School, East Charleston & West Charleston Post Offices, and on the town website indicating that copies were available at the Town Clerk's Office. A PDF version was also made available on the town's website.

1.7.2 Development of the 2014 Charleston Hazard Mitigation Plan

Following FEMA guidance in Local Mitigation Plan Review Tool Regulation Checklist, the plan was written using data sources that included:

- Surveys collecting public comment:

The survey sought updated information for Table 5-1, as well as information on the progress, logical next steps, and continued relevance of the mitigation strategies laid out in the 2005 plan draft. Additionally, the following municipal plans and reports were reviewed and used:

- 2013 Charleston Town Plan
- 2014 Charleston Capitol Budget and Road Plan

Based on information obtained and input from town officials, OPHCS and NVDA staff drafted the plan, building on new data, town plans and community input. OPHCS engaged in outreach with the following town staff and community organizations to provide an inclusive and strategic mitigation plan (**Names in bold indicate Planning Team Members**):

- **Tom Jenson, Charleston Selectboard Chair**
- **Bernie Pepin, Charleston Road Foreman**
- **Larry Young, Selectboard**
- **Dean Bennett, Charleston Selectboard**
- Bill Rodgers, Director of Operations, Great Bay Hydro Corporation
- Chris Herrick, HAZMAT Chief, State of Vermont
- Richard Colburn, Treasurer, Charleston Historical Society
- **Pat Austin, School Board, Charleston Elementary School**
- Tom Wagner, President of Echo Lake Protective Association
- **Jason Benoit - Director, Northwoods Stewardship Center**
- **Jamie LeClair, Newport City Fire Chief and LEPC 10 Chair**
- **Duane Molton, Charleston Fire Chief and local business owner**
- **John Kellogg, Charleston Planning Commission**
- **Colleen Kellogg, Charleston Town Clerk**
- **Bruce Melendy, Emergency Planner NVDA**

Additionally, in the town's ongoing efforts to engage and include surrounded towns, the inclusion of the LEPC chair and Newport Fire Chief on the planning team served to enhance the collaboration and area awareness with surrounding towns and rescue services. The draft plan was revised based on input and presented to the town select board in November 2014. The revised draft sections related to Hazards and Mitigation Strategies was posted on the Charleston website for public review in November, 2014.

The revised final draft was resubmitted to DEMHS and FEMA for formal review and approval pending municipal adoption. OPHCS and NVDA staff made minor revisions to the plan in response to comments from the State Mitigation Office. This version of the plan was resubmitted to the Federal Emergency Management Agency Region 1 for approval pending adoption. Upon approval pending adoption, the final draft was sent to select board members and the town clerk. NVDA staff also provided draft language for a resolution of adoption to be discussed at a regularly scheduled and properly warned select board meeting in _____, 2014.

The Plan was adopted by the Charleston Selectboard on _____.

SECTION 2: HAZARD IDENTIFICATION

Detailed descriptions of the natural, technological, and societal hazards affecting the town of Charleston are discussed here. Designated and non-designated hazard areas are described in Section 3 of this plan. Vulnerability of structures and infrastructure to hazards is also described in Section 4.

2.1 Hazardous Substances

Hazardous material release is a concern for the town of Charleston. According to the Charleston Fire Department, a collection source for facility tier II reports, only the school submitted a 2014 Tier II report. With this, there are minimal reported hazardous material storage sites in Charleston. Sites that contain large amounts of fuel or store what DEMHS calls Extremely Hazardous Substances are the most likely to cause significant problems in a hazardous materials incident and the town is free from such areas. The Town has two diesel fuel tanks in code-compliant spill containment shrouds. Farms and businesses have smaller fuel tanks for diesel and gas. There are various sized propane tanks all around town. Garages have various automotive products, such as oil, grease and antifreeze. While any site can be the source of a spill, history remarks positively to the responsible actions of business owners and farms in the town as there have been no significant chemical spills in the town.

According to the 2014 hazardous materials data obtained, the following sites in Charleston are required to file a Tier II report.

Table 2-1 Town of Charleston, Tier II Reporting Facilities

Owner / Facility	Type of Substance
CHARLESTON ELEMENTARY SCHOOL	HEATING OIL

2.2 Transportation Incidents

Overview of Charleston Roads:

“Charleston depends on the 60 miles of local and state roads within our borders and road maintenance is a top priority. Charleston has 10.15 miles of Class 2 roads, 30.51 miles of Class 3 roads, 9.01 miles of Class 4 roads, and 5.85 miles of legal trails. The state highways account for another 13.88 miles of road. Vermont Route 105 runs through the Town, roughly parallel to the Clyde River, connecting the Town to Island Pond and Derby. Route 5A runs perpendicular to Route 105 in West Charleston, connecting to Brownington. Various classes of roads connect residents to Island Pond, Morgan, Derby, Brownington, and Westmore, and to each other. Ninety percent of the Town’s workforce travels to work by car, truck or van—with almost half on the road before 7:00 am.” —2013 Charleston Town Plan

The town is concerned about transportation-related chemical accidents. Namely on the state highway, Route 5A and Route 105. In collaboration with LEPC 10, emergency managers from NVDA, the select board and Fire Department, exploring the benefits of a HMEP-grant funded study to better understand what is being transported through the town is a future goal.

2.3.1 High Accident Locations

VTrans has not identified any high-accident locations in Charleston.

2.3.2 Road Infrastructure Failure

Only bridge 5 on Hudson Rd is functionally deficient. This bridge is also scour critical. The bridges and culverts on the Twin Bridge Rd and the road itself cross the Clyde River floodplain. This road is subject to frequent washouts or wash-overs. Part of the town's five year plan is to pursue grants to address this problem. Mad Brook has been subject to repeated washouts on the roads and bridges throughout its watershed. The town has been approved for a Hazard Mitigation Grant from FEMA to replace a twin culvert that has washed completely out three time in the past 8 years on Cole Rd. This grant is waiting on the approval of this Hazard Mitigation Plan by FEMA. The Mad Brook Bridge was washed completely away in 1978, and has been seriously undermined in subsequent FEMA declared events. The Westmore Rd. Bridge has washed out tearing half of the deck away during Irene in Sept 2011. The town is planning to address these locations with repair and will pursue funding to do so.

SECTION 3: RISK ASSESSMENT

3.1 Designated Hazard Areas

3.1.1 Flood Hazard Areas

According to the Charleston Town Plan, designated flood hazard areas exist in the town but most major infrastructure and roadways are out of harm's way. 12 residences are in the floodplain and no commercial property other than hay fields and a few hay barns exist with the 100-year floodplain. All culverts on Hudson rd. and Twin Bridge Rd. are, however, located in the floodplain.

3.1.2 Fluvial Erosion Hazard Areas

The town is relatively free of any concern related to stream bank scouring as there are no high-risk areas in terms of environmental or economic risk. While portions of the Mad Brook have some fluvial erosion potential, the town has not seen any major increase in erosion since 2011, when repeated flooding inundated much of the state.

3.1.3 Repetitive Loss Properties

The town has no repetitive loss properties.

3.2 Non-designated Hazard Areas

3.2.1 1998 Ice Storm Damage

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

3.2.2 High Winds and Lightning

Ridgeline and hilltop homes as well as homes located in the midst of mature forests are the most vulnerable to damage from falling trees and tree limbs. High tension line runs along VT RT 105 and the Vermont Agency of Transportation works to keep limbs trimmed.

3.3 Previous FEMA-Declared Natural Disasters and Snow Emergencies

Since 2005, Charleston has received public assistance funding from FEMA for the following natural disasters:

Table 3-1 Town of Charleston, FEMA-declared disasters and snow emergencies, 2005-2014

Date (FEMA ID#)	Type of Event	Total Repair Estimates
DR-1715	Flooding	\$61,719.00
DR-1995	Flooding	\$213,712.00
DR-4022	Flooding	\$187,394.00
DR-4140	Flooding	\$76,598.00
DR-4178	Flooding	\$18,851.00

Sources: Town Records, Project Worksheets and award letters.

The Town of Charleston was reimbursed at a rate of 75 percent by FEMA for the estimated repair costs and 12.5% by the state. Funds provided in response to these natural disasters were used for gravel, ditching, road repair and additional secondary costs associated with these activities.

Future Events

Although estimating the risk of future events is far from an exact science, the Planning Team used best available data and best professional judgment to conduct an updated Hazards Risk Estimate analysis, which was subsequently reviewed and revised by town officials in 2014. This analysis assigns numerical values to a hazard's affected area, expected consequences, and probability. This quantification allows direct comparison of very different kinds of hazards and their effect on the town, and serves as a method of identifying which hazards hold the greatest risk based on prior experience and best available data. The following scoring system was used in this assessment.

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

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

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

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

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

3.4.1 Natural Hazards

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

- Severe Winter Storm (28)
- Flooding (16)
- Fire (10)
- Wildfire (7)

While flooding is 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. Charleston has minimal fluvial erosion hazard areas along stream banks.

Table 3-2 Natural hazards risk estimation matrix, Charleston

Hazard and Risk Analysis: Natural Hazards	Drought	Flooding	High Winds	Fluvial Erosion	Landslide	Lightning	Multi-Structure Urban Fire	Wildfire	Winter Storm	Radio logical (Natural)
	Area Impacted Key: 0 = No developed area impacted 1 = Less than 25% of developed area impacted 2 = Less than 50% of developed area impacted 3 = Less than 75% of developed area impacted 4 = Over 75% of developed area impacted	0	1	1	0	0	0	2	1	4
Consequences										
Health & Safety Consequences Key: 0 = No health and safety impact 1 = Few injuries or illnesses 2 = Few fatalities or illnesses 3 = Numerous Fatalities	0	1	0	0	0	0	2	1	1	0
Property Damage Key: 0 = No property damage 1 = Few properties destroyed or damaged 2 = Few destroyed but many damaged 2 = Few damaged and many destroyed 3 = Many properties destroyed and damaged	0	1	1	0	0	0	3	1	1	0
Environmental Damage Key: 0 = Little or no environmental damage 1 = Resources damaged with short-term recovery 2 = Resources damaged with long-term recovery 3 = Resources destroyed beyond recovery	0	0	0	0	0	0	0	2	0	0
Economic Disruption Key: 0 = No economic impact 1 = Low direct and/or indirect costs 2 = High direct and low indirect costs 2 = Low direct and high indirect costs 3 = High direct and high indirect costs	0	1	1	0	0	0	3	2	1	0
Sum of Area & Consequences Scores	0	4	3	0	0	0	10	7	7	0
Probability of Occurrence Key: 1 = Unknown but rare occurrence 2 = Unknown but anticipate an occurrence 3 = 100 years or less occurrence 4 = 25 years or less occurrence 5 = Once a year or more occurrence	1	4	1	0	0	0	1	1	4	0
TOTAL RISK RATING Total Risk Rating = Sum of Area & Consequences Scores x Probability of Occurrence	0	16	3	0	0	0	10	7	28	0

3.4.2 Technological Hazards

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

Power Loss (7)

Telecommunications Failure (36)

Hazardous Materials Incident (7)

Charleston is vulnerable to Power Loss and Telecommunications Failure because the population is dispersed and repairing utility infrastructure in rural areas can take more time.

Table 3-3 Technological hazards risk estimation matrix, Charleston

Hazard and Risk Analysis: Technological Hazards	Gas Service Loss	Hazardous Materials Incident	Power Loss	Radiological Incident	Sewer Service Loss	Telecommunications Failure	Water Service Loss	Major Transportation Incident	Military Ordnance Incident
	Area Impacted Key: 0 = No developed area impacted 1 = Less than 25% of developed area impacted 2 = Less than 50% of developed area impacted 3 = Less than 75% of developed area impacted 4 = Over 75% of developed area impacted	0	1	4	0	0	4	0	2
Consequences									
Health & Safety Consequences Key: 0 = No health and safety impact 1 = Few injuries or illnesses 2 = Few fatalities or illnesses 3 = Numerous Fatalities	0	1	1	0	0	2	0	1	0
Property Damage Key: 0 = No property damage 1 = Few properties destroyed or damaged 2 = Few destroyed but many damaged 3 = Few damaged and many destroyed 4 = Many properties destroyed and damaged	0	1	1	0	0	1	0	1	0
Environmental Damage Key: 0 = Little or no environmental damage 1 = Resources damaged with short-term recovery 2 = Resources damaged with long-term recovery 3 = Resources destroyed beyond recovery	0	2	1	0	0	1	0	1	0
Economic Disruption Key: 0 = No economic impact 1 = Low direct and/or indirect costs 2 = High direct and low indirect costs 2 = Low direct and high indirect costs 3 = High direct and high indirect costs	0	2	1	0	0	1	0	1	0
Sum of Area & Consequences Scores	0	7	7	0	0	9	0	6	0
Probability of Occurrence Key: 1 = Unknown but rare occurrence 2 = Unknown but anticipate an occurrence 3 = 100 years or less occurrence 4 = 25 years or less occurrence 5 = Once a year or more occurrence	1	1	1	1	0	4	0	1	0
TOTAL RISK RATING Total Risk Rating = Sum of Area & Consequences Scores x Probability of Occurrence	0	7	7	0	0	36	0	6	0

3.4.3 Societal Hazards

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

- Epidemic (4)
- Crime (15)

The likelihood of an epidemic is difficult to gauge, but its consequences could be severe. The largest organizations in the town (and the ones with the highest populations on any given day) would be most susceptible to becoming zones of high attack rates and would look to State Health Department recommendations on closure notices. Because of the rural nature of the town, there are few societal hazards.

Table 3-4 Societal hazards risk estimation matrix, Charleston

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

3.4.4 Hazard Summary

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

- Severe Winter Storm
- Power Loss
- Flooding
- Telecommunications Failure
- Major Transportation Incident
- Epidemic

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

SECTION 4: VULNERABILITY ASSESSMENT

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.” *Map 4-1* shows the geographic distribution of some critical facilities and utilities. Table 4-1 identifies critical facilities in Charleston, excluding critical facilities designated as hazardous materials storage sites, which are listed in Tables 2-1 and 2-2.

Table 4-1 Critical facilities in the Town of Charleston

Facility Type	Number of Facilities
Education Facility	1
Fire Station	1
Emergency Shelters	2
Emergency Operations Center	1
Government and Military	1

4.2 Infrastructure

4.2.1 Town Highways

The following is a statistical overview of roads in the Town of Charleston. These tables show the range of road types within the town, from highways to unpaved roads. The different road types have different hazard vulnerabilities. Unpaved roads are more vulnerable to being washed out in a flood or heavy storm, while traffic incidents are more likely to occur on large, arterial roads.

Table 4-2 Town highway mileage by class, Town of Charleston

Class 1	Class 2	Class 3	Class 4	State Hwy	Fed Hwy	Interstate	Total 1, 2, 3, State Hwy
0	10.5	30.51	9.01	13.88	0	0	63

Source: data derived from VTrans TransRDS GIS data – Charleston Town Plan 2013

Table 4-3 Town highway mileage by surface type, Town of Charleston

Paved	Gravel	Soil or Graded	Unimproved	Impassable	Unknown	Total
5	35.5	9.01	0	0	0	49.51

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

4.2.2 Bridges, Culverts, and Dams

Bridges:

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 NVDA and represent those of greatest concern for the town. This analysis does not take into account the fluvial geomorphology or the elevation of the bridge above the floodplain.

Table 4-4 Inventoried bridges in the Town of Charleston with identified need

Class	Bridge Type	Deficiency	Bridge Features	Scour Critical	Located in Floodplain
TOWN SHORT	SLAB	FUNCTIONALLY DEFICIENCY	HUDSON ROAD	3 - SCOUR CRITICAL	NO
TOWN SHORT	SLAB	UNKNOWN	MAD BROOK	NO	NO
TOWN SHORT	SLAB	UNKNOWN	WESTMORE	NO	NO

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

Culverts:

Citizens must buy their own driveway culverts but the Town will install them. The Town maintains a culvert inventory that assesses over 800 culverts with data on length, overall condition, size and location. This data guides the town’s culvert maintenance and replacement plan. All culverts removed from the Town roads become the Town’s property. Usable culverts will be reused on Class 4 roads. Less useful culverts are sold on a first come first serve basis and others are sold as scrap metal. Guardrails are placed on an as-needed basis or as required by the state. A supply of beam rail and posts are stored at the Town Pit on Ten Mile Square Road. Culverts located in the 100-year floodplain are listed below.

Table 4-5: Charleston culverts located in 100-year floodplain

All (48) culverts on Hudson Road are in the 100-year Floodplain.

All (4) on Twin Bridges

Source: The entire Culvert Inventory with maps for the town can be found on the state site: <https://vtculverts.org/map>.

Dams:

The National Dam Inventory shows two structures in the town. The first is the West Charleston Hydroelectric Plant, federally licensed as the Clyde River Hydroelectric Project (FERC Project No. 2306). The facility ceased operation in 1998 due to poor condition but Great Bay Hydro, a private energy company based in Portsmouth, NH, acquired the facility from Citizens Utilities in 2004. The second and upstream from Great Bay Hydro's operation is the two-turbine Barton Village Hydropower Project (FERC No. 7725), operated by Barton Village Electric, which serves more than 2,000 customers in Barton, Westmore, West Charleston, Brownington, Evansville, and Sutton. The plant operates in "run-of-river" mode. Originally constructed in the 1890s, the current facility is between 60 and 70 years old.

4.2.3 Water, Wastewater and Natural Gas Service Areas

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

4.2.4 Electric Power Transmission Lines and Telecommunications Land Lines

High-tension electric transmission run through the Town of Charleston, running along VT RT 105.

4.3 Estimating Potential Losses in Designated Hazard Areas.

12 residences and 0 commercial/industrial structures are located within the 100-year floodplain. Assuming a 2007 median grand list value, the estimated potential losses due to a major flood event inundating the floodplain are less than 1%. This estimate only takes structures into account, it does not account for personal property or business losses. The town has no repetitive loss properties.

4.4 Land Use and Development Trends Related to Mitigation

Charleston's land use is primarily residential and commercial. The Town of Charleston covers 24,662 acres (38.5 square miles). Population density is 26.6 people per square mile. Residences are concentrated primarily within the East and West Charleston Village areas, around the larger lakes, and along the larger state and Town roads, leaving much of the Town's acreage in an undeveloped condition. Nearly all of the land in Charleston is privately owned with exception of a few small state owned fishing access areas, Town-owned office and road maintenance facilities and a municipal Town Forest. The Town Forest is located along the Class 4 Town Farm Road on the Charleston-Westmore town line, and includes 184 acres within the Town of Charleston, as well as a contiguous 50 acres in Westmore. In Charleston, 9500 acres (41%) are currently enrolled in UVA (use value appraisal), including 51% of all parcels greater than 50 acres. This

represents an increase of 2900 acres (15%) since 2003. Lands conserved by the Vermont Land Trust total 3221 acres (13%). One of the largest blocks of UVA and conserved acreage is found in the east corner of Town, made up of a dairy farm, the Northwoods Stewardship Center, and multiple smaller private ownerships.

Table 4-6: Charleston Land Cover Types (Source VCGI)

<i>Broad type Detail</i>
<i><u>Forested</u></i>
<i>Mixed forest 24.1%</i>
<i>Evergreen forest 23.3%</i>
<i>Deciduous forest 16.3%</i>
<i>Forested wetland 9.2%</i>
<i>Total forested 72.9%</i>
<i><u>Agricultural</u></i>
<i>Hay/pasture 7.8%</i>
<i>Row crop 6.8%</i>
<i>Total agricultural 14.6%</i>
<i><u>Other nonforested</u></i>
<i>Water 5.7%</i>
<i>Transportation/utilities 4.0%</i>
<i>Non-forested wetland 1.8%</i>
<i>Residential 0.6%</i>
<i>Brush/transitional 0.3%</i>
<i>Commercial/industrial 0.0%</i>
<i>Total other non-forested 12.4%</i>

Parcel sizes in Charleston range widely, from a fraction of an acre to over 1100 acres, with 74% of parcels being at least 50 acres in size—slightly above the state average (VNRC 2012). Increasing land values and development have resulted in steady subdivision of large parcels, inhibited somewhat by the UVA program or conservation easements through various organizations—most notably the Vermont Land Trust (VLT).

4.4.2 Future Development and Housing

Charleston can benefit from attracting new business. Although unemployment in the Town is lower than the state average and the nation, there is strong support among Town residents for new job opportunities and the contribution that new business can make to the Town’s tax base. New business areas appropriate for the Town include farming, agriculture, manufacturing, technology, health care, service businesses, tourism, and other residential scale enterprises that can be well integrated within the town’s rural setting in ways that protect natural

resources and scenic beauty. Charleston is adjacent to five municipalities: Brighton to the east; Morgan to the east and north; Derby to the north and west; Brownington to the west and south; and Westmore to the south. Interaction with these towns in terms of their land use and future development has and continues to be a concern when actions conflict with the objectives and land conservation measures set forth in the Charleston Town Plan.

Housing

Mobile Homes occupied by full-time and part time residents continue to be a significant part of the housing mix (17% of overall housing units). According to the 2010 U.S. Census, about one-third of the Town's housing stock was built before 1950 (27% before 1940), and almost half was built between 1960 and 1990. About 12% has been built since 2000:

- About 45% of housing is valued between \$50,000 and \$150,000.
- 13% between \$150,000 and \$200,000.
- 28% between \$200,000 and \$300,000.
- 8% above \$300,000.
- 43% of rental units cost between \$500 and \$750 per month.
- 50% cost between \$750 and \$1000 per month.
- 7% cost between \$1000 and \$1500 per month.

SECTION 5: MITIGATION STRATEGY

5.1 Charleston Town Goals and Policies that support Hazard Mitigation

5.1.1 Purpose and Goals

5.1.1.1 Community Goals

- a. Continue supporting state standards with local, POS water/sewer sources
- b. Take advantage of the UVM/ACCD mobile home park preparedness programs to support resiliency of this large and disproportionately impacted population during disasters.
- c. Consider implementation of special population tracking within the community where-by residents unable to drive or that have no one to depend on can self-identify for inclusion in a maintained data-base so that rescue personal and emergency managers can account for this demographic.
- d. Work with residents, NVDA, rescue services (Derby and Island Pond), Vermont EMS and the LEPC to accomplish greater efficiency in response times for residents living closer to Island Pond.

5.1.1.2 Capital Improvement Goals

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

5.1.1.3 Public Participation Goals

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

5.1.1.4 Regulatory Devices Goals

- a. The town is confident that state regulations will serve the town best and adopts to not have zoning at this time.
- b. Maintain and continue a Capital Expense Budget and Program for the purpose of ensuring that Charleston's rate of growth does not outstrip the Town's ability to pay for the associated necessary services such as roads, schools, police and fire protection, solid waste, etc. The town's capital expense budget is for roads and maintaining town office and garage. School budget is administered separately by school board. There is not a local police force but a mutual aid agreement that includes 19 departments. Solid waste is handled by local haulers.

5.1.2 Land Use

5.1.2.1 Flood Hazard Overlay District

- a. Work to develop a Flood Hazard Area Overlay District to include all designated flood hazard areas. The purpose of the Flood Hazard Area Overlay District is to (1) protect public health,

safety, and welfare by preventing or minimizing hazards to life and property due to flooding, and (2) to ensure that private property owners within designated flood hazard areas are eligible for flood insurance under the National Flood Insurance Program (NFIP). The town has elected not to be part of the NFIP but is dedicated to not encouraging new development in the floodplain. The town has no mobile home parks and very few residences at risk of flooding with no repetitive loss properties.

5.1.3 Natural Resources

5.1.3.1 Natural Resources Goals

- a. Ensure that the existing health ordinance is enforced to maintain protection of both surface and groundwater supplies.
- b. Ensure that permits issued for development near sensitive areas, such as steep slopes, high elevations, wetlands, scenic vistas and wildlife habitats, contain conditions assuring conformance to the goals set forth in this plan.
- c. The Conservation Commission should work with the NVDA to continue the process of identifying the Town's land conservation priorities, and to the degree possible, link them to broader regional conservation work.
- d. The Conservation Commission shall also be an active participant in the local management plans for Charleston's Natural Areas.

5.1.3.2 Policies

- a. Through both town and state-level management, work to:
 - Encourage and maintain naturally vegetated shorelines, buffers and setbacks for all rivers, ponds and streams.
 - Allow higher density or cluster development in existing and designated settlement areas and low density development in the remaining areas.
 - Reduce flood hazard and repetitive road and driveway washout through continued updates and adherence to the Town Capitol Budget and Road Plan.
 - Identify and manage pollution, flooding and fluvial erosion hazards along rivers and streams as they arise.

5.1.4 Transportation Plan

5.1.4.1 Transportation Goals

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

- a. Maintaining safe operating conditions on the present system of town roads through design to keep traffic at appropriate speeds and timely maintenance, including consideration of additional paving (though only on portions of roads prone to damage) should state funding become available.
- b. Protection of existing town roads from flood damage and uncontrolled storm water runoff.
- c. Preserving the capacity of town roads and maintain adequate traffic flows and safety.
- d. Support the road maintenance crew through Town-provided training sessions.

- e. Ensuring that owners and managers of recreational areas provide and maintain adequate and safe parking facilities.
- f. Continuing long term access opportunities to gravel and sand deposits for future road maintenance use (the town has secured a 50 year supply of good sand and gravel).

5.1.5 Utilities and Facilities Plan

5.1.5.1 Utilities and Facilities Goals

- a. Maintain current relationships with the Vermont State Police and Rescue for police and emergency medical services, respectively.
- b. Lack of crime does not support necessity for additional actions or planning at this time.
- c. Identify effective locations for tanker truck access to water in portions of town that currently do not have adequate supplies. The Charleston Fire Department and NVDA shall be responsible for this task.
- d. Promote high-speed internet access throughout town to assist and encourage local businesses to reside in Charleston.
- e. Ensure adequate provision of water sources for fire suppression by requiring dry hydrants, fire ponds, water storage at Charleston Valley, or other measures as conditions on town land use permits where appropriate. The Planning Commission will work with developers and property owners on this task.
- f. Work to develop a recruiting plan for fire department as a problem facing the town is an ageing membership where no new (young) volunteers are coming in due to the perceived commitment of time the training required.

5.1.6 Educational Facilities

5.1.6.1 Educational Goals

- a. The School Board should work with the Selectboard and the Charleston Volunteer Fire Department to ensure that the necessary equipment exists at the Elementary School for its use as an emergency shelter.
- b. Increase emergency planning cohesion between school and town EOPs through mutual participation and presentation at scheduled LEPC meetings and town and/or school meetings.

5.2 Existing Town of Charleston Actions that Support Hazard Mitigation

Table 5-1 Existing municipal actions that support hazard mitigation, Town of Charleston

Type of Existing Protection	Description /Details/Comments	Issues or Concerns
Emergency Response		
Police Services	Vermont State Police	None at this time
Fire Services	Charleston VFD	Water access for fire department is problematic; some roads are difficult to access.
Fire Department Personnel		Need for new volunteers remains as current roster ages.
Fire Department Mutual Aid Agreements	Northeast International Mutual Aid (19 participants)	None at this time
EMS Services	Newport/Island Pond	Response times on Island Pond side are slow and need improvement.
Other Municipal Services		
Highway Services	Town Highway Department	None at this time
Highway personnel	4 FTE field personnel	MOU's completed with residents to avoid future conflict and liability over culvert and ditching work
Water / Sewer Department	None	None at this time
Planning and Zoning personnel		None at this time
Residential Building Code / Inspection	No	None at this time
Emergency Plans		
Local Emergency Operations Plan (LEOP)	2014	Assure sheltering plans and contact information is up to date and vulnerable populations addressed.
Municipal Rapid Response Plan	2005	Replaced by LEOP
School Emergency/Evacuation Plan(s)	2014	Increased collaboration (with town staff, LEPC, NVDA), knowledge of roles and drills are next step.
Municipal HAZMAT Plan	None	Not required but enhanced knowledge via HMEP funded transportation study through LEPC would benefit town.
Dam Emergency Plans	Great Bay Hydro has shared its comprehensive Emergency Response Plan with the Town.	Invite representatives to LEPC and town to increase collaboration. Assure understanding of risk and associated protocol for residents and impacted town infrastructure (if any).
Shelter, Primary	Charleston Elementary School	Work with ARC with Sheltering Initiative to obtain training and supplies. Include volunteer staff in planning communication and schedule drills to test efficacy.
Replacement Power, backup generator	HMGP grant approved/award awaiting Hazard Mitigation plan approval	None at this time
Shelter, Secondary:	Plymouth Church	Assure continued communication lines are open and contacts are correct (See LEOP comments)
Replacement Power, backup generator	Yes	Assure maintenance program
Municipal Plans		
Town / Municipal Comprehensive Plan	2013	None at this time
Town of Charleston Road Inventory and Capital Budget Plan	2014	None at this time
Hazard Specific Zoning (slope, wetland, conservation, industrial, etc.)	Utilize most current state regs	None at this time

Highway Access (curb cut) Policy	Application process, review by Highway Dept. Foreman with final approval by Selectboard	None at this time
Participation in National Flood Insurance Program (NFIP) and Floodplain/Flood Hazard Area Ordinance	No, the town elects not to Participate.	Residential homes or businesses in the floodplain is not an outstanding concern for the town and the barrier to obtaining mortgages would serve has a deleterious consequence to participating. SFHA mapping update is needed.
Culvert and bridge Inventory	2014	https://vtculverts.org/map https://vtculverts.org/bridges#list Town of Charleston Road Inventory and Capital Budget Plan (2014)

5.3 Town of Charleston All-Hazards Mitigation Goals

The following goals were developed by OPHCS and NVDA staff in 2014, and approved by Town of Charleston officials during the development of this plan.

- 1) Reduce at a minimum, and prevent to the maximum extent possible, the loss of life and injury resulting from all hazards.
- 2) Mitigate financial losses and environmental degradation incurred by municipal, educational, residential, commercial, industrial and agricultural establishments due to various hazards.
- 3) Maintain and increase awareness amongst the town’s residents and businesses of the damages caused by previous and potential future hazard events as identified specifically in this Local All-Hazards Mitigation Plan.
- 4) Recognize the linkages between the relative frequency and severity of disaster events and the design, development, use and maintenance of infrastructure such as roads, utilities and storm water management and the planning and development of various land uses.
- 5) Maintain existing municipal plans, programs and ordinances that directly or indirectly support hazard mitigation.
- 6) Consider formal incorporation of this Local All-Hazards Mitigation Plan into the municipal comprehensive plan as described in 24 VSA, Section 4403(5).
- 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.

5.4 Mitigation Actions

5.4.1 Current Capabilities and Need for Mitigation Actions

The Town Plan’s goals and policies that support hazard mitigation, and the existing mitigation actions, demonstrate the variety of policies and actions forming the foundation of this All Hazards Mitigation Plan. Generally, the Town considers its existing capabilities are adequate to address the identified priority hazards in this Plan.

- 1) Severe Winter Storm – The Town regards its current hazard mitigation efforts carried out by the road departments as adequate to address winter storm impacts to local roads, however temporary road closure due to winter storms may isolate parts of town. Winter storms are often the cause of the power loss and telecommunications failure.

- 2) Power Loss – The private service provider which owns and operates the electric utility is responsible for restoring service. Tree trimming and vegetation management, coupled with maintaining adequate repair vehicles and personnel are the primary means of mitigation.
- 3) Flooding – Major infrastructure that has seen repeated damage due to flooding is a concern for the town and they are active in acquiring mitigation funding to address these defined areas. The Town will investigate establishing a Flood Hazard Overlay District to include all designated flood hazard areas.
- 4) Major Transportation Incidents – Despite having no listed high accident locations, the town is concerned about a transportation-related chemical spill. With the availability of Hazardous Materials Emergency Preparedness (HMEP) funding available to the local LEPC, there is an opportunity to learn more about what types of chemicals are being transported through the town and what response mechanisms may need to be in place.
- 5) Telecommunications Failure – The private service providers which own and operate landline and cellular services are responsible for restoring service. As with the electric utilities, tree trimming and vegetation management, coupled with maintaining adequate repair vehicles and personnel are the primary means of mitigation.
- 6) Epidemic – In part, the Town relies on epidemic education provided by the state Health Department and the school. Medical facilities are located in nearby communities. The Mitigation Action on public awareness of hazards provides an opportunity to address pandemic hazards, preparedness and mitigation.

5.4.2 Specific Mitigation Actions

Action #1: Complete fluvial geomorphology assessment and develop strategies in response to identified risks in addition to investigating increased mapping of the SFHA.

Status: Ongoing

Primary Responsible Entities: NVDA, Agency of Natural Resources (VT ANR) (for assessments and mapping); Town of Charleston Selectboard (for ordinance changes and other actions).

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

Timeframe: January 2015 – April 2020

Funding Requirements and Sources: Through EMPG funding, NVDA can assist in enhanced mapping of the floodplain within the town. Continuation of assessments and strategy development is contingent upon individual municipalities and/or regional and local organizations, securing funding in partnership with ANR. The level of municipal participation is contingent upon the level of participation asked of staff and that such work would not hinder the ability of municipal staff to carry out their day-to-day municipal duties.

Specific Identified Tasks

- 1) Fluvial Geomorphic Assessments - Funding permitting, conduct Phase I and Phase II fluvial geomorphic assessments on streams and waterways in Charleston. If using PDM funding, individual municipalities may select only a subset of streams upon which to perform these

assessments and therefore may choose to assess only those sections of streams wherein the history of flood and erosion damage, the history of channel management, and the proximity of existing or potential development or public infrastructure to the active channel makes an assessment a priority. Justification should be provided for streams, watersheds, or stream reaches not selected for fluvial assessment. Fluvial assessments shall be conducted as guided by the VT ANR Fluvial Geomorphic Assessment Protocols.

- 2) Fluvial Erosion Hazard Mapping - Within a year of completed geomorphic assessments for a waterway, funding permitting, a GIS provider (NVDA) should rate the fluvial erosion hazard for each assessed reach, and develop a fluvial erosion hazard map for the waterway, using the GIS extension known as SGAT (or Stream Geomorphic Assessment Tool) for assessed stream reaches. As assessments are completed, a map of all assessed waterways in the town should be created. This data will undergo town review and QA/QC by VT ANR before a final map is drawn.
- 3) River Corridor Management Plans – River Corridor Management Plans (RCMP) are encouraged for waterways where Phase I and Phase II assessments have been completed. Creating such a plan requires additional fieldwork and work with local landowners to identify acceptable reach-based management options that enable stream systems to reach equilibrium conditions. Management measures may include stream corridor buffer planting, culvert replacement and roadway improvements, berm removal, and corridor easements. Under Act 110, the Agency of Natural Resources will be identifying best management practices for shorelands and river corridors, and will be providing financial incentives, such as grants and pass-through funding. While the town relies on state regulations for zoning and other regulations, incorporating a RCMP into the Town Plan will only serve to increase the town’s awareness in this crucial facet of mitigation planning.
- 4) Fluvial Erosion Hazard Mitigation Implementation - Within five years of completing the final fluvial erosion hazard map, the town will draft strategies to avoid or mitigate losses from the identified fluvial erosion hazards. These strategies may include the adoption and implementation of programs, mechanisms or regulations to prevent endangerment of persons and property in riparian corridor areas from fluvial adjustment processes. Efforts could range from a relatively simple, public information campaign about the map to the adoption of a municipal ordinance or by-law that restricts development in such hazard areas.

Rationale / Cost-Benefit Review:

Continuing this project will require a sustained succession of grants, state appropriations and other funding to complete assessments in Charleston. Successful completion will provide municipal and regional benefits. The municipality’s fluvial erosion areas would be adequately and electronically mapped. This will enable the municipality to make residents and businesses aware of fluvial erosion hazards and potentially lead to municipally-directed programs, mechanisms and regulations that further mitigate against this hazard, protecting existing structures and infrastructure. Identifying fluvial erosion hazard areas could also help the municipality restrict future development in hazardous areas, if that should be an advantage to the town in the future. More accurate knowledge of fluvial geomorphology will enable the community to have a better understanding of hazard areas and what mitigation measures might most effectively address those concerns. Flooding is the most common and most significant

hazard that can trigger a Federal disaster declaration in Charleston. Along with an update to the flood hazard area maps, identifying the fluvial erosion hazard areas provides improved opportunities for the community to mitigate potential losses and gauge future development initiatives.

Action #2: Evaluate capabilities of existing road and storm water management infrastructure. Continue and improve highway, culvert and bridge maintenance programs.

Status: Ongoing

Lead Responsible Entity: Town of Charleston Road Foreman

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

Timeframe: January 2015 – April 2020

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

Progress since 2005: The Road Foreman continually monitors road and storm water management capabilities. All bridges and culverts have been electronically accounted for and the town is diligent in maintaining a comprehensive road plan that serves to guide action. The Town of Charleston Road Inventory and Capital Budget Plan (2015-2020) specifies actions, areas of road erosion, estimated costs of repair and future needs with supporting mapping. As mentioned, the town has done an outstanding job in acquiring Hazard Mitigation funding to address crucial infrastructure and can begin moving forward whence this plan is approved. Overview and introduction from the plan itself is included below:

“The purpose of this road inventory update and capital budget plan is to provide an up to date survey of all road structures in an easy to retrieve and manipulate data file that can provide electronic reporting to the state, and to plan specific remedies for drainage and erosion problems on Charleston's roads. We have reviewed and updated all information on Charleston's culverts and bridges on the VOBSIT web site as of May 7 2014. It will be used to store all pertinent information on all aspects of Charleston's roads, report electronically to the state, be used to create reports to FEMA or other grantors when we apply for assistance and help us plan for future projects. The specific sites chosen will further the goal of re-mediating problem areas on town roads to prevent washouts during heavy rain events.

The areas identified in this plan were selected based on the condition of culverts and ditches and primarily focused on runoff issues particularly as the incidence of heavy storms has increased. In many cases, culverts properly sized for normal rain events are overwhelmed by the sever ones. We will seek local, state and federal grants funds to address these sites. This plan will provide a timetable and proposed budget for each one.”

Specific Identified Tasks:

- 1) Infrastructure Assessment for Storm water Vulnerability – Funding and staff resources permitting, assess the vulnerability and operational capability of municipal-owned roads, culverts and other storm water management infrastructure to predicted storm water and

snowmelt in areas with a documented history of recurring problems. The infrastructure will be evaluated regularly prior to replacement or upgrades of the existing infrastructure. Separate analyses of all infrastructure in each municipality is not intended or warranted.

- 2) Infrastructure Assessment for Fluvial Erosion/Landslide Vulnerability – Funding and staff resources permitting, assess the operational capability and vulnerability of municipal-owned roads, culverts, bridges and other infrastructure to fluvial erosion of varying severity as determined by Strategy #1 above.
- 3) Culvert Upgrades - Upgrade culverts and ditching along various roads to mitigate against repeated damages from storm water or spring snowmelt. Specific projects include:
 - Approved HMGP-funded culvert upgrade on Cole Road
- 4) Continued Monitoring of Vulnerable Infrastructure - Monitor various bridges and culvert locations that have erosion and scouring concerns.
- 5) Road Improvements - Within political and financial restraints, consider re-engineering certain sections of roads to lower overall maintenance costs, improving snow plowing speeds and improve overall capability of roads to handle current and projected traffic volumes. Specific projects include:
 - See Charleston Road Inventory and Capitol Budget Plan
- 6) Erosion / Landslide Mitigation - Undertake erosion or landslide mitigation projects at various locations where municipal roads regularly incur damage from adjacent rivers/streams and hillsides as applicable. Specific areas of concern:
 - See Charleston Road Inventory and Capitol Budget Plan

Rationale / Cost-Benefit Review: Conducting vulnerability assessments facilitates a targeted and effective approach to road and storm water management infrastructure. This will prove useful in the development and implementation of municipal capital and operating plans as well as the development and implementation of grant-funded mitigation projects. Some areas suffer low-level but consistent damage during heavy rains and snowmelt. Mitigating against these problems would reduce short and long term maintenance costs and improve the flow of traffic for personal and commercial purposes during flooding events.

Action #3: Maintain and improve capabilities of existing and potential public shelters.

Status: Ongoing

Primary Responsible Entities: Town of Charleston; NVDA Emergency Planning services, American Red Cross, POS Shelter staff.

Potential Partner Entities: LEPC#10; Charleston Fire Chief, ARC’s Sheltering Initiative Program

Timeframe: January 2015 – April 2020

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

Charleston Elementary School has been identified as the primary emergency shelter. The school does not have an emergency generator. However, HMGP grant approved for generator

installation and award awaiting Hazard Mitigation plan approval. Plymouth Church is the secondary shelter and it does have a generator in place.

Specific Identified Tasks:

- 1) Maintain Existing Shelter Capability – Maintain and improve capabilities of existing shelters. Notification procedures and shelter staffing is a priority for the town and intends to move forward on planning and public involvement. School staff have committed to staffing the shelter and more formalized training is the logical next step and the ARC’s “Shelter Initiative Program” can be used at no cost to the town to enhance both shelter management knowledge and supply cache.
- 2) Assess Vulnerable Population— Develop an awareness of the most at-risk community members during an evacuation and/or sheltering event. Focusing on those that lack resources or capability to reach facilities when in need and create plans on how to address this potential hurdle.

Rationale / Cost-Benefit Review:

More formalized planning in both staffing and notification procedure, especially pertaining to vulnerable populations where transportation and special needs are a concern could potentially significantly reduce the physical, psychological and social impacts of a disaster.

Action #4: Work to enhance response times of emergency medical services in areas of town where there is a known deficit.

Status: New (see below)

Risk or Hazard Addressed: Community input surveys have brought this problem to light and potential solutions need to be addressed after analysis completed.

Primary Responsible Entities: Town of Charleston, Island Pond and Newport EMS and NVDA.

Potential Partner Entities: Vermont EMS, LEPC

Timeframe: January 2015 – April 2020

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

Specific Identified Tasks:

- 1) Work with EMS agencies to develop clear understanding of magnitude of the problem and develop mapping of affected area including demographics and call-volume in affected areas.
- 2) Develop potential solutions, barriers and needs assessment based on recommendations from Vermont EMS department.

Rationale / Cost-Benefit Review:

Now that this issue has been raised through the public outreach portion constituting this plan, the town should look into what can be done, if in fact, response times to the affected areas are deemed to be below what current benchmarks suggest as adequate at the state/federal level. With EMPG funding, NVDA can assist in the labor involved in the outreach required to further define

this potential problem. Additionally, the LEPC can be approached to dedicate funding to accomplish this task with little impact to its operating budget.

Action #5: Review and modify evacuation and sheltering plans based on the results of drills and exercises or procedures implemented in an actual incident.

Status: Ongoing

Primary Responsible Entities: Town of Charleston, Charleston Fire Chief, NVDA, LEPC and ARC

Timeframe: January 2015-April 2020

Funding Requirements and Sources: Implementation through existing programs, contingent on available resources and funding. ARC resources come at no cost and opportunities exist for work in this category to be completed with EMPG, LEPC and HMEP (if evacuation exercise uses chemical event as scenario) funding.

Progress: The town is currently updated their Local Emergency Operations Plan (LEOP) and is open to working with the regional LEPC and the DEMHS on trainings and/or exercises related to evacuation and notification protocol.

Specific Identified Tasks:

- 1) Evacuation and Sheltering Exercises – Conduct evacuation drills or exercises and evaluate performance.
- 2) Evacuation and Sheltering Plans – Review evacuation, sheltering, and relocation plans based on results of drills, exercises, and actual incidents.

Rationale / Cost-Benefit Review:

Town officials note that residents are resistant to evacuation. However, familiarity with evacuation and sheltering could potentially significantly reduce the loss of life and psychological and social impacts of a disaster.

Action #6: Ensure town and school emergency plans are fully coordinated.

Status: Ongoing

Primary Responsible Entities: Town of Charleston; Charleston Elementary School Principal; Charleston Fire Chief, NVDA.

Timeframe: January 2015-April 2020

Funding Requirements and Sources: Implementation through existing programs

Progress since 2005: Because the school board is a distinct entity from town government, there is an increased challenge in coordinating planning efforts. With the movement towards formalizing shelter staffing protocol with the school and adoption of the town's LEOP, an opportunity to begin discussion on this integration can begin.

Specific Identified Tasks:

- 1) Maintain Communications – Maintain good communication between school and town officials regarding plans and safety issues, so that any changes to plans are known to all parties.
- 2) Monitor Exercises – When evacuation drills and other exercises are carried out, monitor coordination between school and town officials.

Rationale / Cost-Benefit Review: Improved coordination could potentially significantly reduce the loss of life and property damage. EMPG funding to NVDA can serve this endeavor.

Action #7: Raise public awareness of hazards, hazard mitigation and disaster preparedness.

Status: Ongoing

Lead Responsible Entities: Town of Charleston; Charleston Fire Chief, LEPC, NVDA.

Timeframe: January 2015 – April 2020

Progress since 2005: The Volunteer Fire Department annually conducts fire preparedness programs and school and family programs related to hazard awareness and disaster preparedness, including providing information at Town Meeting. The LEPC meets regularly and covers a host of topics related to emergency preparedness and raises awareness in the community about what organizations are doing around emergency response planning and chemical safety. Town meeting day can serve as an annual update and outreach opportunity as well.

Specific Identified Tasks:

- 1) School Programs – Continue school programs to raise student awareness of hazards, safety, preparedness and prevention.
- 2) Family Programs – Continue family programs, such as car safety seat and bike safety programs, to raise family awareness of hazards, safety, preparedness and prevention.
- 3) Fire Prevention Programs – Continue National Fire Prevention Week and other programs to raise public awareness of fire hazards, safety, preparedness and prevention.
- 4) Other hazard awareness programs – Develop public awareness programs, based on all-hazards needs. Programs to address pandemic hazards, preparedness and mitigation may be appropriate as directed by the state department of health and its jurisdictional offices of local health.

Rationale / Cost-Benefit Review: Improved awareness could potentially significantly reduce the loss of life and property damage. Improved awareness would also build understanding and public support for municipal mitigation actions to reduce potential infrastructure and liability costs.

5.4.3 Prioritization of Mitigation Strategies

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, most proposed FEMA mitigation projects will undergo a benefit-cost analysis using a FEMA BCA template and approved methodology.

Table 5-2 Charleston action evaluation and prioritization matrix

Rank	Mitigation Action	Responds to high hazard	Funding potential	Protection value	Time to implement	Social and Political acceptance	Technical feasibility	Admin feasibility	Benefit to Cost	Environmental advantage	TOTAL
3	Evaluate capabilities of existing road and storm water management infrastructure. Continue and improve highway, culvert and bridge maintenance programs.	5	4	5	2	5	3	3	4	4	35
2	Maintain and improve capabilities of existing and potential public shelters.	2	5	5	4	5	5	4	5	2	37
6	Work to enhance response times of emergency medical services in areas of town where there is a known deficit.	3	3	4	1	3	3	2	3	1	23
5	Review and modify evacuation and sheltering plans based on the results of drills and exercises or procedures implemented in an actual incident	3	4	5	2	5	3	3	5	1	27
4	Ensure town and school emergency plans are fully coordinated	3	5	4	4	5	4	3	5	1	34
1	Raise public awareness of hazards, hazard mitigation and disaster preparedness	4	5	5	5	5	5	5	5	1	40
7	Complete fluvial geomorphology (in coordination with state recommendations and protocol) assessment and develop strategies in response to any identified risk	1	2	2	2	2	1	1	1	3	15

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

5.5 Implementation and Monitoring of Mitigation Strategies

The following table is intended to aid municipal officials in implementing the mitigation actions for Charleston, and to facilitate the annual monitoring of the plan.

Table 5-3 Charleston All-Hazards Mitigation Plan Implementation Matrix

Action	AHMP Page #	Primary Responsible Entity	Task	Brief Description	Progress
Complete fluvial geomorphology assessment and develop strategies in response to identified risk.	25	NVDA, VT ANR	Fluvial Geomorphic Assessments	Conduct Phase I and Phase II fluvial geomorphic assessments on streams and waterways in Charleston.	
	25	NVDA, VT ANR	Fluvial Erosion Hazard Mapping	Rate the fluvial erosion hazard for each assessed reach and develop a fluvial erosion hazard map for the waterway using SGAT. Create map of all assessed reaches. Submit to VT ANR for QA/QC.	
	25	TBD, determined by funding.	River Corridor Management Plans	Where Phase I and II assessments are complete, develop a River Corridor Management Plan.	
	25	Charleston Planning Commission	Fluvial Erosion Hazard Mitigation Implementation	Develop strategies to mitigate losses from identified fluvial erosion hazards.	
	26	Charleston Planning Commission	Flood Insurance Rating Map Updates	Review draft FIRM data. Update floodplain regulations/zoning.	
Evaluate capabilities of existing road and storm water management infrastructure. Continue and improve highway, culvert and bridge maintenance programs.	27	Road Foreman	Infrastructure Assessment for Stormwater Vulnerability	Assess the vulnerability and operational capability of municipal roads, culverts and storm water infrastructure.	
	27	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.	
	27	Road Foreman	Culvert Upgrades	Upgrade culverts and ditching along roads to mitigate against repeated damages from stormwater or spring snowmelt.	

Action	AHMP Page #	Primary Responsible Entity	Task	Brief Description	Progress
continued	27	Road Foreman	Continued Monitoring of Vulnerable Infrastructure	Monitor bridges and culverts with erosion and scouring concerns.	
	27	Road Foreman	Road Improvements	Consider re-engineering 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.	
	27	Road Foreman	Erosion/Landslide Mitigation	Undertake erosion or landslide mitigation projects where roads regularly incur damage from adjacent rivers/streams and hillsides.	
Maintain and improve capabilities of existing and potential public shelters	28	Emergency Management Director	Maintain and Improve Existing Shelter Capability	Maintain and improve on capabilities of existing emergency shelter capability, including emergency generator.	
	28	Emergency Management Director	Investigate Alternate Shelters	Investigate capabilities of other buildings sufficient to serve as smaller shelters.	
Work to enhance response times of emergency medical services in areas of town where there is a known deficit	29	Charleston Planning Commission	Organize working Group to gather data and define problem	What are response times in area Of question and are the above Acceptable limit. What data can VT EMS provide?	
	29	NVDA	Assist with information Gathering	Communicate with State EMS to get the problem understood better	

Action	AHMP Page #	Primary Responsible Entity	Task	Brief Description	Progress
Review and modify evacuation and sheltering plans based on the results of drills and exercises or procedures implemented in an actual incident	30	Emergency Management Director, Charleston Fire Chief	Evacuation and Sheltering Exercises	Conduct evacuation drills or exercises and evaluate performance.	
	30	Emergency Management Director, Charleston Fire Chief	Evacuation and Sheltering Plans	Review evacuation, sheltering, and relocation plans based on results of drills, exercises, and actual incidents.	
Ensure town and school emergency plans are fully coordinated	30	Emergency Management Director, School Principal, Charleston Fire Chief	Maintain Communications	Maintain good communication between school and town officials regarding plans and safety issues, so that any changes are known to all parties.	
	30	Emergency Management Director, School Principal, Charleston Fire Chief	Monitor Exercises	When evacuation drills and other exercises are carried out, monitor coordination between school and town officials.	
Raise public awareness of hazards, hazard mitigation and disaster preparedness.	31	Emergency Management Director; Charleston Fire Chief	School Programs	Continue school programs to raise student awareness of hazards, safety, preparedness and prevention.	
	31	Emergency Management Director; Charleston Fire Chief	Family Programs	Continue family programs, such as car safety seat and bike safety programs, to raise family awareness of hazards, safety, preparedness and prevention.	
	31	Emergency Management Director; Charleston Fire Chief	Fire Prevention Programs	Continue National Fire Prevention Week and other programs to raise public awareness of fire hazards, safety, preparedness and prevention.	
	31	Emergency Management Director; Charleston Fire Chief	Other hazard awareness programs	Develop public awareness programs, based on all-hazards needs.	

Appendix A: Charleston Base Map

Note: FEMA has not produced digital flood data for Charleston. Charleston has not been enrolled in the Flood Insurance program, so their maps are the old 11"X 17" which are not included in this plan.



