

# Chesterfield Hazard Mitigation Plan Update 2021



## Chesterfield, New Hampshire

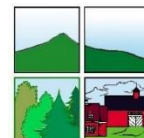
**FEMA (date)**

**Prepared by the:**

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## **Executive Summary**

The Chesterfield Hazard Mitigation Plan serves as a means to reduce future losses from natural, technological, and human-caused hazard events before they occur. The Plan was developed by the Chesterfield Hazard Mitigation Work Group.

### **Potential hazards are addressed as follows:**

- Inland Flooding
- Drought
- Earthquake
- Extreme Temperatures
- High Wind, Downburst, Tornado
- Infectious Disease
- Landslide
- Lightning
- Severe Winter Weather
- Solar Storms and Space Weather
- Tropical Storm/Hurricane
- Wildfire
- Dam Failure
- Known & Emerging Contaminants
- Hazardous Materials
- Long-term Utility Outage
- Cyber Event
- Terrorism/Violence
- Transport Accident

**The Chesterfield Hazard Mitigation Work Group identified “Critical Facilities” and “Areas at Risk” as follows:**

### **Critical Facilities**

- Town Hall
- Elementary School
- Fire Station(s)
- Town Garage
- Cell towers
- Fuel storage facilities
- Town Offices/Police Station
- Transfer Station
- Dry hydrants
- Evacuation routes
- Bridges on evacuation routes

### **Areas/Populations at Risk**

- All churches in Town
- Recreational facilities
- Daycare Centers
- Large employers
- Special needs populations

**The Chesterfield Hazard Mitigation Work Group identified existing hazard mitigation programs as follows:**

- Town Warning System
- Local Road Design Standards
- Local Road Maintenance Program
- Local Bridge Maintenance Program
- Code Enforcement Officer
- Health Officer
- Town Adopted Building Codes
- Town Radio System
- Tree Maintenance Plan
- Town Master Plan
- Capital Improvements Plan
- Mutual Aid
- Erosion and Sedimentation Plan
- Best Management Practices
- Emergency Backup Power
- Shoreland Water Quality Protection Program
- Winter Operations Guidelines
- Spill Prevention and Counter Measures Plan
- Floodplain Zoning Ordinance
- Fire Pond Management Plan
- Phone Notification System
- Local Emergency Operations Plan
- School Evacuation Plan
- River Stewardship

**The Chesterfield Hazard Mitigation Work Group prioritized newly identified hazard mitigation strategies as follows:**

- Include a link of the NH HSEM and/or FEMA website on the Town website.
- Improve public awareness of the NFIP.
- Consider adding surge protectors and other grounding equipment on public & historic buildings and other critical infrastructure.
- Investigate stockpiling materials to handle a wide-spread infectious disease event.
- Notify NH DOT of problem culverts on NH 9A and on NH 63.
- Consider additional locations for a heating, cooling, and charging center.
- Update Town website to include information to the public on ways to mitigate and prepare for severe weather conditions.
- Inspect dams for debris prior to heavy storm events.
- Consider locations for distribution of water and other supplies.
- Update locations for emergency shelters.
- Update the Emergency Operations Plan every 5 years. Apply for a grant in 2021.
- Increase public education and information on emergency communication, preparedness, evacuation, and public notification.
- Include this Plan as an appendix of the Chesterfield Master Plan.
- Install fire warning signs at trailheads.
- Continue to implement the fire pond/dry hydrant management plan to provide increased access to and upkeep of water sources for fire protection. Create additional fire ponds where needed.
- Provide emergency and mitigation training for fire, police, and highway department members.
- Continue mutual aid pacts with surrounding communities.
- Investigate potential locations for the housing of pets during an emergency event.
- Investigate options and implement, as appropriate, cyber security measures.
- Provide training for town employees, Selectmen and Planning Board and Zoning Board members on the NFIP.
- Increase awareness of solar storms and space weather events.
- Obtain a copy of the Emergency Plans for Camp Spofford and Roads End Farm. Encourage the creation of emergency plans if not available.
- Build a retaining wall on Streeter Hill Road and replace the culvert.
- Establish a relationship with the Regional Public Health Representative.
- Replace and upsize culvert on Pond Brook Road.
- Replace and upsize culvert on Gulf Road.
- Replace and upsize culvert on Old Ferry Road.
- Update the Chesterfield Capital Improvements Plan annually and include projects that will help to reduce the impact of natural, technological, and human-caused hazards.
- Provide outreach material on the proper disposal of hazardous household materials and medicines. Share materials with Spofford Lake Association.
- Determine the locations that need emergency generators, and work to obtain and install them.
- Seek ways to obtain unlisted and cell phone numbers for emergency notifications.
- Provide education of BMPs and E&S Control Plans for construction and maintenance work throughout the town as needed.
- Consider adding a steep slope ordinance to reduce property loss.

# Chapter 1

## Introduction

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### Methodology and Public Involvement

#### **Purpose**

The Chesterfield Hazard Mitigation Plan Update 2016 is a planning tool to be used by the Town of Chesterfield, as well as other local, state and federal governments, in their efforts to reduce the effects from natural and man-made hazards. By maintaining an updated Hazard Mitigation Plan, the town is eligible to receive grant funding for mitigation projects.

#### **Authority**

This Multi-Hazard Mitigation Plan was prepared pursuant to Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Act), herein enacted by Section 104 of the Disaster Mitigation Act of 2000 (DMA) (P.L. 106-390). This Act provides new and revitalized approaches to mitigation planning. Section 322 of DMA 2000 emphasizes the need for State, local and tribal entities to closely coordinate mitigation planning and implementation efforts. The development and periodic update of this plan satisfies the planning requirements of the Disaster Mitigation Act (DMA) of 2000 which amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act).

#### **Funding Source**

This Plan was funded by the NH Homeland Security and Emergency Management, with grants from FEMA's Pre-disaster Mitigation Program.

#### **Scope of the Plan**

The scope of this Plan includes the identification of natural hazards affecting the Town of Chesterfield, as identified by the Hazard Mitigation Work Group. The hazards were reviewed under the following categories as outlined in the 2018 State Hazard Mitigation Plan:

Natural Hazards: avalanche, flood, drought, earthquake, extreme temperatures, high wind events, infectious disease, landslide, lightning, severe winter weather, solar storm and space weather, tropical storm/hurricane, and wildfire.

Technological Hazards: aging infrastructure, conflagration, dam failure, known & emerging contaminants, hazardous materials, long-term utility outage, radiological.

Human Caused Hazards: cyber event, mass casualty incident, terrorism/violence, transport accident.

After careful review of the historical natural disasters in and near the Town of Chesterfield, the work group determined that the risk of avalanche, coastal flooding, earthquake, landslide, aging infrastructure, conflagration, radiological, and mass casualty incident do not pose enough of a risk to the Town of Chesterfield to include in this plan.

## **Methodology**

Using FEMA's Local Multi-Hazard Mitigation Planning Guidance, the Chesterfield Hazard Mitigation Work Group developed the content of the Chesterfield Hazard Mitigation Plan by following the tasks set forth in the handbook.

Tasks to complete the Plan Update:

**Task 1: Determine the Planning Area & Resources:** This task was conducted by Town staff and the Regional Planning Commission. The results of this research were shared with the Work Group and can be found in Chapter 2, Community Profile.

**Task 2: Building the Planning Team:** The Emergency Management Director contacted Town officials, department heads, and residents who might wish to volunteer their time and serve on a Work Group.

**Task 3: Create an Outreach Program:** This task was used throughout the plan and is a vital part of the plan's success. Many of the proposed actions involve a community outreach component for individuals to use as a means to reduce the risk of loss of life and property from future natural and man-made hazards.

**Task 4: Review Community Capabilities:** The Work Group brainstormed on the type of hazards and locations that have sustained or could be susceptible to each hazard within the Town. The results are shown in the Hazards Map, which can be found at the end of the Plan.

The Work Group then identified and catalogued all of the critical facilities within the Town. The result is found in Chapter 5, Critical Facilities, with a location map at the end of the Plan.

**Task 5: Conduct a Risk Assessment:** A risk assessment was conducted during the first Work Group meeting and is located in Chapter 3, Assessing Probability, Severity, and Risk.

**Task 6: Develop a Mitigation Strategy:** The Work Group identified plans and policies that are already in place to reduce the effects of man-made and natural hazards. Then the Work Group evaluated the effectiveness of the existing measures to identify where they can be improved. The results are found in Chapter 7, Mitigation Strategies. The Work Group then developed the Mitigation Action Plan (Chapter 8), which is a clear strategy that outlines who is responsible for implementing each project, when will the action be started, and what is the funding source.

**Task 7: Keep the Plan Current:** It is important to the Town of Chesterfield that this plan be monitored and updated annually or after a presidentially declared disaster. Chapter 9 addresses this issue.

**Task 8: Review & Adopt the Plan:** The Work Group members reviewed and approved each section of the plan as it was completed. After acceptance by the Work Group, the Plan was submitted to the New Hampshire Homeland Security and Emergency Management for review. At a public meeting, the Board of Selectmen formally adopted the plan on (add date). The plan was then granted formal approval by FEMA on (add date).

**Task 9: Create a Safe & Resilient Community:** The Work Group discussed the mitigation actions in the Action Plan and the ways in which the implementation of the actions will be beneficial to the community. Annual reviews of the Action Plan by the Work Group are needed to maintain the timeframes identified for completion of activities. Incorporation of the plan into other land use plans and the Capital Improvement Plan help to ensure that the goals of the plan are met. Implementation of the actions prior to a hazardous

event can be funded through a variety of resources found at the end of this plan in Appendix C and D.

A final draft of this Plan was made available to the Work Group and the public for review and comment. The document was also provided to the NH Homeland Security and Emergency Management for their review and comment.

The following are dates of Work Group meetings and sub-Work Group meetings.

### **Public Meetings**

**March 25, 2021, 9:00 - 10:30 a.m.:** Working Group meeting held remotely via Zoom.

**April 22, 2021, 9:00 - 10:30 a.m.:** Working Group meeting held remotely via Zoom.

**May 13, 2021, 9:00 - 10:30 a.m.:** Working Group meeting held remotely via Zoom.

**June 3, 2021, 9:00 - 10:30 a.m.:** Working Group meeting held remotely via Zoom.

**June 26, 2021, 9:00 - 10:30 a.m.:** Working Group meeting held remotely via Zoom.

The Board of Selectmen adopted the Local Hazard Mitigation Plan at a public hearing held at Chesterfield Town Offices on (add date). A copy of the public hearing notice can be found in Appendix E. Prior to this public hearing, the draft plan was made available to the public at the Chesterfield Offices and on the Town website. All comments were addressed before the final adoption.

### **Public Participation**

An article was printed in the Southwest Region Planning Commission Newsletter prior to the first meeting to inform the members of the community as well as surrounding communities and other interested stakeholders in participating in this plan update. Copies of the newsletter were sent to the 34 towns within the region, the Cheshire County Office, businesses, and other interested parties. It is also available on the Southwest Region Planning Commission website. In addition to the SWRPC newsletter and website, an email of the SWRPC Happenings was sent to approximately 430 addresses, including neighboring communities, county, businesses, and academia. The email contains notices of public meetings and events. A copy of this mailing is included in Appendix E.

A copy of the draft plan was made available for public review and input at the Town Office from (add dates). In addition, the draft plan was also available for public viewing on the Town website to reach a broad range of interested parties. The notice for the public viewing period was posted at the Town Office and on the Town website in accordance with RSA 91A and a copy is in Appendix E. All comments from the public were included in the plan. Three members of the public were members of the Chesterfield Hazard Mitigation Work Group and provided input during the Work Group meetings.

### **Resource List for the Hazard Mitigation Work Group**

Chesterfield's Emergency Management Director (EMD), or designee, reviewed and coordinated with the following agencies in order to determine if any conflicts existed or if there were any potential areas for cooperation. Training support has been offered by some of those on this resource list.

New Hampshire Homeland Security and Emergency Management:	1-800-852-3792
110 Smokey Bear Boulevard	
Concord, NH 03305	
Field Representative: Elizabeth Gilboy	(603) 223-3668
Mitigation Planner: Kayla Henderson	(603) 223-3650
Mitigation Officer: Brian Eaton	(603) 227-8427



New Hampshire Department of Transportation:  
John Kallfelz (District 4), Swanzey, NH 352-2302

Eversource Utilities:  
Laurel Boivin, Keene, NH 357-7309 Ext. 5115  
1-800-662-7764

Chesterfield Town Office:  
Alissa Thompson, Town Administrator 363-4624 Ext. 13

Chesterfield School/District Principals:

Sharyn D'Eon  
Chesterfield Elementary School (K-8), 535 Old Chesterfield Road, Chesterfield, NH 363-8301

Cindy Gallagher  
Keene High School, Arch Street, Keene, NH 352-0640

### **Plan Updates**

During the planning process, the Work Group reviewed relevant portions of the previous hazard mitigation plan and updated those portions accordingly. Unchanged sections were incorporated into the plan while other sections were amended to reflect changes. Particular attention was given to the previous mitigation strategies that have been completed and to give a status update on those that remain on the list. The 10 step process was followed during the meetings. The previous plan was used as a base to begin the update. Amendments were made in each chapter to reflect changes that have occurred during the five year period. Included in the changes were:

Ch. 1 Introduction - updated Methodology, Acknowledgements, etc., and added Plan Updates;  
Ch. 2 Community Profile - NFIP policies updated, added Continued Compliance with NFIP;  
Ch. 3 Assessing Probability, Severity, and Risk - updated the risk assessment;  
Ch. 4 Past and Potential Hazards - updated hazards and their location, added risk assessment information;  
Ch. 5 Critical Facilities - updated locations;  
Ch. 6 Existing Mitigation Strategies and Proposed Improvements - updated chart and other data,  
updated chart for Status of Previous Mitigation Action Items;  
Ch. 7 Mitigation Strategies - updated the STAPLEE chart;  
Ch. 8 Prioritized Implementation Schedule - updated the Action Plan;  
Ch. 9 Adoption, Implementation, Monitoring and Updates - Adoption certificate, updated information;  
Appendices - added agendas, resources, updated information.

This update was prepared with assistance from planners at Southwest Region Planning Commission trained in Hazard Mitigation Planning. Data and maps used to prepare this plan are available at their office and should be used in preparing future updates.

**FEMA Final Approval:** (add date)

## **Acknowledgements**

The Chesterfield Board of Selectmen extends special thanks to the Chesterfield Hazard Mitigation Work Group as follows:

John Zannotti, *Chesterfield Emergency Management Director (EMD)*  
Jim Barey, *Chesterfield Office Manager*  
Michael Bomba, *Chesterfield Police Lieutenant*  
Mike Chamberlain, *Chesterfield Citizen*  
Duane Chickering, *Chesterfield Police Chief*  
Rick Cooper, *Chesterfield Fire Chief*  
Sharon D'Eon, *Chesterfield School Principal*  
Steve Dumont, *Spofford Fire Chief*  
Alissa Fox, *Chesterfield Town Administrator*  
Hazel Hunter, *Chesterfield Resident*  
John Keppler, *Chesterfield Assistant Emergency Management Director*  
Chris Lord, *Chesterfield Director of Public Works*  
Cheryl Maibusch, *Chesterfield Resident*  
Fran Shippee, *Chesterfield Board of Selectmen*  
Gary Winn, *Chesterfield Board of Selectmen*

The Chesterfield Board of Selectmen offers thanks to the New Hampshire Homeland Security and Emergency Management for developing the State of New Hampshire Multi-Hazard Mitigation Plan Update 2018 (<http://www.nh.gov/safety/divisions/hsem/HazardMitigation/documents/hazard-mitigation-plan.pdf>) which served as a model for this plan. In addition, special thanks are extended to the staff of the Southwest Region Planning Commission for professional services, process facilitation and preparation of this document.

## **Hazard Mitigation Goals**

The Chesterfield Hazard Mitigation Work Group reviewed the goals set forth in the New Hampshire Hazard Mitigation Plan Update - 2018. The work group generally concurs with those goals and has amended them to better meet the goals of the Town.

The overall Goals of the Town of Chesterfield with respect to hazard mitigation are stipulated here:

1. To improve upon the protection of the general population, the citizens of the Town of Chesterfield and guests, from all natural, technological and human-caused hazards.
2. To reduce the potential impact of natural, technological and human-caused hazards on the Town of Chesterfield's emergency response services, critical facilities and infrastructure.
3. To reduce the potential impact of natural, technological and human-caused disasters on the Town of Chesterfield's economy, natural resources, historic/cultural treasures, and private property.
4. To improve the Town of Chesterfield's Emergency Preparedness and Disaster Response and Recovery Capability.
5. To reduce the Town of Chesterfield's risk with respect to natural, technological and human-caused hazards through outreach and education.
6. To identify, introduce and implement cost-effective hazard mitigation measures so as to accomplish the Town's goals and objectives, and to raise the awareness of and acceptance of hazard mitigation opportunities generally.
7. To address the challenges posed by climate change as they pertain to increasing risks in Chesterfield's infrastructure and natural environment.
8. To work in conjunction and cooperation with the State of New Hampshire's Hazard Mitigation Goals and with FEMA.

## Chapter 2

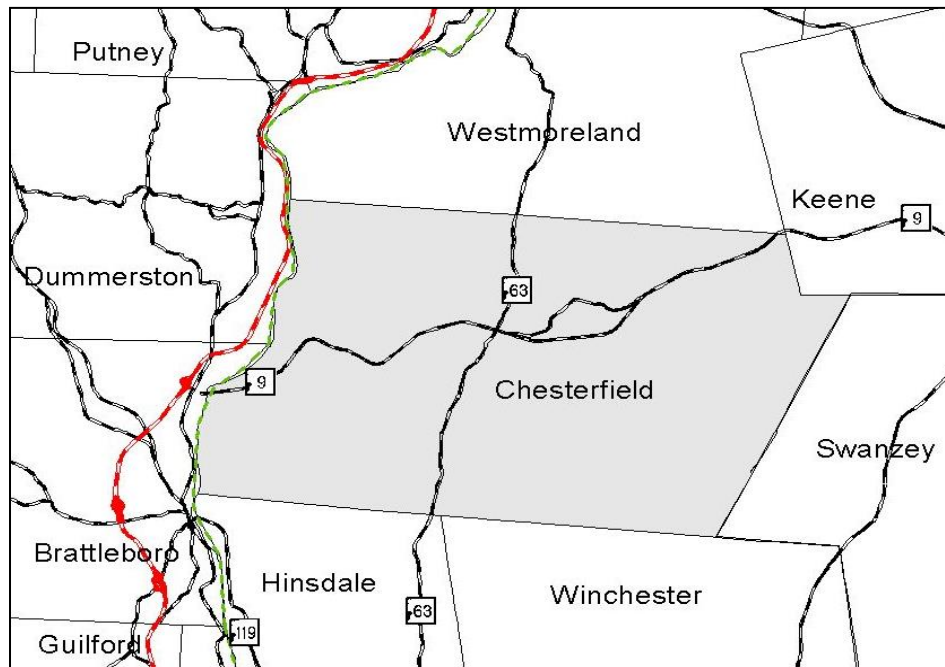
# Community Profile

### Town Overview

#### Town Overview

The Town of Chesterfield is located in the western portion of Cheshire County, in Southwest New Hampshire. Chesterfield is bounded on the north side by Westmoreland, easterly by Swanzey and Keene, southerly by Hinsdale and Winchester and westerly by the Connecticut River. According to the 2019 New Hampshire population estimates, the Town's population is 3,705 and includes the villages of Spofford and West Chesterfield.

**Location Map of Chesterfield, NH**



Source: SWRPC GIS Database

The Town of Chesterfield consists of 47.5 square miles. There are several small first order streams in the Town of Chesterfield. The vast majority of these streams drain small valleys into the Connecticut River to the west and Spofford Lake (740 acres) to the north. Additionally, Chesterfield contains three town forests, the James O'Neil Forest, Madam Sherrie Forest and Friedsam Town Forest, and Pisgah State Park, Wantastiquet State Park and Chesterfield Gorge are at least partially located in Chesterfield.

The topography of Chesterfield consists of rolling hills interrupted by narrow valleys. The higher areas vary from very stony loam to rock outcrops. Chesterfield's elevation starts at 220 feet on the Connecticut River and rises to 1,340 feet in the southwest corner of town at the Hinsdale border on Wantastiquet Mountain.

Chesterfield's climate is temperate. According to U.S. Climate Data, the average high temperature in 2020 was 31°F in January and 82.4°F in July. The annual precipitation in 2020 was 43.6 inches of rainfall and 55 inches of snowfall.

A three-member Board of Selectmen governs the Town of Chesterfield. The Town maintains a full-time Town Administrator, two volunteer/on-call Fire Chiefs, and on-call fire precincts for Chesterfield and Spofford. There is a full-time Police Chief and a Road Agent. The Cheshire Medical Center and the Dartmouth-Hitchcock Clinic are located in Keene, 12 miles east of Chesterfield; Brattleboro Hospital and Brattleboro Rescue, Inc. are located to the west in Vermont. The City of Keene responds to calls east of NH 63 while Rescue Inc. responds to calls west of NH 63.

### **Development Patterns**

Examination of the Towns' existing land use indicates that there is a considerable amount of undeveloped land, primarily of wooded and brush-covered areas, with substantial development constraints.

Residential uses comprise most of the developed land. The residential pattern consists of the developed centers of Spofford, Chesterfield Center and West Chesterfield, with more recent development occurring in the form of new subdivisions along the outlying Class V roads and the two State Roads.

Commercial development is located for the most part around the three population centers, as well as along NH 9. NH 9 is zoned for commercial uses; industrial uses, however, are allowed only by special exception upon approval by the Zoning Board of Adjustment.

### **Consideration for Development**

Several factors have played, and will continue to play, an important role in the development of Chesterfield. These include: the existing development pattern and availability of land for future development; the present road network; physical factors such as steep slopes, poor soil conditions, land set aside for conservation, the Connecticut River, its tributaries and floodplains; and the availability of utilities such as public water and sanitary sewers. These factors have an impact, both individually and cumulatively, on where and how development occurs. As the population continues to grow, new development has been outside of the flood prone areas which has helped to protect the residents from any increase in vulnerability of hazards. As the intensity of storms continues to increase though, it is important to review the existing programs and strategies, and improve upon areas that are needed.

### **Current Development Trends**

Chesterfield remains a rural community with three distinct population/village centers. There has been increased residential development outside these centers and additional commercial activity has developed along NH 9 and NH 63. Commercial activity continues to be concentrated along NH 9.

New residential growth includes a substantial amount of single-family home development. Commercial activity consists of a continuation of convenience-oriented facilities that serve day-to-day retail and personal needs of the local residents, as well as activity along NH 9 and NH 9A geared to attract and accommodate the traveling public.

It is expected that future development will begin to gravitate towards areas within close proximity to the three existing centers, since this is where the available infrastructure is located. There is also a considerable amount of landlocked area which could be developed, given the availability of new access roads and infrastructure.

According to the 2010 US Census, the number of housing units in Chesterfield was 1,802 units which was an increase of 170 units (or 10% increase) from the amount in 2000. The chart below shows the trend in the housing supply based on the number of residential building permits issued from 2010 to 2019 which represents a smaller increase of 4.5% over the 9 year period. The current number of housing units is estimated to be 1,884. This information was supplied by the NH Office of Strategic Initiatives in a report entitled New Hampshire's Housing Supply: Current Estimates and Trends, December 2020.

#### Housing Supply: Residential Building Permits Issued Between 2010 – 2019

	Total Units 2010 Census	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total Estimated Housing Units
Total Units	1,802	4	5	4	3	6	1	19	22	10	8	1,884

Source: NH Office of Planning and Development

#### Population Trends

The table below shows population in Chesterfield for 1980, 1990, 2000 and 2010 according to the US Census. There was a population increase in each of the decades, however the rate of increase has declined during this time period.

#### Population 1980 - 2010

	1980	1990	2000	2010	2019 est.
Population	2651	3112	3542	3604	3,705
% Change	---	21%	13.8%	1.8%	2.8%

Source: U.S. Census

#### Population Projections

Population projections are an important component in planning for the future. Projections are beneficial to help communities begin to plan and budget for Capital Improvement Projects. Since population projections are based on a set of assumptions, changes can be significant if the assumptions used in the calculations are not met. For example, a tropical storm that destroys a large employer or causes infrastructure damages to that facility, can cause a significant economic hardship to the business that may ultimately result in its closure and loss of jobs. This can then result in an outward migration of residents from the community. Therefore, population projections should only be used as a basis to begin planning for the future.

The New Hampshire Office of Planning and Development (NH OPD) prepares population projections for each community in New Hampshire. The projections for Chesterfield are presented below in five-year intervals up to the year 2040, beginning with the population estimate from the year 2015. Using these projections, Chesterfield is expected to experience little or no growth over the next 25 years.

#### Population Projections

	2015	2020	2025	2030	2035	2040	# Increase 2015-2040	% Change 2015-2040
Chesterfield	3,610	3,598	3,588	3,602	3,613	3,620	10	.3%

Source: NH Office of Strategic Initiatives, September 2016

## **Development in Hazard Areas**

Hazards identified in this plan are regional risks and, as such, all new development falls into the hazard area. The exception to this is flooding. According to the Community Information System (CIS) of FEMA, there have only been 3 development permits and no variances granted within the SFHA since 1987, the earliest records kept in the CIS for the Town of Chesterfield.

The demographic trends in the previous sections indicate that Chesterfield's population and development is increasing at a slower rate than in previous decades. This provides an opportunity to plan for future events rather than react as they occur. As the population continues to grow, new development has been outside of the flood prone areas which has helped to protect the residents from any increase in vulnerability of flood hazards. As the intensity of storms continues to increase though, it is important to review the existing programs and strategies, and improve upon areas that are needed. The plan was revised with this in mind and strategies were considered during the Work Group meetings.

## **National Flood Insurance Program (NFIP)**

Chesterfield is a participating member of the National Flood Insurance Program. Chesterfield joined the NFIP on April 2, 1986. Flood Insurance Rate Maps, all bearing the effective date of May 23, 2006, are used for flood insurance purposes and are on file with the Chesterfield Planning Board. The most recent flood insurance study was done on May 23, 2006. There are approximately 28 residential structures located in the FEMA designated Special Flood Hazard Areas (SFHA's), and 12 NFIP Policies totaling \$2,595,700. There are currently no "Repetitive Loss Properties" insured under the NFIP within the Town of Chesterfield.

Per 44 CFR 201.6(c)(3)(ii) of the Federal Register, the Hazard Mitigation Planning Work Group did review the requirements that the Mitigation Strategy must address the jurisdiction's participation in the NFIP. As noted the Town of Chesterfield already is a member of the NFIP. Actions related to continued compliance with the NFIP have been included within the Action Plan.

## **Continued Compliance with NFIP Requirements**

The Town of Chesterfield acknowledges the importance of maintaining requirements set forth in the National Flood Insurance Program. As such, the Town took steps related to continued compliance with the program that will help to reduce or eliminate the potential for loss of life and property due to flooding. The following actions have been taken since the last Hazard Mitigation Plan:

- monitored beaver population;
- maintained and replaced culverts;
- continued enforcement of the Floodplain Development Ordinance;
- continued enforcement of the Building and Zoning Ordinances.

## Chapter 3

# Assessing Probability, Severity, and Risk

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### Method for Rating Potential Hazardous Impacts

The Chesterfield Work Group members completed a risk assessment of the types of hazards that could occur in Town. The *Severity* was calculated by determining the average of the human, property and business impacts. *Risk* was calculated by multiplying severity by probability. *Low*, *Medium* and *High* risk was assigned as shown below. **Appendix B** provides explanations for the risk assessment measures.

#### Method used for rating impacts, probability of occurrences and overall risk

Impacts: The *Impact* is an estimate generally based on a hazard's effects on humans, property and businesses.

##### Impact Scoring

- 1 - Inconvenience, reduced service/productivity, minor damages, non-life-threatening injuries.
- 3 - Moderate to major damages, temporary closure and reduced service/productivity, numerous injuries, and deaths.
- 6 - Devastation and significant injuries and deaths, permanent closure and/or relocation of services, long-term effects.

Probability of Occurrence: The *Probability of Occurrence* is a numeric value that represents the likelihood that the given hazard will occur within the next 10 years.

##### Probability Scoring

- 1 - 33% probability of occurring within 10 years (Low)
- 3 - 34-66% probability of occurring within 10 years (Medium)
- 6 - 67-100% probability of occurring within 10 years (High)

Severity: Severity is calculated by taking the average of the vulnerability for human, business and property impacts of each hazard type.

Risk: Risk is an adjective description (High, Medium, or Low) of the overall threat posed by a hazard over the next 10 years. It is calculated by multiplying the probability of occurrence and severity.

Overall Risk: The *Overall Risk* is a representation of the combined *potential impact* and *probability of occurrence* ratings. This is calculated by multiplying the probability of occurrence rating score by the impact rating score (the average of human, property and business impacts). The goal of identifying the overall risk of each identified hazard is to assist the Town in determining which hazards pose the largest potential threat. The overall risk ratings are broken down and color coded into the following categories:

White: values 1 - 6, Low Risk

Yellow: values 7 - 12, Medium Risk

Red: values 13 +, High Risk



**Risk Assessment Matrix**

Threat/Hazard		Classification	Human Impact	Property Impact	Economic/ Business Impact	Average Impact Score	Probability of Occurrence	Overall Risk
Natural Hazards	Avalanches	Low	3	3	1	2.3	1	2
	Coastal Flooding	N/A	0	0	0	0	0	0
	Inland Flooding	High	3	3	1	2.3	6	14
	Drought	Medium	1	3	3	1.7	6	10
	Earthquakes	Low	1	1	1	1	6	6
	Extreme Temperatures	Medium	3	1	1	1.7	6	10
	High Wind Events	High	3	3	3	3	6	18
	Infectious Disease	High	3	1	3	2.3	6	14
	Landslide	Low	1	1	1	1	3	3
	Lightning	High	3	3	1	2.3	6	14
	Severe Winter Weather	High	3	1	3	2.3	6	14
	Solar Storms & Space Weather	Medium	3	1	5	3	4	12
	Tropical Storm & Hurricane	High	3	3	3	3	6	18
	Wildfire	Medium	3	3	1	2.3	3	7
Technological Hazards	Aging Infrastructure	Low	3	3	3	3	1	3
	Conflagration	Low	3	3	3	3	1	3
	Dam Failure	Medium	6	3	3	4	3	12
	Known & Emerging Contaminants	High	3	3	3	3	6	18
	Hazardous Materials	Medium	3	3	3	3	3	9
	Long-term Utility Outage	High	3	3	1	2.3	6	14
	Radiological	Low	3	1	1	1.7	3	5
Human-caused Hazards	Cyber Event	High	3	1	5	3	6	18
	Mass Casualty Incident	Low	3	3	1	2.3	1	2
	Terrorism/Violence	High	3	1	3	2.3	6	14
	Transport Accident	Medium	3	1	1	1.7	6	10

## Chapter 4

# Past and Potential Hazards

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### Hazard Identification and Assessment

The Chesterfield Hazard Mitigation Work Group looked at the type of hazards that could occur within Town. These hazards were identified by using the New Hampshire Hazard Mitigation Plan (2018), the Federal Emergency Management Agency website, the previous Chesterfield Hazard Mitigation Plan, and the Chesterfield Hazard Risk Assessment. From this list, the work group developed a summary for each hazard type to provide information on past and potential events, risk and impact. In some instances, specific locations of hazard events that have occurred within the past five years have been recorded.

This information in this chapter is only given for the natural hazards identified within this plan. The work group also identified the following technological hazards and human-caused hazards that have occurred in Town or have the potential to occur: dam failure, known and emerging contaminants, long-term utility outage, cyber event, terrorism/violence, and transport accident. Some of the natural hazards listed in the NH Hazard Mitigation Plan (2018) ranked low in the Chesterfield Hazard Risk Assessment (Chapter 3) and are not included in this chapter. The low-risk natural hazards include: avalanche, coastal flooding, earthquakes, and landslides. The Work Group decided to focus on the medium and high-risk natural hazards and also included dam failure. These include inland flooding, drought, extreme temperature, high wind events, infectious disease, lightning, severe winter weather, solar storms and space weather, tropical storms, wildfire, and dam failure.

Existing and future structures have the potential of being affected by some of the hazards identified in this Plan. Some hazards identified in this plan are regional or town-wide risks and, as such, all structures, infrastructure and critical facilities fall into the hazard area. As the population continues to grow, new development has been outside of the flood prone areas which has helped to protect the residents from any increase in vulnerability of hazards. However, as the intensity of storms continues to increase, it is important to review the existing programs and strategies, and improve upon areas that are needed.

#### **Flooding**

Risk: High

Impact: Low

Future Probability: High

Floods are defined as a temporary overflow of water onto lands that are not normally covered by water. Flooding results from the overflow of major rivers and tributaries, storm surges, and/or inadequate local drainage. Floods can cause loss of life, property damage, crop/livestock damage, and water supply contamination. Floods can also disrupt travel routes on roads and bridges. Inland floods are most likely to occur in the spring due to the increase in rainfall and melting of snow; however, floods can occur at any time of the year. A sudden thaw in the winter or a major downpour in the summer can cause flooding because there is suddenly a lot of water in one place with nowhere to go.

Floodplains are usually located in lowlands near rivers, and flood on a regular basis. The term 100-year flood does not mean that flood will occur once every 100 years. It is a statement of probability that scientists and engineers use to describe how one flood compares to others that are likely to occur. It is more accurate to use the phrase “1% annual chance flood”. What this means is that there is a 1% chance of a flood of that size happening in any year.

Past Events from 2015 to present:

- July 1-2, 2017: There was a FEMA Disaster Declaration #4329 for Grafton County. Heavy rains occurred, but Chesterfield had little to no impact. There was some localized flooding on Swanzy Rd, but no structural damages, injuries, or death were reported due to this event.
- October 29, 2017 to November 1, 2017: Heavy rains occurred, but no local impact to Town services and no structural damages, injuries, or death were reported due to this event.
- March 2, 2018: Heavy rains occurred, but no local impact to Town services and no structural damages, injuries, or death were reported due to this event.
- July 16-18, 2021: Heavy rains occurred with more than 4". The following locations were impacted by the heavy rain:
  - Edgar Road - a culvert was washed out
  - Welcome Hill Road - the ditch line washed out
  - Old Chesterfield Road - the ditch line washed out

Potential Occurrences: Low lying areas have the potential for flooding during heavy rain events and during snowmelt.

Potential Impact:

- There is a potential for injuries and loss of life, structural damage and interruption of services.
- There is potential for flooding of roads and for damage/repair to the road surface due to accumulation of heavy rain and runoff which could cause a delay in the response time of emergency services.

**Drought**

Risk: Medium

Impact: Low

Future Probability: High

Droughts are a natural hazard that impacts the entire Town. A greater emphasis is placed on responding to these hazards rather than mitigating for them. Outreach and education on methods of dealing with drought are important. Below is the Intensity Scale that is used with the Palmer Drought Severity Index to describe the observed impact with each category.

Category	Intensity	Impact
D0	Abnormally Dry	Crop growth is stunted; fire danger is elevated; lawns brown and gardens wilt; surface water levels are lower.
D1	Moderate Drought	Wildfires and brush fires increase; increased use of irrigation for crops; hay and grain yields are lower; honey production declines; trees and fish are stressed making them susceptible to disease; water conservation is recommended.
D2	Severe Drought	Water quality and quantity declines; irrigation ponds are dry and hay crops are impacted causing economic hardship to farms; crop yields and size of fruit are reduced; outdoor burning is limited; air quality is poor; impact on the health of trees and wildlife is observed.
D3	Extreme Drought	Crop loss, farms are stressed and are experiencing a financial impact; extremely reduced flow or ceased flow of water; river temperatures are warm; wildlife disease is increased; many well are dry; new and deeper wells are needed.
D4	Exceptional Drought	NH has little or no experience in D4, so no impacts have been recorded at this level.

Source: NOAA

Past Events from 2015 to present:

- Summer of 2018 - drought conditions existed throughout New Hampshire.
- Summer of 2020 - drought conditions existed throughout New Hampshire. Chesterfield farms saw a reduced crop yield and impacts on some wells. Spofford Lake had a low water level for most of the summer.

Potential Occurrences:

- This is a recurring event that impacts the entire Town. Areas that are most impacted from droughts are farms and residents with wells.

Potential Impact:

- Drought will increase the risk of wildfire, especially in areas of high recreational use and as more timberland is set aside as non-harvested timberland.
- Some private wells may run dry.
- Minimal impact to Town services.

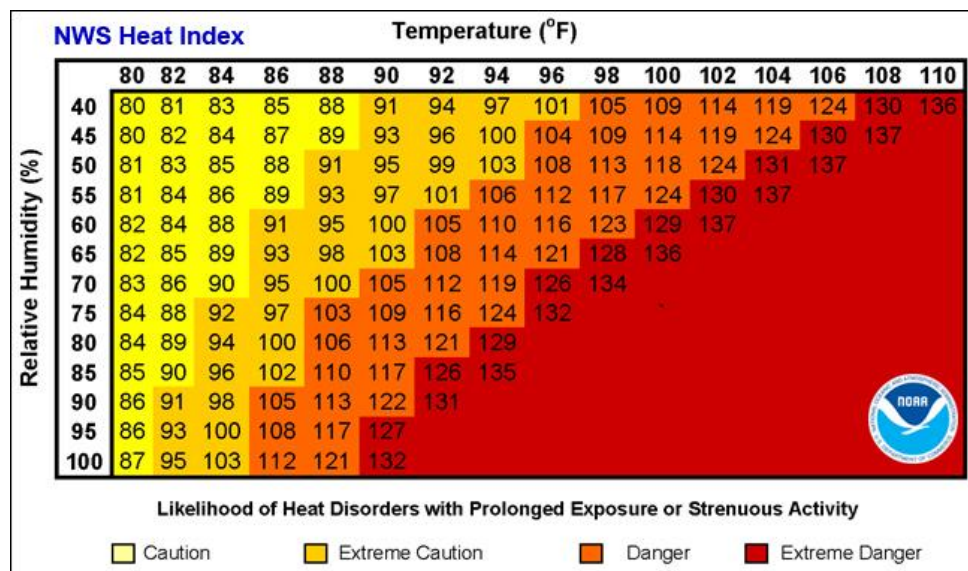
### Extreme Temperatures

Risk: Medium

Impact: Low

Future probability: High

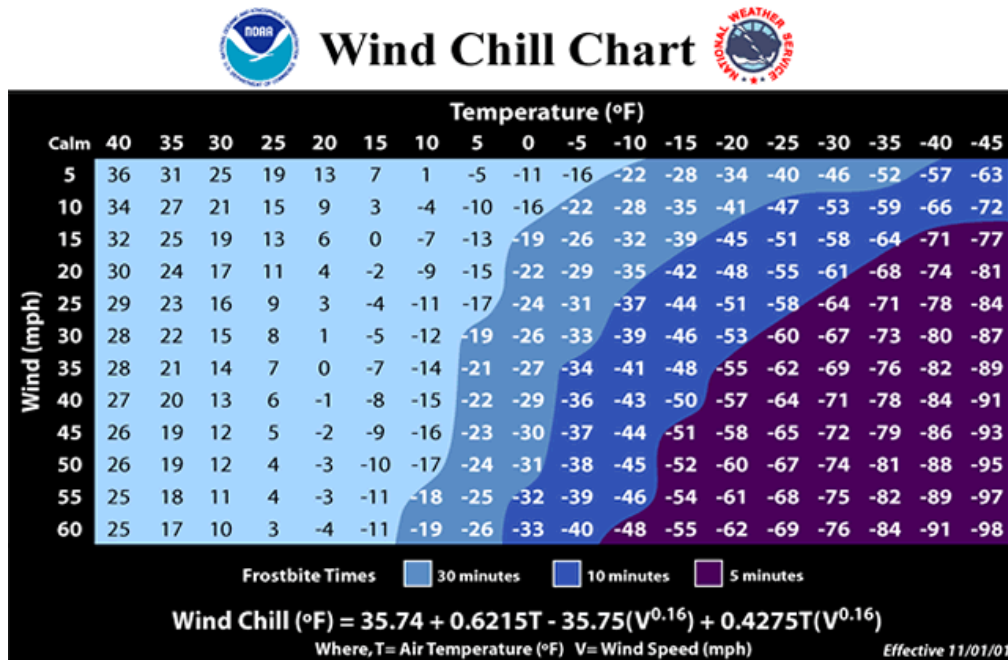
**Extreme heat** is characterized by abnormally high temperatures and/or longer than average time periods of high temperatures. Although it is an infrequent event, it usually occurs on an annual basis between late July and August and happens town wide. The severity of extreme heat can be dangerous to those residents with medical conditions and the elderly. It is important to have cooling areas and a good supply of water available. Extreme heat can add to the potential for wildfires and depletion of the water supply for firefighting. The Chesterfield Hazard Mitigation Work Group did not recall any impact to the Town services due to this hazard. They also did not recall any death, injuries or structural damage as a result of extreme heat. The NWS Heat Index is an indicator of the likeliness of heat disorders with prolonged exposure or strenuous activity, especially for those with a history of stroke and heart issues.



Source: National Weather Service

**Extreme Cold** events occur during meteorological cold waves, also known as cold snaps that are caused by the southern transport of arctic airmasses into the Northeast. These events are most common in winter months and increase the likelihood of cold disorders in humans and animals that have prolonged exposure to low ambient temperatures. Cold disorders can include frostbite and hypothermia which can eventually lead to death. Extreme cold can also damage or kill crops and animals (wild, farm, or domesticated), potentially presenting a risk to the economy.

The Wind Chill Chart below shows the impact that wind and cold temperatures can have by indicating the number of minutes until frostbite strikes.



Source: National Weather Service

Past Events from 2015 to present:

- The Work Group did not recall any impactful events of extreme heat or cold that impacted town services.

Potential Occurrences:

- This is a town-wide event; therefore, no specific locations are listed.

Potential Impact:

- There is a potential for interruption of service.
- Vulnerable populations are at greater risk.

### High Wind, Tornado, Downburst

Risk: High

Impact: Medium

Future probability: High

The Enhanced Fujita Scale is used to determine the intensity of tornadoes. Most tornadoes are in the F0 to F2 Class. Building to modern wind standards provides significant property protection from these hazard

events. New Hampshire is located within Zone 2 for Design Wind Speed for Community Shelters, which is 160 mph, and is also noted as being within a hurricane susceptible region.

Past Events (regional): The southwestern portion of the state is considered a special wind hazard area as demonstrated by the high proportion of tornadoes and severe wind events that are experienced in this region annually. On July 3, 1997 several tornadoes struck this section of the state. An F1 tornado caused severe tree loss in Swanzey, destroying a building and damaging the stables at the Cheshire Fairgrounds. Although outside the southwest region, the 2008 Barnstead Tornado caused significant damage and also involved loss of life. Therefore, this is a real hazard and the damage it could inflict should not to be taken lightly.

Locally, the Work Group noted that the frequency of severe wind events has increased over the past few years. Proactive measures to cut tree branches from roadways and near powerlines has reduced the impact to Town services and power losses.

2016 - Severe wind hit the area and caused a loss of power to about 80% of Chesterfield. Most of the homes returned to power within 24 hours.

September 2018 - Severe wind hit the Town and took down large trees and some power lines. North Shore Road was closed between 24 to 48 hours while crews repaired the powerlines and removed trees on the road.

Potential Occurrences:

- River corridors and hill tops are more susceptible.
- This is a town-wide event; therefore, no specific locations are listed.

Potential Impact:

- There is a potential for structural damage.
- There is a potential for loss of life and property as well as disruption of utility service.
- Such events cause small blocks of downed timber.

**The Enhance Fajita Scale** is used to rate the intensity of a tornado by examining the damage caused by the tornado once it has passed.

**EF-0:** Wind speed 65-85 mph.; frequency 53.5%. Minor damage.

**EF-1:** Wind speed 86-101 mph.; frequency 31.6%. Moderate damage.

**EF-2:** Wind speed 111-135 mph.; frequency 10.0%. Considerable damage.

**EF-3:** Wind speed 136-165 mph.; frequency 3.4%. Severe damage.

**EF-4:** Wind speed 166-200 mph.; frequency 0.7%. Extreme damage.

**EF-5:** Wind speed >200 mph.; frequency 0.1%. Total destruction.

## **Infectious Disease**

Risk: High

Impact: Low

Future probability: High

Infectious Disease - Epidemics may be caused by infectious diseases, which can be transmitted through food, water, the environment or person-to-person or animal-to-person; and noninfectious diseases, such as a chemical exposure, that causes increased rates of illness. Infectious diseases that may cause an epidemic can be broadly categorized into the following groups:

- Foodborne (Salmonellosis, E. Coli)
- Water (Cholera, Giardiasis)
- Vaccine Preventable (Measles, Mumps)



- Sexually Transmitted (HIV, Syphilis)
- Person-to-Person (TB, meningitis)
- Arthropod borne (Lyme, West Nile Virus)
- Zoonotic (Rabies, Psittacosis)
- Opportunistic fungal and fungal infections (Candidiasis)

Past Events: March 2020 to present - The Covid-19 pandemic is a worldwide event that has caused many deaths and may result in lasting effects for those who have contracted the virus and survived. This pandemic is still occurring, so data will be forthcoming in the next update of this plan.

Potential Occurrences:

- This is a town-wide event; therefore, no specific locations are listed.

Potential Impact: Those with weakened immune systems are at greater risk during these events.

- There is a potential for injury or death.
- There is a potential for injury or death to domestic animals and wildlife.
- There is a potential for risk to waterbodies and wildlife habitat.
- There is a potential for loss of crops and vegetation.
- There is a potential for economic disparity.

### Lightning

Risk: High

Impact: Low

Future probability: High

Lightning is a natural hazard that is unpredictable. It could strike anywhere during a storm and potentially start a forest fire, especially in periods of drought. High elevations and areas around waterbodies may be more susceptible to lightning strike incidents. The table on the next page categorizes lightning hazards according to the Lightning Activity Level (LAL) using cloud conditions and precipitation, and an estimate of lightning strikes per every 15 minutes.

LAL	Cloud & Storm Development	Lightning Strikes/15 min
1	No thunderstorms.	-
2	Cumulus clouds are common but few reach the towering cumulus stage. A single thunderstorm must be confirmed in the observation area. Light rain will occasionally reach the ground. Lightning is very infrequent.	1-8
3	Towering cumulus covers less than two-tenths of the sky. Thunderstorms are few, but two to three must occur within the observation area. Light to moderate rain will reach the ground, and lightning is infrequent.	9-15
4	Towering cumulus covers two to three-tenths of the sky. Thunderstorms are scattered and more than 3 must occur within the observation area. Moderate rain is common & lightning is frequent.	16-25
5	Towering cumulus and thunderstorms are numerous. They cover more than three-tenths and occasionally obscure the sky. Rain is moderate to heavy and lightning is frequent and intense.	>25
6	Similar to LAL 3 except thunderstorms are dry.	9-15

Source: NOAA

#### Past Events:

- Several occurrences of lightning strikes have been recorded in Chesterfield including four structural fires between 1993 and 2006.
- The Fire Station/Town Office has been struck several times in prior years, but have not resulted in structural damage, injury or death.
- In 2018, lightning struck a barn on High Road. The barn was destroyed and some minor impact to the adjacent house occurred.
- In 2020, lightning was the cause of a wildfire on Horseshoe Road causing several acres to burn. There were no injuries and no structural damage, however it took the Fire Department and mutual aid 2 days to extinguish the fire.

#### Potential Occurrences:

- Lightning could occur anywhere, therefore, no specific locations are identified.
- Antennas and satellites, church steeples, cupolas, and other upward protruding architectural features are at greater risk for lightning strikes.
- Hikers, fisherman and boaters are at risk during lightning events and should seek safe shelter.

#### Potential Impact:

- Forested areas with a high fuel load are a high risk for forest fire during lightning storms.
- Telephone and power outages often occur when transformers are hit by lightning or when a tree gets struck and falls onto the lines.
- There is a potential for damage to structures.
- There is a potential for injury or death.

### Severe Winter Weather

Risk: High

Impact: Low

Future probability: High

Three types of winter events that cause concern are heavy snow, ice storms and extreme cold. Chesterfield's recent history has not recorded any loss of life due to the extreme winter weather. These random events are difficult to set a cost to repair or replace any of the structures or utilities affected.

To help prepare for these events, the Sperry Piltz Ice Accumulation Index was created.

THE SPIA INDEX™	
ICE DAMAGE INDEX	DAMAGE AND IMPACT DESCRIPTIONS
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1-5 days.
4	Prolonged and widespread utility interruptions with extensive damage to main distribution feeder lines and some high voltage transmission lines/structures. Outages lasting 5-10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.



Past Events from 2015 to present:

- November 26, 2014 - Thanksgiving Storm. A strong storm event hit the area with heavy snow and wind causing power outages throughout the state. Chesterfield residents lost power for the Thanksgiving holiday, but power was restored within 48 hours. The snowfall was approximately 8 inches. There were no injuries or death as a result of the storm and no structural damage reported.
- January 26-29, 2015 - There were several successive snow storms with more than 10" each resulting in FEMA Disaster Declaration #DR-4209 to provide assistance to communities in Hillsborough, Rockingham, and Strafford Counties. There was no local impact to the Town other than snow removal.
- March 14-15, 2017 - The Town experienced 9 inches of wet/ heavy snow and high winds. Some minor power outages. There were no injuries or death as a result of the storm and no structural damage reported.
- March 13-14, 2018 - Heavy snow storm but no local impact. FEMA Disaster Declaration # DR-4371 for Carroll, Strafford and Rockingham Counties. There were no injuries or death as a result of the storm and no structural damage reported.

Potential Occurrences:

- This is a town-wide event; therefore, no specific locations are listed.

Potential Impact:

- There is a potential for interruption of service.
- There is a potential of damage to structures.
- There is a potential for injury or death.

**Solar Storm and Space Weather**

Risk: Medium

Impact: Medium

Future probability: Medium

The term space weather is relatively new and describes the dynamic conditions in the Earth's outer space environment, similar to how the terms "climate" and "weather" refer to the conditions in the Earth's lower atmosphere. Space weather includes any and all conditions and events on the sun, in the solar wind, in near-Earth space, and in our upper atmosphere that can affect space-borne and ground based technological systems.

The chart on the next page shows the level of severity of space weather as it relates to the impact on radio communications. The National Oceanic and Atmospheric Administration (NOAA) uses this chart to alert those who depend on radio communications such as first responders and airlines on days that could create life threatening situations if their radios are impacted.

### Radio Blackout Chart

Scale	Description	Effect	Physical measure	Average Frequency (1 cycle = 11 years)
R 5	Extreme	<b>HF Radio:</b> Complete HF (high frequency) radio blackout on the entire sunlit side of the Earth lasting for a number of hours. This results in no HF radio contact with mariners and en route aviators in this sector. <b>Navigation:</b> Low-frequency navigation signals used by maritime and general aviation systems experience outages on the sunlit side of the Earth for many hours, causing loss in positioning. Increased satellite navigation errors in positioning for several hours on the sunlit side of Earth, which may spread into the night side.	X20 ( $2 \times 10^{-3}$ )	Less than 1 per cycle
R 4	Severe	<b>HF Radio:</b> HF radio communication blackout on most of the sunlit side of Earth for one to two hours. HF radio contact lost during this time. <b>Navigation:</b> Outages of low-frequency navigation signals cause increased error in positioning for one to two hours. Minor disruptions of satellite navigation possible on the sunlit side of Earth.	X10 ( $10^{-3}$ )	8 per cycle (8 days per cycle)
R 3	Strong	<b>HF Radio:</b> Wide area blackout of HF radio communication, loss of radio contact for about an hour on sunlit side of Earth. <b>Navigation:</b> Low-frequency navigation signals degraded for about an hour.	X1 ( $10^{-4}$ )	175 per cycle (140 days per cycle)
R 2	Moderate	<b>HF Radio:</b> Limited blackout of HF radio communication on sunlit side, loss of radio contact for tens of minutes. <b>Navigation:</b> Degradation of low-frequency navigation signals for tens of minutes.	M5 ( $5 \times 10^{-5}$ )	350 per cycle (300 days per cycle)
R 1	Minor	<b>HF Radio:</b> Weak or minor degradation of HF radio communication on sunlit side, occasional loss of radio contact. <b>Navigation:</b> Low-frequency navigation signals degraded for brief intervals.	M1 ( $10^{-5}$ )	2000 per cycle (950 days per cycle)

Source: National Oceanic and Atmospheric Administration (NOAA)

#### Past Events:

- This is a hazard that is difficult to detect and the Work Group was not aware of any specific dates of occurrence. There have been no incidents of damage or interruption of communication services recorded in Chesterfield.

#### Potential Occurrences:

- The entire town is at risk for solar storms and space weather. There is a concern for disruption in emergency services communications and businesses that rely on the internet.

#### Potential Impact:

- There is a potential for interruption of service.

### Tropical Storm/Hurricane

Risk: High

Impact: Medium

Future probability: High

There is concern for tropical storms and hurricanes to impact Chesterfield. Chesterfield's inland location in southwestern New Hampshire reduces the risk of extreme high winds that are associated with hurricanes. A major hurricane can cause significant damage to a community. Most of the damage is caused by high water and high winds. To help categorize the extent of these events the Saffir-Simpson Hurricane Wind Scale is used. It is a rating system from 1 to 5 based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, and require preventative measures.

#### Category 1

Wind Speed: 74 - 95 mph, 64 - 82 kts

Very dangerous winds will produce some damage: Extensive damage to power lines and poles likely will result in power outages that could last a few to several days

**Category 2**

Wind Speed: 96 - 110 mph, 83 - 95 kts

Extremely dangerous winds will cause extensive damage: Near-total power loss is expected with outages that could last from several days to weeks.

**Category 3**

Wind Speed: 111 - 129 mph, 96 - 112 kts

Devastating damage will occur: Electricity and water will be unavailable for several days to weeks after the storm passes.

**Category 4**

Wind Speed: 130 - 156 mph, 113 - 136 kts

Catastrophic damage will occur: Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

**Category 5**

Wind Speed: 157 mph or higher, 137 kts or higher

Catastrophic damage will occur: Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: <http://www.nhc.noaa.gov/aboutsshws.php>

Past Events from 2015 to present:

- The Town has experienced small blocks of downed timber and uprooting of trees in past years, however, there have been no occurrences of tropical storms or hurricanes in the past five years that have impacted Chesterfield.

Potential Occurrences:

- River corridors and hill tops are more susceptible.
- This is a town-wide hazard; therefore, no specific locations are identified.

Potential Impact:

- There is a potential for injury or death, structural damage and disruption of utility service.
- There is a potential for flooding of evacuation routes and other roads.

**Wildfire**

Risk: Medium

Impact: Low

Future probability: Medium

The whole Town is at risk for wildfires. There is a substantial amount of debris on the ground from the Ice Storms of 1998 and 2008, wind shears, heavy winds, and logging practices. As timber harvesting is reduced, wood roads close and debris builds up on the ground, the potential for wildfire increases town-wide.

Past Events from 2015 to present:

- In 2020, lightning was the cause of a wildfire on Horseshoe Road causing several acres to burn. There were no injuries and no structural damage, however it took the Fire Department and mutual aid 2 days to extinguish the fire.
- There have been several brush fires along local roads that have not been recorded.

Potential Occurrences:

- The potential for a wildfire is higher in the forested areas of Chesterfield including Pisgah State Park and Mount Wantastiquet.

- A lack of direct access to many remote areas within Town adds to the danger.

Potential Impact:

- There is a potential for the risk of life and property loss.
- There is a potential for loss of wildlife habitat and timber.
- There is a potential for disruption of utility service.

Wildfires are classified according to size: Class A - one-fourth acre or less; Class B - greater than one-fourth acre, but less than 10 acres; Class C - 10 acres or more, but less than 100 acres; Class D - 100 acres or more, but less than 300 acres; Class E - 300 acres or more, but less than 1,000 acres; Class F - 1,000 acres or more, but less than 5,000 acres; Class G - 5,000 acres or more. The wildfires in Chesterfield have mostly been small in nature and caused by lightning strikes (Class A or B).

### **Dam Failure**

Risk: Medium

Impact: Low

Future probability: Medium

Dam failure is defined as the sudden, rapid, and uncontrolled release of impounded water. The Spofford Lake Dam is the only significant hazard dam in Chesterfield. All other active dams are listed as low-hazard dams or no-menace dams and do not pose a risk.

Past Events from 2014 to present:

- There have been no recent occurrences of dam breach in Town.

Potential Occurrences:

- Areas downstream from Lake Spofford.

Potential Impact:

- There is a potential for the risk of life and property loss and for disruption of utility service.

NM - Non-menace; L - Low hazard; S - Significant hazard; H - High Hazard. Generally, all Class H dams need to have Emergency Action Plans, and most Class S dams also require them. There is one Class S dam according to the Department of Environmental Services Dam Bureau. The Class S dam is the Spofford Lake Dam.

DAM	HAZCL	NAME	HEIGHT	IMPOUNDMENT
D045001	NM	CATSBANE BROOK	17	3
D045008	S	SPOFFORD LAKE DAM	11	731
D045009	L	FULLAM POND DAM	18	31.4
D045012	NM	HUBNER FIRE POND	9	0.25
D045013	NM	OTTO RICHTER POND	10	1
D045019	NM	FIRE POND	12	0.05
D045021	NM	THOMPSON DAM	7	0.25
D045025	NM	STOW MILLS POND 2	9	0.41
D045027	NM	BRIERE POND	10	25.7

Source: NH DES Dam Bureau

# Chapter 5

## Critical Facilities

### Category and Location

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Hazards identified in this plan are regional risks and, as such, all critical facilities fall into the hazard area. The exception to this is flooding. There are six identified critical facilities that fall within the 100-year floodplain.

A Critical Facility is defined as a building, structure, or location which:

- Is vital to the hazard response effort
- Maintains an existing level of protection from hazards for the community
- Would create a secondary disaster if a hazard were to impact it

The critical facilities list for the Town of Chesterfield has been identified using a similar list provided by NH HSEM. Chesterfield's Hazard Mitigation Work Group has divided this list of facilities into four categories. The first category contains facilities needed for emergency response in the event of a disaster. The second category contains non-emergency response facilities that have been identified by the Work Group as non-essential. These are not required in an emergency response event but are considered essential for the everyday operation of Chesterfield. The third category contains facilities and populations that the Work Group wishes to protect in the event of a disaster. The fourth category contains potential resources which can provide services or supplies in the event of a disaster.

#### **Category 1 - Emergency Response Services:**

The Town has identified the emergency response facilities and services as the highest priority in regards to protection from natural and man-made hazards.

##### **1. Emergency Operations Center**

Chesterfield Town Offices - 490 NH 63  
Spofford Fire Station - 9 Pontiac Drive (alternate)

##### **2. Fire Station**

Chesterfield Center Fire Station - 492 NH 63  
Spofford Fire Station - 9 Pontiac Dr. (alternate)  
West Chesterfield Fire Station - 68 Main Street

##### **3. Emergency Shelters**

Chesterfield School - 535 Old Chesterfield Road  
Chesterfield Fire Station - 492 NH 63  
Town Hall - 522 NH 63  
Camp Spofford - 24 NH 9A  
Spofford Fire Station - 9 Pontiac Drive  
Town Offices - 490 NH 63

##### **4. Dry Hydrants - Fire Ponds - Water Sources**

###### **Dry Hydrants**

Canal Street, Pontiac Drive  
NH 63/north end of Silverdale  
Meadow View Road/near cul-de-sac

Fire Ponds

Poor Road  
Stowe Road  
Brook Street  
Spring Street  
Atherton Hill Road/Tuttle  
Pontiac Drive  
Horseshoe Road  
Old Chesterfield Road  
Cross Road (at Chesterfield Inn)

Water Sources

Boat Launch on River Road  
Boat Launch at Spofford Lake

**5. Evacuation Routes**

NH 63  
River Road  
NH 9  
Westmoreland Road

**6. Bridges Located on Evacuation Routes**

NH 9 - Town Brook Culvert  
NH 9 - Catsbane Brook Bridge  
NH 9 - Connecticut River Bridge  
River Road - Governors Brook Bridge  
Westmoreland Road - Partridge Brook Bridge

**7. Town Garage/Transfer Station - Brattleboro Road**

**8. Communications**

Cell Towers

Mt. Pistareen, Welcome Hill, Tower Hill, and  
Chesterfield Hill (near town line but located in Westmoreland)  
Tower Hill  
Welcome Hill

Telephone Crossboxes

Poocham Road/NH 9  
NH 9 (Perkins Lumber)  
NH 9A and Spring Street  
North Shore Road  
NH 9 & Poor Road  
NH 9 & NH 63  
NH 63 near Library/Church  
Farr Road  
Spofford Village

**Category 2 - Non-Emergency Response Facilities:**

The Town has identified these facilities as non-emergency facilities; however, they are considered essential for the everyday operation of Chesterfield.

**1. Water Supply**

School Water Supply - NH 63  
Town Hall - 522 NH 63  
Spofford Fire Station - 9 Pontiac Drive  
Town Offices - 490 NH 63

**2. Problem Culverts**

NH 63  
Pond Brook Road  
NH 9A  
Gulf Road  
Old Ferry Road

**Category 3 - Facilities/Populations to Protect:**

The third category contains people and facilities that need to be protected in event of a disaster.

**1. Special Needs Population** - identified by confidential survey administered by Emergency Medical Services.

Oxygen-dependent people  
People on a lifeline  
People assisted by Home Health  
Shut-ins and disabled  
Mentally challenged  
Elderly  
Hearing impaired  
Sight impaired

**2. Recreation Area Visitors**

Spofford Lake  
Pisgah State Park  
Wantastiquet State Forest - Mountain Rd.  
Roads End Farm  
Chesterfield School ball fields and tennis courts  
Chesterfield Gorge State Park  
Friedsam Forest  
Camp Spofford  
Connecticut River

**3. Day Care Facilities**

Church Street

**4. Churches**

Old Swanzey Road  
NH 63 (2 churches)  
Main Street - West Chesterfield  
Church Street  
NH 9A

## 5. Large Employers

Business Name	Approximate # of Employees	Business Category
United Natural Foods	>100	Food Warehouse
Albert's Organics NE Division	>100	Food
Hunter North Associates	>100	Security/Investigation
Thomas Companies	65	Construction
Chesterfield Elementary	50-99	Education
Camp Spofford	50-99	Education/Recreation
Perkins Home Improvements	20-49	Lumber/hardware
Federal Express	20-49	Package Delivery
Foard Panel Inc.	20-49	Construction
Ames Performance	20-49	Auto Parts
Lexmark International	20-49	Printing/Office
Chesterfield Inn	20-49	Hotel/Lodging

### **Category 4 – Potential Resources:**

The fourth category contains facilities that provide potential resources for services or supplies.

#### **1. Food/Water**

Riverside Drive Store  
 UNFI - United Natural Foods Warehouse - 71 Stowe Drive  
 Joan's Food Pantry - 532 NH 63  
 Big Deal - 1474 NH 9  
 Pierre's Place - 85 NH 9  
 Grocery Stores Located in Keene & Brattleboro, VT

#### **2. Emergency Fuel Facilities**

Town Municipal Garage - 39 Old Brattleboro Road  
 Big Deal Convenience Mart - 1474 NH 9  
 Pierre's Place - 85 NH 9  
 Shell Station - 97 NH 9

#### **3. Emergency Generators**

Chesterfield Town Office - 490 NH 63  
 Highway Garage - 39 Old Brattleboro Road  
 Chesterfield School - 535 Old Chesterfield Road  
 Chesterfield Fire Station - 492 NH 63  
 Camp Spofford - 24 NH 9A  
 Spofford Fire Station - 9 Pontiac Drive

#### **4. Gravel Pits**

River Road

#### **5. Miscellaneous Resources**

Emergency Broadcast & Television: WKNE 103.7 F.M., WINQ 98.7 F.M.

Transportation: Busses - First Student in Keene  
 Trucks - Local Contractors, National Guard

Beds, Cots, Blankets: National Guard  
 Red Cross



Rescue Equipment:

Fire Stations

Chesterfield Snowmobile Club

**Critical Facilities Within Hazard Areas**

Hazards identified in this plan are regional risks and, as such, all critical facilities fall into the hazard area. The exception to this is flooding. Six identified critical facilities fall within the 100-year floodplain. The facilities are identified in the following table:

FACILITY TYPE	BUILDING TYPE	ADDRESS
Gravel Pit w/Hazardous Material	Commercial	River Road
Recreation - Outdoor	Park - Boat Landing	River Road
Dam	Dam	Just north of Snow Road
Bridges	Bridges	(2) NH 9 Bridges over Connecticut River
Dam/Fire Pond	Dam/Fire Pond	Old Chesterfield & Horseshoe Roads
Bridge	Bridge	State Bridge on Brook Street

# Chapter 6

## Existing Mitigation Strategies

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### And Proposed Improvements

#### Description of Existing Programs

The Chesterfield Hazard Mitigation Work Group reviewed each hazard and their related strategies to determine any gaps in coverage. They identified the following existing mitigation strategies related to:

Best Management Practices - Townwide practices to reduce non-point sources of runoff from entering the local waterways.

School Evacuation Plan (2015) - Designated plan to evacuate the school in the event of an emergency or disaster addressing bussing, transportation routes (primary and alternative), traffic & crowd control, end destination and parental notification.

Town-Adopted Building Code - Chesterfield maintains a building inspector and has adopted provisions of the NH Life Safety Code and the NH State Building Code which includes the International Building Code, International Plumbing Code, International Mechanical Code, International Energy Conservation Code and National Electric Code. The current program is working. Updated editions of code books are obtained as they become available.

Code Enforcement Officer - Enforces building and zoning ordinances and reviews permit applications.

Health Officer - Inspects failed septic systems, wells, etc.

Emergency Back-up Power Program - Town supplied generators for Critical Facilities; portable or fixed.

Local Road Design Standards - Standards set by the Town and the Highway Department to ensure a constant construction benchmark.

Local Bridge Maintenance Program - Guidelines and schedules for annual upkeep of town bridges and culverts.

Local Road Maintenance Program - Chesterfield maintains a budget each year for various roadway projects, such as resurfacing, culvert replacement and repair, and new road construction.

Floodplain Zoning Ordinance - An ordinance has been adopted as part of the Town's Land Use Plan to control development in the 100-year floodplain.

Winter Operations Guidelines - is designed as a set of guidelines for the Highway Department and Town personnel to follow during times of extreme winter weather.

Town Master Plan - A guidance document to ensure that overall development in Town is sustainable, meeting the needs of the citizens by setting forth steps and guidelines for a sound living environment through intelligent growth. The Master Plan was updated (2016).

Mutual Aid - Provides assistance to all aspects of Chesterfield's Emergency Management Services in Town.

Fire Pond Management Plan - This designates a maintenance schedule to the local ponds used by the fire department for water supply for fire prevention.

Spill Prevention Control and Counter Measures Plan - This plan is available at the Town Garage in the event that there is a spill on the grounds. It includes a requirement for a secondary holding area in the event of a spill.

Town Warning System - Town implemented warning system utilizing vehicle mounted bullhorns.

Town Wide Phone Disaster Notification System - Town implemented phone notification policy.

Erosion and Sedimentation Plan - E&S plans are established by the state for erosion and sediment control.

Town Radio System - This system has town-wide frequency.

Shoreland Water Quality Protection Act - Designates a protective buffer along the following shorelines in accordance to DES Regulations: Connecticut River, Spofford Lake, Catsbane Brook, Gulf Brook, Partridge Brook, Very Brook, Hubbard Brook and Town Brook.

River Stewardship - The Town has representation on the Connecticut River Joint Commission and the Wantastiquet Local Advisory Work Group.

Capital Improvements Program - The Capital Improvements Plan should to be updated annually.

Tree Maintenance Program - Town Highway Department needs more flexibility to be able to perform necessary tree maintenance.

Local Emergency Operations Plan (2017) - This plan identifies the response procedures and capabilities of the Town of Chesterfield in the event of a natural or man-made disaster.

## Existing Protection Matrix

This step involves identifying existing mitigation strategies and Town programs. This section evaluates their effectiveness and outlines those programs and recommends improvements to ensure the highest quality emergency services possible.

Effectiveness of the existing protection is rated Good, Average, or Below Average: *Good* - meets and sometimes exceeds expectations; *Average*- meets general expectations; *Below Average* - needs improvements.

Existing Protection	Description/Area Covered	Responsible Local Agent	Effectiveness (Poor, Avg, Good)	Recommended Changes - Actions
Floodplain Zoning Ordinance	Floodplain areas	Code Enforcement Officer	Good	Update as changes occur.
School Evacuation Plan (2020)	School	State Fire Marshall, Police Chief, SAU 29	Good	Should encompass State Comprehensive Plan; will be including an active shooter drill in 2021.
Fire Pond Management Plan for Chesterfield and Spofford Fire Depts. (2015)	Location and Maintenance of Ponds	Fire Chief	Average	Need additional fire ponds, cisterns, and/or dry hydrants to cover gaps; maintenance of fire ponds is needed.
Town Warning System	Town-wide	Fire Department and Police Department	Average	No changes suggested.
Local Road Design Standards and Maintenance Standards	Town-wide	Road Agent and Code Officer	Good	Standards should be reviewed and updated as needed.
Local Bridge Maintenance Program	Town-wide	NH DOT and Road Agent	Good	No improvements suggested.
Code Officer	Town-wide	Selectmen and Planning Board	Good	No improvements suggested.
Health Officer	Town-wide	Selectmen and Planning Board	Good	No improvements suggested.
Emergency Operations Plan (2017)	Town-wide	EMD	Good	Update every 5 years. Should be updated in 2022.
Building Codes	Town-wide	Code Officer, Planning Board, Selectmen	Good	Update as new codes are developed.
Shoreland Water Quality Protection Program	Buffer along the designated shorelines	Code Officer, DES, LAC & Conservation Commission	Average	Town has adopted zoning ordinances to coincide with the Shoreland Water Quality Protection Act. Better enforcement is needed.

<b>Existing Protection</b>	<b>Description/Area Covered</b>	<b>Responsible Local Agent</b>	<b>Effectiveness (Poor, Avg, Good)</b>	<b>Recommended Changes - Actions</b>
Winter Operations Guidelines	All town roads	Road Agent	Good	Update as needed.
Spill Prevention Control and Counter Measures Plan	Town-wide	Road Agent	Average	Plans for area to be regulated for spills to enter secondary holding area.
Town Radio System	Town-wide	Police, Fire, and Highway	Good	Maintain and replace as needed.
River Stewardship	Connecticut River Valley	Conservation Commission and Cheshire Conservation District	Average	Better public education would be beneficial.
Tree Maintenance Program	Town-wide	Utility companies and Highway Department	Average	Need additional resources.
Town Capital Improvements Plan	Town-wide	Planning Board	Good	Needs to be updated annually.
Mutual Aid	Town-wide	Fire Chief, Police Chief, EMD, Road Agent, and Selectmen	Good	Update as needed.
Erosion & Sedimentation plans	Town-wide.	State and local Conservation Commission	Poor	Develop written action plan/streamline process for emergencies.
Best Management Practices	Town-wide	State and local Conservation Commission	Unknown	Stay updated on current practices.
Emergency Power Back-up Program	Town Office, School, Spofford Fire Station	EMD	Good	Additional generators needed.
Town Master Plan (2016)	Town-wide	Planning Board	Average	Include this plan as an appendix.
Town-wide Phone Disaster Notification System	Town-wide	EMD and Mutual Aid	Good	Need to obtain more unlisted and cell phone numbers.

### Status of Previous Priority Mitigation Actions

The following table provides a status update for the Priority Mitigation Actions identified in the previous Plan. Previously identified mitigation actions are noted as complete, delete, or defer to the updated Plan's new mitigation strategies list.

Mitigation Action	Status	Explanation/Comment
Install a new flow gauge for the Connecticut River.	Delete	A new gauge is not needed at this time.
Provide emergency training for Fire, Police, and Highway Department members.	Complete and ongoing	*Continue as a new mitigation action.
Increase public education and information on emergency communication, preparedness, evacuation, and public notification.	Complete and ongoing	*Continue as a new mitigation action.
Improve public awareness of the NFIP.	Complete and ongoing	*Continue as a new mitigation action.
Update Town website to include information to the public on ways to mitigate and prepare for severe weather conditions.	Complete and ongoing	*Continue as a new mitigation action.
Evaluate water quality at the Town Office, Chesterfield Fire Station and Highway Garage.	Complete	Water flow test has been completed.
Continue mutual aid pacts with surrounding communities to share resources in order to be better prepared for emergency situations.	Complete and ongoing	*Continue as a new mitigation action.
Perform maintenance of fire ponds as needed.	Complete and ongoing	*Continue as a new mitigation action.
Obtain a copy of the Emergency Plans for Camp Spofford and Roads End Farm.	Defer	*Continue as a new mitigation action.
Incorporate this plan as a chapter or appendix in the Chesterfield Master Plan.	Defer	*Continue as a new mitigation action.
Include projects from this plan into the Capital Improvement Program.	Defer	*Continue as a new mitigation action.
Replace and upsize the culvert on Pond Brook Road.	Defer	*Continue as a new mitigation action.
Replace and upsize the culvert on Old Ferry Road.	Defer	*Continue as a new mitigation action.
Build a retaining wall on Streeter Hill Road and replace the culvert.	Defer	*Continue as a new mitigation action.

Mitigation Action	Status	Explanation/Comment
Notify NH DOT of problem culverts on NH 9A and on NH 63.	Complete and ongoing	*Continue as a new mitigation action.
Update the Emergency Operations Plan.	Complete	Apply in December 2021.
Create additional fire ponds or other water sources where needed.	Complete and ongoing	*Continue as a new mitigation action. Cisterns have been added in new developments.
Replace and upsize the culvert on Gulf Road.	Defer	*Continue as a new mitigation action.
Upgrade Town emergency shelter capabilities.	Defer	*Continue as a new mitigation action.
Investigate the need for additional portable and fixed generators for town facilities.	Defer	*Continue as a new mitigation action.
Provide training for town employees, Selectmen and Planning Board and Zoning Board members on the NFIP.	Defer	*Continue as a new mitigation action.
Identify options for beaver dam eradication.	Complete	No action needed.
Provide education of BMPs and E&S Control Plans for construction and maintenance work throughout the town as needed. (steep slopes along roads-bank stabilization)	Complete and ongoing	*Continue as a new mitigation action.

*\*These actions were brought forward and considered along with new mitigation actions; all were then treated as potential actions and prioritized in a similar manner.*

## Chapter 7

# Mitigation Strategies

### Prioritizing Proposed Mitigation Actions

The following programs and activities are aimed at mitigating the impacts of the identified potential hazards. As more information becomes available for other hazards that may have the potential to impact the Town of Chesterfield, additional strategies will be added to the Hazard Mitigation Plan Update 2021. The identified strategies are not only meant to address reducing the effects of hazards on existing buildings and infrastructure, but also to address reducing the effects of hazards on new buildings and infrastructure.

In addition to the programs and activities that Chesterfield is currently undertaking to protect its residents and property from natural, technological and human-caused disasters, a number of additional strategies were identified by the Local Hazard Mitigation Work Group for consideration. The process of compiling a comprehensive list of all mitigation strategies currently in place throughout the Town helped the Work Group identify gaps in the existing coverage and improvements which could be made to the existing strategies. New strategies were identified for each general hazard type using the following categories: Prevention (programs and policies), Property Protection, Emergency Services, Public Information.

In addition to the mitigation strategies proposed generally for each hazard type as indicated above, the Work Group brainstormed actions for specific potential hazard areas identified. The section below shows proposed mitigation actions for both general hazard types and specific potential hazard areas. Each strategy was discussed to determine realistic strategies to be included in the STAPLEE chart.

#### Potential Strategies Matrix

Hazard Type	Prevention	Property Protection	Emergency Services	Public Information
Flooding	Perform a culvert inventory and assessment.	Assess ditches & culverts for stormwater management prior to heavy rain events.	Update locations for emergency shelters.	Improve public awareness of the NFIP.
	Identify options for beaver dam eradication.	Upsize culverts on: Pond Brook Road, Gulf Road, and Old Ferry Road.		Install a new flow gauge for the Connecticut River.
Drought	Maintain an updated list of addresses of the older residents and special needs populations.	Add a water conservation regulation & water ban if necessary.	Consider locations for a water distribution center.	Provide information to residents on water conservation/drought resistant landscaping and/or rain gardens.
Extreme Temperatures	Maintain an updated list of addresses of the older residents and special needs populations.	Update heating and cooling, insulation, windows, etc.	Update locations for emergency shelters.	Post links to the FEMA and NH HSEM website.
			Consider locations for heating, cooling and charging center.	



Hazard Type or Specific Location	Prevention	Property Protection	Emergency Services	Public Information
High Wind Events	Require tie-downs for structures (such as sheds).	Trim tree branches near critical facilities, Town structures and roadways.	Update locations for emergency shelters.	Provide information for residents to understand ways to mitigate potential damage during a tornado/severe wind/downburst event.
Infectious Disease	Develop a protocol for determining closures and measures needed to protect the public.		Establish a relationship with the Regional Public Health Representative.	Conduct a public information workshop on emergency preparedness for short-term and long-term quarantine.
Lightning	Consider adding surge protectors to critical infrastructure.	Investigate locations for grounding equipment on public & historic buildings.	Additional generators are needed.	Include a link of the NH HSEM or FEMA website on the Town website.
Severe Winter Weather	Winter storms operations plan. (create/update)	Coordinate with Eversource to trim tree branches near power lines.	Determine the need for additional portable and fixed generators.	Provide information to residents about proper use of generators and the importance of maintaining the heating system to prevent carbon monoxide poisoning and fires.
		Trim tree branches near critical facilities, town structures, and roadways.	Update the vulnerable populations list annually.	
Solar Storms and Space Weather	Become more aware and monitor high impact days.		Consider alternative means of communication.	Post links to the FEMA and NH HSEM website.
Tropical Storm and Hurricane		Consider requirement for new construction to withstand severe wind speeds.	Determine the need for additional portable and fixed generators.	Post links to the FEMA and NH HSEM, NOAA, website.
Wild Fires	Install fire warning signs at trailheads.	Continue to implement the fire ponds/dry hydrant management plan to provide increased access to and upkeep of water sources for fire protection.	Continue the Fire Prevention Program including carbon monoxide, fire and evacuation information.	Provide residents with information on fire safety & prevention.
				Provide state links to obtain fire permit and fire hazard levels and alerts.

Hazard Type or Specific Location	Prevention	Property Protection	Emergency Services	Public Information
Dams	Identify options for beaver dam eradication	Inspect dams for debris prior to heavy storm events.		
Hazardous Materials	Provide information to residents & businesses about evacuation routes and procedures.		Continue mutual aid SWNHMA & Cheshire County Sheriff's Dept.	Disseminate outreach material on proper disposal of hazardous household materials and medicines.
Erosion	Consider a steep slopes ordinance.	Build a retaining wall on Streeter Hill Road and replace the culvert.	Stabilize with plantings, retaining walls, and rip rap.	
	Establish and implement BMPs and E&S Control Plans for construction and maintenance work throughout the town			
All Hazards	Continue Mutual Aid hazard drills		Update locations for emergency shelters.	Develop a Town warning system such as E911 or Code Red.
	ICS/NIMS Training for Town departments.		Consider locations for emergency shelters for pets.	

## Prioritization of Proposed Mitigation Strategies

The goal of each strategy identified in the previous list is reduction or prevention of damage from a hazard event. In order to determine their effectiveness in accomplishing this goal, a set of criteria was applied to each strategy. The STAPLEE method analyzes the Social, Technical, Administrative, Political, Legal, Economic and Environmental aspects of a project and is commonly used by public administration officials and planners for making planning decisions. The following questions were asked about the proposed mitigation strategies and discussed in the table:

- **Social:** Is the proposed strategy socially acceptable to the community? Are there equity issues involved that would mean that one segment of the community is treated unfairly?
- **Technical:** Will the proposed strategy work? Will it create more problems than it solves?
- **Administrative:** Can the community implement the strategy? Is there someone to coordinate and lead the effort?
- **Political:** Is the strategy politically acceptable? Is there public support both to implement and to maintain the project?
- **Legal:** Is the community authorized to implement the proposed strategy? Is there a clear legal basis or precedent for this activity?
- **Economic:** What are the costs and benefits of this strategy? Does the cost seem reasonable for the size of the problem and the likely benefits?
- **Environmental:** How will the strategy impact the environment? Will the strategy need environmental regulatory approvals?

Each mitigation strategy was evaluated and assigned a score (Good = 3, Average = 2, Poor = 1) based on the above criteria. An evaluation chart with total scores for each strategy can be found in the table below. Each strategy was evaluated and prioritized according to the final score. The highest scoring strategies were determined to be of most importance, economically, socially, environmentally, and politically.

STAPLEE CHART Mitigation Strategy	Is it <b>Socially</b> acceptable?	Is it <b>Technically</b> feasible & potentially	Is it <b>Administratively</b> workable?	Is it <b>Politically</b> acceptable?	Is there <b>Legal</b> authority to implement?	Is it <b>Economically</b> beneficial?	Is it <b>Environmentally</b> beneficial?	Total Score
Include a link of the NH HSEM and/or FEMA website on the Town website.	3	3	3	3	3	3	3	21
Improve public awareness of the NFIP.	3	3	3	3	3	3	3	21
Consider adding surge protectors and other grounding equipment on public & historic buildings and other critical infrastructure.	3	3	3	3	3	3	3	21
Investigate stockpiling materials to handle a wide-spread infectious disease event.	3	3	3	3	3	3	3	21
Establish a relationship with the Regional Public Health Representative.	3	3	3	3	3	3	3	21
Notify NH DOT of problem culverts on NH 9A and on NH 63.	3	3	3	3	3	3	3	21

<b>STAPLEE CHART</b> <b>Mitigation Strategy</b>	<b>Is it Socially acceptable?</b>	<b>Is it Technically feasible &amp; potentially</b>	<b>Is it Administratively workable?</b>	<b>Is it Politically acceptable?</b>	<b>Is there Legal authority to implement?</b>	<b>Is it Economically beneficial?</b>	<b>Is it Environmentally beneficial?</b>	<b>Total Score</b>
Consider additional locations for a heating, cooling, and charging center.	3	3	3	3	3	3	3	21
Update Town website to include information to the public on ways to mitigate and prepare for severe weather conditions.	3	3	3	3	3	3	3	21
Inspect dams for debris prior to heavy storm events.	3	3	3	3	3	3	3	21
Consider locations for distribution of water and other supplies.	3	3	3	3	3	3	3	21
Update locations for emergency shelters.	3	3	3	3	3	3	3	21
Update the Emergency Operations Plan every 5 years. Apply for a grant in 2021-22.	3	3	3	3	3	3	3	21
Increase public education and information on emergency communication, preparedness, evacuation, and public notification.	3	3	3	3	3	3	3	21
Include this Plan as an appendix of the Chesterfield Master Plan.	3	3	3	3	3	3	3	21
Install fire warning signs at trailheads.	3	3	3	3	3	3	3	21
Continue to implement the fire pond/dry hydrant management plan to provide increased access to and upkeep of water sources for fire protection. Create additional fire ponds where needed.	3	3	3	3	3	3	3	21
Provide emergency and mitigation training for fire, police, and highway department members.	3	3	3	3	3	3	3	21
Continue mutual aid pacts with surrounding communities.	3	3	3	3	3	3	3	21
Investigate potential locations for the housing of pets during an emergency event.	3	3	3	3	3	3	3	21
Investigate options and implement, as appropriate, cyber security measures.	3	3	3	3	3	3	3	21
Provide training for town employees, Selectmen Planning Board and Zoning Board members on the NFIP.	3	3	2	3	3	3	3	20
Increase awareness of solar storms and space weather events.	3	3	2	3	3	3	3	20
Obtain a copy of the Emergency Plans for Camp Spofford and Roads End Farm. Encourage the creation of emergency plans if not available.	3	3	3	3	2	3	3	20
Build a retaining wall on Streeter Hill Road and replace the culvert.	3	3	3	2	3	2	3	19

<b>STAPLEE CHART</b> <b>Mitigation Strategy</b>	<b>Is it <b>Socially</b> acceptable?</b>	<b>Is it <b>Technically</b> feasible &amp; potentially</b>	<b>Is it <b>Administratively</b> workable?</b>	<b>Is it <b>Politically</b> acceptable?</b>	<b>Is there <b>Legal</b> authority to implement?</b>	<b>Is it <b>Economically</b> beneficial?</b>	<b>Is it <b>Environmentally</b> beneficial?</b>	<b>Total Score</b>
Replace and upsize culvert on Pond Brook Road.	3	3	3	2	3	2	3	19
Replace and upsize culvert on Gulf Road.	3	3	3	2	3	2	3	19
Replace and upsize culvert on Old Ferry Road.	3	3	3	2	3	2	3	19
Update the Chesterfield Capital Improvements Plan annually and include projects that will help to reduce the impact of natural, technological, and human-caused hazards.	3	3	2	2	3	3	3	19
Provide outreach material on the proper disposal of hazardous household materials and medicines. Share materials with Spofford Lake Association.	3	3	2	3	3	2	3	19
Determine the locations that need emergency generators, and work to obtain and install them.	3	3	2	3	3	1	3	18
Seek ways to obtain unlisted and cell phone numbers for emergency notifications.	2	2	2	2	3	3	3	17
Provide education of BMPs and E&S Control Plans for construction and maintenance work throughout the town as needed.	3	3	1	3	3	1	3	17
Consider adding a steep slope ordinance to reduce property loss.	2	2	2	1	2	3	3	15

## Chapter 8

# Prioritized Implementation Schedule

### Action Plan

The Chesterfield Hazard Mitigation Work Group developed an action plan that outlines who is responsible for implementing each of the prioritized strategies determined in the previous chapters, as well as when and how the actions will be implemented. The following questions were asked to develop an implementation schedule for the identified priority mitigation strategies:

**WHO?** Who will lead the implementation efforts? Who will put together funding requests and applications?

**WHEN?** When will these actions be implemented, and in what order?

**HOW?** How will the community fund these projects? How will the community implement these projects? What resources will be needed to implement these projects?

Mitigation Actions that were identified in Chapter 7 but did not score as a priority, will remain in the plan. As additional funding and staff becomes available, these strategies should be considered in future plan updates.

Once the plan is formally approved by FEMA, the Town will begin working on the actions listed below with an estimated completion date as noted in the timeframe (When) column. Also, as additional information becomes available regarding project leadership, timeline, funding sources, and/or cost estimates, the plan will be reviewed and amended accordingly.

The scale used for the When column is: short-term 1 - 2 years; mid-term 3 - 4 years; long term 5 years.

### Implementation Strategy for Priority Mitigation Actions – Summary Chart

Mitigation Action	Who (Leadership)	When (Deadline)	How (Estimated Cost and Funding Source)
Include a link of the NH HSEM and/or FEMA website on the Town website.	Emergency Management Director	Short-Term	Town budget
Improve public awareness of the NFIP.	Emergency Management Director	Short-Term	Material from HSEM and FEMA
Consider adding surge protectors and other grounding equipment on public & historic buildings and other critical infrastructure.	Director of Public Works	Mid-term	Town budget and grants
Investigate stockpiling materials to handle a wide-spread infectious disease event.	Emergency Management Director	Mid-term	Town budget and grants
Establish a relationship with the Regional Public Health Representative.	Emergency Management Director	Short-term	Town budget
Notify NH DOT of problem culverts on NH 9A and on NH 63.	Director of Public Works	Short-term	Town budget

Mitigation Action	Who (Leadership)	When (Deadline)	How (Estimated Cost and Funding Source)
Consider additional locations for a heating, cooling, and charging center.	Emergency Management Director	Short-term	Town budget
Update Town website to include information to the public on ways to mitigate and prepare for severe weather conditions.	Emergency Management Director	Short-term	Town budget
Inspect dams for debris prior to heavy storm events.	Director of Public Works	Short-term	Town budget
Consider locations for distribution of water and other supplies.	Emergency Management Director	Short-term	Town budget
Update locations for emergency shelters.	Emergency Management Director	Mid-term	Town budget
Update the Emergency Operations Plan every 5 years. Apply for grant in 2021-22.	Emergency Management Director	Short-term	Town budget
Increase public education and information on emergency communication, preparedness, evacuation, and public notification.	Emergency Management Director	Short-term	Town budget
Include this Plan as an appendix of the Chesterfield Master Plan.	Board of Selectmen	Short-term	Town budget
Install fire warning signs at trailheads.	Conservation Commission	Short-term	Town budget and grants
Continue to implement the fire pond/dry hydrant management plan to provide increased access to and upkeep of water sources for fire protection. Create additional fire ponds where needed.	Fire Chiefs	Short-term	Precinct budget and grants
Provide emergency and mitigation training for fire, police, and highway department members.	Department Heads (PD, FD, DPW)	Short-term	Town budget and grants
Continue mutual aid pacts with surrounding communities.	Department Heads (PD, FD, DPW, TA)	Short-term	Town budget
Investigate potential locations for the housing of pets during an emergency event.	Emergency Management Director	Short-term	Town budget
Investigate options and implement, as appropriate, cyber security measures.	Board of Selectmen and Police Department	Short-term	Town budget and grants
Provide training for town employees, Selectmen and Planning Board and Zoning Board members on the NFIP.	Board of Selectmen	Short-term	Town budget
Increase awareness of solar storms and space weather events.	Emergency Management Director	Mid-term	Town budget
Obtain a copy of the Emergency Plans for Camp Spofford and Roads End Farm. Encourage the creation of emergency plans if not available.	Emergency Management Director	Short-term	Town budget
Build a retaining wall on Streeter Hill Road and replace the culvert.	Director of Public Works	Long-term	Town budget and grants

Mitigation Action	Who (Leadership)	When (Deadline)	How (Estimated Cost and Funding Source)
Replace and upsize culvert on Pond Brook Road.	Director of Public Works	Long-term	Town budget and grants
Replace and upsize culvert on Gulf Road.	Director of Public Works	Long-term	Town budget and grants
Replace and upsize culvert on Old Ferry Road.	Director of Public Works	Long-term	Town budget and grants
Update the Chesterfield Capital Improvements Plan annually and include projects that will help to reduce the impact of natural, technological, and human-caused hazards.	Planning Board	Mid-term	Town budget
Provide outreach material on the proper disposal of hazardous household materials and medicines. Share materials with Spofford Lake Association.	Director of Public Works and Police Department	Short-term	Town budget
Determine the locations that need emergency generators, and work to obtain and install them.	Emergency Management Director	Mid-term	Town budget/grants
Seek ways to obtain unlisted and cell phone numbers for emergency notifications.	Emergency Management Director	Mid-term	Town budget
Provide education of BMPs and E&S Control Plans for construction and maintenance work throughout the town as needed.	Director of Public Works and Code Enforcement	Short-term	Town budget
Consider adding a steep slope ordinance to reduce property loss.	Planning Board	Mid-term	Town budget



## **Chapter 9**

# **Adoption, Implementation, Monitoring & Updates**

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### **Plan Maintenance**

#### **Adoption**

The Chesterfield Board of Selectmen adopted the Chesterfield Hazard Mitigation Plan Update 2021 on (add date). A copy of the resolution can be found at the end of this chapter. Adopted policy addresses the actions for implementation set forth in the prioritized implementation schedule (action plan) in the previous chapter and in the “Monitoring & Updates” sub-section contained in this Chapter. All other sections of this Plan are supporting documentation for information purposes only and are not included as the statement of policy.

A copy of the public hearing notice for the Board of Selectmen meeting at which the plan was adopted is included in **Appendix E**. The plan was available to the public via a hard copy at the Town Office prior to the Selectmen meeting and on the Town website. Any comments were considered and addressed prior to adoption of the plan.

#### **Implementation of the Plan through Existing Programs**

In addition to work by the Hazard Mitigation Work Group and Town departments, several other mechanisms exist which will ensure that the Chesterfield Hazard Mitigation Plan receives the attention it requires for satisfactory use. Ordinances were approved and projects were put into the Capital Improvement Program to implement some actions that will reduce the risk of loss of life and property due to future hazards.

#### **Master Plan**

The Master Plan was updated in 2016. The Chesterfield Hazard Mitigation Plan Update 2016 was used to help draft some of the chapters of the Master Plan, including the Transportation, Natural Resources, and the Historic and Recreational Resources Chapters. The Planning Board will consider this updated Hazard Mitigation Plan as a chapter or appendix to its Master Plan. The Emergency Management Director will assist the Planning Board with the process.

#### **Zoning Ordinance and Regulations**

Some of the implementation strategies proposed involve revisions to the Subdivision Regulations and/or the Site Plan Review Regulations. The Local Hazard Mitigation Work Group will oversee the process to begin working with the Planning Board to develop appropriate language for the modifications.

#### **Continued Public Involvement**

On behalf of the Hazard Mitigation Work Group, the Emergency Management Director (EMD), under direction of the Board of Selectmen, will be responsible for ensuring that Town departments and the public have adequate opportunity to participate in the planning process. Administrative staff may be utilized to assist with the public involvement process. For the yearly update process, techniques that may be utilized for public involvement include:

- Provide invitations to Budget Work Group members;
- Provide invitations to Town department heads; and
- Post notices of meetings at the Town Office

A number of Implementation Action items which will be undertaken relate to public education and involvement. Additionally, members of the public including area business owners, schools, communities, and organizations will be invited to participate in the yearly process of updating the Chesterfield Hazard Mitigation Plan. These outreach activities will be undertaken during the Plan's annual review and during any Hazard Mitigation Work Group meetings the Board of Selectmen calls to order. For all meetings regarding the Hazard Mitigation Plan, the public will be noticed and the meetings will be open to the public.

### **Monitoring & Updates**

Recognizing that many mitigation projects are ongoing, and that while in the implementation stage communities may suffer budget cuts, experience staff turnover, or projects may fail altogether, a good plan needs to provide for periodic monitoring and evaluation of its successes and failures and allow for updates of the Plan where necessary.

In order to track progress and update the Mitigation Strategies identified in the Action Plan (Chapter 8), the Town Hazard Mitigation Work Group will revisit the Chesterfield Hazard Mitigation Plan annually, or after a hazard event. The Emergency Management Director is responsible for initiating this review and needs to consult with the Board of Selectmen and other key local officials. Changes should be made to the Plan to accommodate for projects that have failed or are not considered feasible after a review for their consistency with the timeframe, the community's priorities and funding resources. Priorities that did not make the implementation list, but are identified as potential mitigation strategies, should be reviewed as well during the monitoring and update of this Plan to determine feasibility of future implementation. In keeping with the process of adopting the Chesterfield Hazard Mitigation Plan, a public hearing to receive public comment on Plan maintenance and updating will be held during the annual review period and the final product adopted by the Board of Selectmen.

Monitoring of the plan shall include periodic reports, meetings, site visits, and phone calls. The projects identified in this plan will be evaluated to make sure they are still applicable and practical. When the plan is evaluated, any changes should be incorporated into the plan in the annual update.

**Appendix F** is meant to assist in the monitoring and evaluation of the plan on an ongoing basis.

The Town of Chesterfield, NH Hazard Mitigation Plan must be reviewed, revised as appropriate and resubmitted to FEMA for approval every **five years** in order to maintain eligibility for Pre-Disaster Mitigation Competitive (PDM-C) and Hazard Mitigation Grant Program project grants.

This plan received FEMA final approval on **(add FEMA date)**

**CERTIFICATE OF ADOPTION**  
**CHESTERFIELD, NEW HAMPSHIRE**  
**BOARD OF SELECTMEN**  
**A RESOLUTION ADOPTING THE**  
**CHESTERFIELD HAZARD MITIGATION PLAN UPDATE 2021**

WHEREAS, the Town of Chesterfield has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan Update 2021 under the requirements of 44 CFR 201.6; and

WHEREAS, work group meetings were held between (dates) regarding the development and review of the Chesterfield Hazard Mitigation Plan Update 2021; and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the Town of Chesterfield, and

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Town of Chesterfield, 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 Chesterfield eligible for funding to alleviate the impacts of future hazards; now therefore be it **RESOLVED** by the Board of Selectmen:

1. The Plan is hereby adopted as an official plan of the Town of Chesterfield;
2. The respective officials identified in the mitigation strategy 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 a part of this resolution for a period of five (5) years from the date of this resolution.

**IN WITNESS WHEREOF**, the undersigned has affixed his/her signature and the corporate seal of the Town of Chesterfield this \_\_\_\_ day of \_\_\_\_\_, **2021**

\_\_\_\_\_  
Chesterfield Board of Selectmen Chairman

\_\_\_\_\_  
Board of Selectmen

\_\_\_\_\_  
Board of Selectmen

ATTEST \_\_\_\_\_

# **Appendices**

# **Appendix A: Hazard Descriptions**

## Natural Hazards

**Avalanche:** An avalanche is a slope failure consisting of a mass of rapidly moving, fluidized snow that slides down a mountainside. The flow can be composed of snow, ice, water, soil, rocks, and trees. An avalanche can be comparable to a landslide; only with snow instead of earth. Natural and human-caused snow avalanches most often result from structural weaknesses of mountainside and unstable snow and ice formations. Heavy snowfall followed by high winds often create areas of unstable snow accumulations that can be set in motion by human activities, such as hiking, ice climbing, skiing, and snowboarding.

**Inland Flooding:** Inland flooding is generally defined as a high flow, overflow, or inundation by water, which causes or threatens damage. Flooding results from the overflow of rivers, their tributaries and streams primarily from high precipitation events. Flash flooding is defined as a flow with a rapid rise in water level and extreme velocities in a river or stream, beginning within six hours of the causative event (e.g., intense rainfall, dam failure, ice jam). Ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters. Because of New Hampshire's steep terrain in the headwaters of watersheds, particularly outside of the coastal plain, flash floods also lead to river bank and bed erosion. Extreme precipitation events in recent years, such as Tropical Storm Irene, have led to buildings on the edges of streambanks becoming at risk to river erosion, or culvert failures. The National Flood Insurance Program (NFIP) has a more specific definition of flooding, which can also be considered and used when looking at floodplain and floodplain mapping.

A flood is defined by the NFIP as:

- A general and temporary condition of partial or complete inundation of 2 or more acres of normally dry land area or of 2 or more properties (at least 1 of which is the policyholder's property) from:
  - Overflow of inland or tidal waters
  - Unusual and rapid accumulation or runoff of surface waters from any source
  - Mudflow
- Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above.

Areas that have been identified as part of the 1% annual chance floodplain in support of the NFIP simply represent those areas for which mapping has been performed. With sufficient rainfall, snowmelt, or through the result of ice jam formation or in the event of dam failure, all areas that are floodplain adjacent to rivers and streams are prone to flood inundation. Developed areas are susceptible to poor drainage flooding during episodes of heavy rain that falls within a short duration. Such flooding is the result of the concentration of impervious surfaces where the amount of concrete, asphalt, rooftops, and other minimally or non-porous materials concentrates flow to stormwater systems that, during heavy rain, cannot always handle the input, causing flooding conditions on streets and parking lots.

**Drought:** A drought is basically the absence of water in an area that occurs slowly due to below-average precipitation over an extended period, resulting in low stream flows, low surface water, and low groundwater levels. Mitigation for drought is difficult, however, preparedness can help to reduce the impacts that a drought can have. During a drought, water stored in aquifers and surface reservoirs becomes increasingly important to offset the lack of rain, especially in areas of high agricultural production. Conservation of water usage prior to, and during a drought can help reduce the potential water shortages that often occur during a drought.

**Earthquakes:** The United States Geological Survey (USGS) defines an earthquake as a sudden slip on a fault. Tectonic plates are always slowly moving, but can get stuck on edges due to friction. When the stress on the plates overcomes the friction, there is an earthquake that releases an energy wave that travels through the earth's crust. The earthquake hazard is anything associated with an earthquake that may affect the normal activities of people; such as, surface faulting, ground shaking, landslides, tsunamis, structural

damage, etc. There are two primary ways in which earthquakes are measured, magnitude (the size of the earthquake) and intensity (measure of the shaking and damage, which can vary from location to location). Magnitude is measured in the Moment Magnitude scale (based off the obsolete Richter scale). The Modified Mercalli Intensity (MMI) classifies the perceived feeling of the earthquake.

**Extreme Temperatures:** Extreme temperatures are a period of prolonged and/or excessive hot or cold that presents a danger to human health and life.

**Extreme heat** is characterized by abnormally high temperatures and/or longer than average time periods of high temperatures. These event conditions are typically infrequent. When they do occur, however, they are usually in late July and August. The severity of extreme heat can be dangerous to those residents with medical conditions and the older population. It is important to have cooling areas and a good supply of water available. Extreme heat can add to the potential for wildfires and depletion of the water supply for firefighting. Extreme heat can also damage or kill crops and animals (wild, farm, or domesticated), potentially presenting a risk to the economy.

The National Weather Service (NWS) provides the following definitions (northeast ranges):

- **Heat Advisory:** Two or more consecutive hours of Heat Index values of 95-99 degrees Fahrenheit for two or more days OR any duration of Heat Index values of 100-104 degrees Fahrenheit. A Heat Advisory is issued within 12 hours of the onset of extremely dangerous heat conditions.
- **Excessive Heat Warning:** Two or more hours with Heat Index values of 105 degrees Fahrenheit or greater. An Excessive Heat Warning is issued within 12 hours of the onset of extremely dangerous heat conditions.
- **Excessive Heat Watches:** Heat watches are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. A Watch is used when the risk of a heat wave has increased but its occurrence and timing is still uncertain.
- **Excessive Heat Outlooks:** Issued when the potential exists for an excessive heat event in the next 3-7 days. An Outlook provides information to those who need considerable lead-time to prepare for the event.

**Extreme Cold** events occur during meteorological cold waves, also known as cold snaps that are caused by the southern transport of arctic air masses into the Northeast. These events are most common in winter months and increase the likelihood of cold disorders in humans and animals that have prolonged exposure to low ambient temperatures. Cold disorders can include frostbite and hypothermia which can eventually lead to death. Extreme cold can also damage or kill crops and animals (wild, farm, or domesticated), potentially presenting a risk to the economy.

The National Weather Service provides the following definitions (northeast ranges):

- **Wind Chill Watch:** NWS issues a wind chill watch when dangerously cold wind chill values are possible. As with a warning, adjust your plans to avoid being outside during the coldest parts of the day. Make sure your car has at least a half a tank of gas, and update your winter survival kit.
- **Wind Chill Advisory:** NWS issues a wind chill advisory when seasonably cold wind chill values but not extremely cold values are expected or occurring. Be sure you and your loved ones' dress appropriately and cover exposed skin when venturing outdoors. A Wind Chill Advisory is issued for New Hampshire if wind chill values are expected to be -20°F to -29°F and winds are greater than 5 mph.
- **Wind Chill Warning:** NWS issues a wind chill warning when dangerously cold wind chill values are expected or occurring. A Wind Chill Advisory is issued for New Hampshire if wind chill values are expected to be -30°F and winds are greater than 5 mph.
- **Freeze Watch:** NWS issues a freeze watch when there is a potential for significant, widespread freezing temperatures within the next 24-36 hours. A freeze watch is issued in the autumn until the end of the growing season and in the spring at the start of the growing season.

- **Frost Advisory:** A frost advisory means areas of frost are expected or occurring, posing a threat to sensitive vegetation.
- **Freeze Warning:** When temperatures are forecasted to go below 32°F for a long period of time, NWS issues a freeze warning. This temperature threshold kills some types of commercial crops and residential plants.
- **Hard Freeze Warning:** NWS issues a hard freeze warning when temperatures are expected to drop below 28°F for an extended period of time, killing most types of commercial crops and residential plants.

**High Wind Events:** The State of New Hampshire experiences two types of high wind events that may result from other severe storms and may occur at any time of the year:

**Tornadoes:** A tornado is a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground. Because wind is invisible, it is hard to see a tornado unless it forms a condensation funnel made up of water droplets, dust and debris. Tornadoes are the most violent of all atmospheric storms.

**Straight-line winds:** This term describes any thunderstorm wind that is not associated with rotation, and is usually used to differentiate from tornadic winds. There are several sub-types of straight-line winds:

- **Downdraft** - small-scale column of air that rapidly sinks towards the ground.
- **Downburst** - result of a downdraft, referred to as a macroburst when the area affected is greater than 2.5 miles and microburst when less than 2.5 miles.
- **Gust Front** - leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Characterized by wind shift, temperature drop and gusty winds in front of a thunderstorm.
- **Derecho** - widespread, long-lived wind storm that is associated with a band of rapidly moving showers or thunderstorms. A typical derecho consists of numerous microbursts, downbursts and downburst clusters. By definition, if the wind damage swath extends more than 240 miles and includes wind gusts of at least 58 mph or greater along most of its length, then the event may be classified as a derecho.

**Infectious Disease/Pandemic:** Infectious diseases are illnesses caused by organisms - such as bacteria, viruses, fungi or parasites. Many organisms live in and on our bodies. They're normally harmless or even helpful, but under certain conditions, some organisms may cause disease. Some infectious diseases can be passed from person to person, some are transmitted by bites from insects or animals and others are acquired by ingesting contaminated food or water or being exposed to organisms in the environment. Signs and symptoms vary depending on the organism causing the infection, but often include fever and fatigue. Mild infections get better on their own without treatment, while some are life-threatening infections and may require hospitalization. Wide-spread infectious diseases may cause mass causality regionally and world-wide.

**Landslide:** A landslide is the downward or outward movement of earth materials on a slope that is reacting to a combination of the force of gravity and a predisposed weakness in the material that allows the sliding process to initiate. The broad classification of landslides includes mudflows, mudslides, debris flows, rockslides, debris avalanches, debris slides, and earth flows. Landslides may be formed when a layer of soil atop a slope becomes saturated by significant precipitation and slides along a more cohesive layer of soil or rock. Although gravity becomes the primary reason for a landslide once a slope has become weak through a process such as the one just described, other causes can include:

- Erosion by rivers or the ocean that creates over-steepened slopes through erosion of the slope's base. In the case of rivers, this can occur as a result of flash flooding.
- Rock and soil slopes are weakened through saturation by snowmelt or heavy rains.
- Earthquake creates stress that makes weak slopes fail - earthquakes of 4.0 magnitude and greater have been known to trigger landslides.
- Wildfires (loss of vegetation).



- Excess weight from accumulation of rain or snow, stockpiling of rock or ore and other material.

**Lightning:** Lightning is a visible electric discharge produced by a thunderstorm. Thunder always accompanies lightning, but may or may not be heard depending on the position of the observer. As lightning passes through the air, it heats the air to a temperature of 18,000-60,000 degrees Fahrenheit. This causes the air to rapidly expand and contract creating a sound wave known as thunder. Thunder can be heard up to 10 miles away from the strike. At longer distances thunder sounds like a low rumble as the higher frequency sounds are absorbed by the environment.

**Severe Winter Weather:** The State of New Hampshire experiences four types of severe weather during the winter months, which usually bring snow, high winds and/or rain depending on temperatures.

Heavy snow - Heavy snow is generally defined as:

- Snowfall accumulating to 4" or more in depth in 12 hours or less; or
- Snowfall accumulating to 6" or more in depth in 24 hours or less.

Blizzard - A blizzard is a snowstorm with the following conditions that is expected to prevail for a period of 3 hours or longer:

- Sustained wind or frequent gusts to 35mph or greater and considerable falling and/or blowing snow that frequently reduces visibility to less than ¼ mile.

Nor'easter - A Nor'easter is a large cyclonic storm that tracks north/northeastward along the East Coast of North America. It is so named due to the northeasterly prevailing wind direction that occurs during the storm. While these storms may occur at any time of the year, they are most frequent and severe during the months of September through April. Nor'easters usually develop off the east coast between Georgia and New Jersey, travel northeastward, and intensify in the New England region. Nor'easters nearly always bring precipitation in the form of heavy rain and/or snow, as well as gale force winds, rough seas, and coastal flooding.

Ice Storm - Ice storms typically occur with warm frontal boundaries, where warm air rises up and over a shallow mass of cold air near the earth's surface. When snow falls from clouds near just north of the warm frontal boundary, it will fall through the deep warm layer aloft first and melt completely into a liquid water droplet. As it passes through the shallow cold layer near the surface, the water droplet cools to the point of being supercooled (a liquid raindrop that remains a liquid at the freezing point). When these supercooled water droplets make contact with freezing surfaces on the ground, such as streets and walkways, they freeze on contact forming layers of ice. This process of freezing rain, when persistent over a long period of time, will form layers that may exceed over an inch thick in extreme cases. Any accumulation of ice can present hazards; however, significant accumulations of ice (1/4" or greater) can pull down trees and utility lines resulting in loss of power and communications. Walking and driving also becomes very dangerous to almost impossible during an ice storm.

**Solar Storms and Space Weather:** The term space weather is relatively new and describes the dynamic conditions in the Earth's outer space environment, similar to how the terms "climate" and "weather" refer to the conditions in the Earth's lower atmosphere. Space weather includes any and all conditions and events on the sun, in the solar wind, in near-Earth space, and in our upper atmosphere that can affect space-borne and ground based technological systems.

The entire State of New Hampshire is at risk for solar storms and space weather. Space weather affects Earth due to the sun sending energy across the Earth in the form of light and electrically charged particles and magnetic fields. Although space weather has occurred since the beginning of time, little was understood about the causes and impacts of these instances on the planet. As society becomes increasingly reliant on electronics and technology, the hazards presented by space weather are not to be underestimated. The magnetic disturbances that solar storms can bring can disrupt communications, damage or destroy electronic components, corrode gas and oil pipelines, and cause significant damage to spacecraft and satellites. Radio operators have long been aware of the effects of space weather and how it impacts radio communications, especially those in the High Frequency (HF) band (3-30MHz). Depending on atmospheric conditions from space weather, radio signals can be partially or completely blocked.

**Hurricane and Tropical Storm:** A *hurricane* is a tropical cyclone in which winds reach speeds of 74 miles per hour or more and blow in a large spiral around a relatively calm center. The eye of the storm is usually 20-30 miles wide and may extend over 400 miles. High winds and flooding are primary causes of hurricane-inflicted loss of life and property damage. *Tropical Storms* are typically storms that have been downgraded from a hurricane as it reaches further inland. These storms often have large amounts of rain and severe wind, but wind speeds do not reach the level to be classified as a hurricane.

**Wildfire:** A wildfire is any non-structural fire, other than prescribed fire, that occurs in the Wildland. Wildland here is defined as consisting of vegetation or natural fuels. Wildfires can be referred to as brushfires, wildland fires, or grass fires depending on the location and what is burning.

## Technological Hazards

**Aging Infrastructure:** The continued regression of the public physical systems including, but not limited to roads and bridges, culverts, utilities, water, and sewage.

**Conflagration:** A large and destructive fire that threatens human life, animal life, health, and/or property. It may also be described as a blaze or simply a (large) fire. A conflagration can begin accidentally, be naturally caused (wildfire), or intentionally created (arson). Conflagrations have the potential to cause loss of life, property devastation/destruction and potential negative economic impacts.

**Dam Failure:** Dam failure is defined as the sudden, rapid, and uncontrolled release of impounded water.

**Known & Emerging Contaminants:** Contaminants in drinking water include naturally occurring contaminants associated with the geology in a given region and known man-made contaminants associated with nearby land use activities. Some contaminants are considered emerging contaminants.

Man-made Contaminants - Man-made chemicals that have been historically recognized to impact some groundwater and surface water sources of drinking water include volatile organic compounds, pesticides, semi-volatile compounds, radionuclides, nitrates/nitrites, metals, and radionuclides.

Emerging Contaminants - *Emerging contaminants* are chemicals that historically have not been monitored in drinking water due to the lack of laboratory capabilities to detect the compounds or a lack of knowledge about the use of certain compounds and their potential to cause human health impacts. Emerging contaminants have been detected in surface and groundwater that are sources of drinking water in the State of New Hampshire. The latest incidents in New Hampshire to garner widespread media and public attention were related to the discovery of poly and perfluoroalkyl substances, more commonly referred to as PFAS. Historically, other emerging contaminants have spiked public concern, including Methyl Tertiary Butyl Ether (MtBE), which is a manufactured chemical used to increase the octane rating of gasoline. MtBE degrades slowly and is highly soluble in water, allowing it to spread further and last longer in groundwater than many other contaminants.

**Hazardous Materials:** A hazardous material is any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Hazardous materials spills or releases can cause damage or loss to life and property. Short or long-term evacuation of local residents and businesses may be required, depending on the nature and extent of the incident.

**Long-term Utility Outage:** A long-term utility outage is defined as a prolonged absence of any type of public utility that is caused by infrastructure failure, cyber-attack, supply depletion, distribution disruption, water source contamination, or a natural, human-caused or technological disaster. This plan considers a long-term utility outage as one lasting two weeks more, or a prolonged outage that causes extreme cascading impacts.

**Radiological:** Radiological hazards can range from relatively localized incidents involving small amounts of radioactive materials to large-scale catastrophic events. Smaller sources of radiation hazards may be

found in medical facilities, industrial and laboratory facilities where radioactive materials and/or radiation producing devices are used. Some radiation is produced naturally from decomposition of radioactive isotopes in soils and underlying strata.

## **Human-Caused Hazards**

**Cyber Event:** The Department of Homeland Security (DHS) defines a cyber incident as an event occurring on or conducted through a computer network that actually or imminently jeopardizes the confidentiality, integrity, or availability of computers, information or communications systems or networks, physical or virtual infrastructure controlled by computers or information systems.

**Mass Casualty Incident:** Any large number of casualties (sick, injured, or dead) produced in a relatively short period of time, usually as the result of a single incident such as a military aircraft accident, hurricane, flood, earthquake, or armed attack that exceeds local logistic support capabilities.

**Terrorism/Violence:** Premeditated, politically motivated violence perpetrated against noncombatant targets by subnational groups or clandestine agents.

**Transport Accident:** A transport accident is any accident that occurs during transportation that has multiple injuries or deaths, or has significant impact to the roadways and surrounding area. Specifically, for this plan, it refers to an aviation, tractor trailer, or vehicle accident.

# **Appendix B: Risk Assessment**

## Risk Assessment

The Hazard Mitigation Working Group met to discuss the Towns' risk assessment and assign rating scores. Consideration was given to climate change, current capabilities, Town assets and critical infrastructure, and previous occurrences when determining the scale of impacts and overall risk. The following terms were used to analyze the hazards:

**Impacts:** The ***Impact*** is an estimate generally based on a hazard's effects on humans, property and businesses. The Working Group determined the impact rating for each of the previously identified hazards. The average impact score was calculated by computing the average of the human, property and business impact scores. The impact ratings were broken down into the following categories:

### Impact Scoring

- 1 - Inconvenience, reduced service/productivity, minor damages, non-life-threatening injuries.
- 3 - Moderate to major damages, temporary closure and reduced service/productivity, numerous injuries and deaths.
- 6 - Devastation and significant injuries and deaths, permanent closure and/or relocation of services, long-term effects.

**Probability of Occurrence:** The *Probability of Occurrence* is a numeric value that represents the likelihood that the given hazard will occur within the next 10 years. This value was chosen based on historical information. The Working Group determined the probability of occurrence rating for each of the previously identified hazards. The probability of occurrence ratings was broken into the following categories:

Low: There is little likelihood that this event will occur within the next 10 years (1 event in 10 years).

Medium: There is moderate likelihood that this event will occur within the next 10 years (1-2 events each 5-10 years).

High: There is great likelihood that this event will occur within the next 10 years (1-2 events each year).

### Probability Scoring

- 1 - 33% probability of occurring within 10 years (Low)
- 3 - 34-66% probability of occurring within 10 years (Medium)
- 6 - 67-100% probability of occurring within 10 years (High)

**Severity** - Severity is calculated by taking the average of the vulnerability for human, business and property impacts of each hazard type.

**Risk** - Risk is an adjective description (High, Medium, or Low) of the overall threat posed by a hazard over the next 10 years. It is calculated by multiplying the probability of occurrence and severity.

Low: There is little potential for a disaster during the next 10 years. The threat is such as to warrant no special effort to prepare for, respond to, recover from, or mitigate against this hazard. This hazard does not need to be specifically addressed in the Town's emergency management training and exercise program except as generally dealt with during hazard awareness training.

Medium: There is moderate potential for a disaster of less than major proportions during the next 10 years. The threat is great enough to warrant modest effort to prepare for, respond to, recover from, and mitigate against this hazard. This hazard should be included in the Town's emergency management training and exercise program.

**High:** Risks that are considered to be high were likely ranked so due to (1) a strong potential for a disaster of major proportions during the next 10 years; or (2) history suggests the occurrence of multiple disasters of moderate proportions during the next 10 years. The threat is significant enough to warrant major program effort to prepare for, respond to, recover from, and mitigate against this hazard. This hazard should be a major focus of the Towns' emergency management training and exercise program.

**Overall Risk:** The *Overall Risk* is a representation of the combined *potential impact* and *probability of occurrence* ratings. This is calculated by multiplying the probability of occurrence rating score by the impact rating score (the average of human, property and business impacts). The goal of identifying the overall risk of each identified hazard is to assist the Town in determining which hazards pose the largest potential threat. The overall risk ratings are broken down and color coded into the following categories:

White: values 1 - 6, Low Risk

Yellow: values 7 - 12, Medium Risk

Red: values 13 - 18, High Risk

# **Appendix C: Resources**

## Resources Used in the Preparation of this Plan

NH HSEM's State of New Hampshire Natural Hazards Mitigation Plan (2018)  
 FEMA's Understanding Your Risks: Identifying Hazards and Estimating Losses  
 Local Mitigation Planning Handbook  
 Town of Chesterfield, NH's Master Plan

## Agencies

<b>New Hampshire Homeland Security and Emergency Management (HSEM)</b> .....	271-2231
Field Representative Hillsborough County: Liz Gilboy.....	603-223-3613
Mitigation Officer: Kayla Henderson.....	271-2231
Mitigation Planner: Meaghan Wells .....	223-3655
<b>Federal Emergency Management Agency (FEMA)</b> .....	877-336-2734
<b>NH Regional Planning Commissions:</b>	
Central NH Regional Planning Commission .....	226-6020
Lakes Region Planning Commission .....	279-8171
Nashua Regional Planning Commission .....	883-0366
North Country Council .....	444-6303
Rockingham Planning Commission .....	778-0885
Southern New Hampshire Planning Commission .....	669-4664
Southwest Region Planning Commission .....	357-0557
Strafford Regional Planning Commission .....	742-2523
Upper Valley Lake Sunapee Regional Planning Commission .....	448-1680
<b>NH Executive Department:</b>	
Governor's Office of Energy and Community Services .....	271-2611
<b>NH Department of Cultural Resources:</b> .....	271-2540
Division of Historical Resources .....	271-3483
<b>NH Department of Environmental Services:</b> .....	271-3503
Air Resources .....	271-1370
Air Toxins Control Program.....	271-0901
Asbestos Program.....	271-1373
Childhood Lead Poisoning Prevention Program.....	271-5733
Environmental Health Tracking Program.....	271-4072
Environmental Toxicology Program .....	271-3994
Health Risk Assessment Program.....	271-6909
Indoor Air Quality Program.....	271-3911
Occupational Health and Safety Program.....	271-2024
Radon Program.....	271-4764
Geology Unit .....	271-3503
Pollution Preventive Program.....	271-6460
Waste Management .....	271-2900
Water Supply and Pollution Control .....	271-3414
Rivers Management and Protection Program .....	271-8801
<b>NH Office of Strategic Initiatives (OSI)</b> .....	271-2155
<b>NH Municipal Association</b> .....	224-7447
<b>NH Fish and Game Department</b> .....	271-3421
Region 1, Lancaster.....	788-3164
Region 2, New Hampton .....	744-5470
Region 3, Durham .....	868-1095
Region 4, Keene.....	352-9669
<b>NH Department of Business and Economic Affairs:</b> .....	271-2411
Economic Development .....	271-2629
Travel and Tourism .....	271-6870
Division of Forests and Lands .....	271-2214
Division of Parks and Recreation .....	271-3556
Design, Development, and Maintenance .....	271-2411



<b>NH Department of Transportation</b> .....	271-3734
<b>Northeast States Emergency Consortium, Inc. (NESEC)</b> .....	(781) 224-9876
<b>US Department of Commerce:</b> .....	(202) 482-2000
NOAA: National Weather Service; Taunton, Massachusetts .....	(508) 824-5116
<b>US Department of the Interior:</b> .....	202-208-3100
US Fish and Wildlife Service .....	225-1411
US Geological Survey .....	225-4681
US Army Corps of Engineers .....	(978) 318-8087
<b>US Department of Agriculture:</b>	
Natural Resource Conservation Service .....	868-7581
Cheshire County, Walpole .....	756-2988
Sullivan County, Newport .....	863-4297
Hillsborough County, Milford .....	673-2409 Ext. #4

### Mitigation Funding Resources

404 Hazard Mitigation Grant Program (HMGP).....	NH Homeland Security and Emergency Management
406 Public Assistance and Hazard Mitigation.....	NH Homeland Security and Emergency Management
Community Development Block Grant (CDBG) .....	NH HSEM, NH OSI, also refer to RPC
Dam Safety Program .....	NH Department of Environmental Services
Emergency Generators Program by NESEC <sup>‡</sup> .....	NH Homeland Security and Emergency Management
Emergency Watershed Protection (EWP) Program.....	USDA, Natural Resources Conservation Service
Flood Mitigation Assistance Program (FMAP) .....	NH HSEM, NH OSI
Flood Plain Management Services (FPMS) .....	US Army Corps of Engineers
Mitigation Assistance Planning (MAP) .....	NH Homeland Security and Emergency Management
Mutual Aid for Public Works .....	NH Municipal Association
National Flood Insurance Program (NFIP) <sup>†</sup> .....	NH OSI, NH HSEM
Power of Prevention Grant by NESEC <sup>‡</sup> .....	NH Homeland Security and Emergency Management
Project Impact .....	NH Homeland Security and Emergency Management
Roadway Repair & Maintenance Program(s).....	NH Department of Transportation
Section 14 Emergency Stream Bank Erosion & Shoreline Protection .....	US Army Corps of Engineers
Section 103 Beach Erosion.....	US Army Corps of Engineers
Section 205 Flood Damage Reduction.....	US Army Corps of Engineers
Section 208 Snagging and Clearing .....	US Army Corps of Engineers
Shoreline Protection Program.....	NH Department of Environmental Services
Various Forest and Lands Program(s).....	NH Department of Business and Economic Affairs
Wetlands Programs .....	NH Department of Environmental Services

<sup>‡</sup>NESEC - Northeast States Emergency Consortium, Inc. is a 501(c)(3), not-for-profit natural disaster, multi-hazard mitigation and emergency management organization located in Wakefield, Massachusetts. Please, contact NH HSEM for more information or visit the Consortium's website at <http://www.nesec.org/index.cfm>.

<sup>†</sup> Note regarding **National Flood Insurance Program (NFIP)** and **Community Rating System (CRS)**:

The National Flood Insurance Program has developed suggested floodplain management activities for those communities who wish to more thoroughly manage or reduce the impact of flooding in their jurisdiction. Through use of a rating system (CRS rating), a community's floodplain management efforts can be evaluated for effectiveness. The rating, which indicates an above average floodplain management effort, is then factored into the premium cost for flood insurance policies sold in the community. The higher the rating achieved in that community, the greater the reduction in flood insurance premium costs for local property owners. The NH Office of Strategic Initiatives can provide additional information regarding participation in the NFIP-CRS Program.

## **FEMA Region 1 Mitigation Planning Webliography**

Hazard Mitigation is sustained action taken to reduce or eliminate risk to people and their property from natural hazards over the longest possible term.

### **REGULATORY INFORMATION**

Final Rule

44 CFR 201.6

<http://www.fema.gov/pdf/help/fr02-4321.pdf>

Disaster Mitigation Act of 2000 (DMA 2K)

<http://www.fema.gov/library/viewRecord.do?id=1935>

### **DISASTERS AND NATURAL HAZARDS INFORMATION**

FEMA-How to deal with specific hazards

<http://www.ready.gov/natural-disasters>

Natural Hazards Center at the University of Colorado

<http://www.colorado.edu/hazards>

National Oceanic and Atmospheric Administration (NOAA): Information on various projects and research on climate and weather.

<http://www.websites.noaa.gov>

National Climatic Data Center active archive of weather data.

<http://lwf.ncdc.noaa.gov/oa/ncdc.html>

Northeast Snowfall Impact Scale

<http://www.erh.noaa.gov/rnk/Newsletter/Fall%202007/NESIS.htm>

Weekend Snowstorm Strikes The Northeast Corridor Classified As A Category 3 "Major" Storm

<http://www.publicaffairs.noaa.gov/releases2006/feb06/noaa06-023.html>

### **FLOOD RELATED HAZARDS**

FEMA Coastal Flood Hazard Analysis & Mapping

<http://www.fema.gov/national-flood-insurance-program-0/fema-coastal-flood-hazard-analyses-and-mapping-1>

Floodsmart

<http://www.floodsmart.gov/floodsmart/>

National Flood Insurance Program (NFIP)

<http://www.fema.gov/nfip>

Digital quality Level 3 Flood Maps

<http://msc.fema.gov/MSD/statemap.htm>

Flood Map Modernization

<http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/map-modernization>

Reducing Damage from Localized Flooding: A Guide for Communities, 2005 FEMA 511

<http://www.fema.gov/library/viewRecord.do?id=1448>

## **FIRE RELATED HAZARDS**

Firewise

<http://www.firewise.org>

NOAA Fire Event Satellite Photos

<http://www.osei.noaa.gov/Events/Fires>

U.S. Forest Service, USDA

<http://www.fs.fed.us/land/wfas/welcome.htm>

Wildfire Hazards – A National Threat

<http://pubs.usgs.gov/fs/2006/3015/2006-3015.pdf>

## **GEOLOGIC RELATED HAZARDS**

USGS Topographic Maps

<http://topomaps.usgs.gov/>

Building Seismic Safety Council

<http://www.nibs.org/?page=bssc>

Earthquake hazard history by state

<http://earthquake.usgs.gov/earthquakes/states/>

USGS data on earthquakes

<http://earthquake.usgs.gov/monitoring/deformation/data/download/>

USGS Earthquake homepage

<http://quake.wr.usgs.gov>

National Cooperative Geologic Mapping Program (NCGMP)

<http://ncgmp.usgs.gov/>

Landslide Overview Map of the Conterminous United States

<http://landslides.usgs.gov/learning/nationalmap/>

Kafka, Alan L. 2008. Why Does the Earth Shake in New England? Boston College, Weston Observatory, Department of Geology and Geophysics

[http://www2.bc.edu/~kafka/Why\\_Quakes/why\\_quakes.html](http://www2.bc.edu/~kafka/Why_Quakes/why_quakes.html)

Map and Geographic Information Center, 2010, "Connecticut GIS Data", University of Connecticut

[http://magic.lib.uconn.edu/connecticut\\_data.html](http://magic.lib.uconn.edu/connecticut_data.html)

2012 Maine earthquake

[http://www.huffingtonpost.com/2012/10/17/maine-earthquake-2012-new-england\\_n\\_1972555.html](http://www.huffingtonpost.com/2012/10/17/maine-earthquake-2012-new-england_n_1972555.html)

## **WIND-RELATED HAZARDS**

ATC Wind Speed Web Site

<http://www.atcouncil.org/windspeed/index.php>

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U.S. Wind Zone Maps

<http://www.fema.gov/safe-rooms/wind-zones-united-states>

Tornado Project Online

<http://www.tornadoproject.com/>

National Hurricane Center

<http://www.nhc.noaa.gov>

Community Hurricane Preparedness Tutorial

<http://meted.ucar.edu/hurricane/chp/hp.htm>

National Severe Storms Laboratory, 2009, "Tornado Basics",

[http://www.nssl.noaa.gov/primer/tornado/tor\\_basics.html](http://www.nssl.noaa.gov/primer/tornado/tor_basics.html)

## **DETERMINING RISK AND VULNERABILITY**

HAZUS

<http://www.hazus.org>

FEMA Hazus Average Annualized Loss Viewer

<http://fema.maps.arcgis.com/home/webmap/viewer.html?webmap=cb8228309e9d405ca6b4db6027df36d9&extent=-139.0898,7.6266,-48.2109,62.6754>

Vulnerability Assessment Tutorial: On-line tutorial for local risk and vulnerability assessment

<http://www.csc.noaa.gov/products/nchaz/htm/mitigate.htm>

Case Study: an example of a completed risk and vulnerability assessment

<http://www.csc.noaa.gov/products/nchaz/htm/case.htm>

## **GEOGRAPHIC INFORMATION SYSTEMS (GIS) AND MAPPING**

The National Spatial Data Infrastructure & Clearinghouse (NSDI) and Federal Geographic Data Work Group (FGDC) Source for information on producing and sharing geographic data

<http://www.fgdc.gov>

The OpenGIS Consortium Industry source for developing standards and specifications for GIS data

<http://www.opengis.org>

Northeast States Emergency Consortium (NESEC): Provides information on various hazards, funding resources, and other information

<http://www.nesec.org>

US Dept of the Interior Geospatial Emergency Management System (IGEMS) provides the public with both an overview and more specific information on current natural hazard events. It is supported by the Department of the Interior Office of Emergency Management.

<http://igems.doi.gov/>

FEMA GeoPlatform: Geospatial data and analytics in support of emergency management

<http://fema.maps.arcgis.com/home/index.html>

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## **DATA GATHERING**

National Information Sharing Consortium (NISC): brings together data owners, custodians, and users in the fields of homeland security, public safety, and emergency management and response. Members leverage efforts related to the governance, development, and sharing of situational awareness and incident management resources, tools, and best practices <http://nisconsortium.org/>

The Hydrologic Engineering Center (HEC), an organization within the Institute for Water Resources, is the designated Center of Expertise for the US Army Corps of Engineers  
<http://www.hec.usace.army.mil/>

National Water & Climate Center  
<http://www.wcc.nrcs.usda.gov/>

WinTR-55 Watershed Hydrology  
<http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/?&cid=stelprdb1042901>

USACE Hydrologic Engineering Center (HEC)  
<http://www.hec.usace.army.mil/software/>

Stormwater Manager's Resource Center SMRC  
<http://www.stormwatercenter.net>

USGS Current Water Data for the Nation  
<http://waterdata.usgs.gov/nwis/rt>

USGS Water Data for the Nation  
<http://waterdata.usgs.gov/nwis/>

Topography Maps and Aerial photos  
<http://www.terraserver.com/view.asp?tid=142>

National Register of Historic Places  
<http://www.nps.gov/nr/about.htm>

National Wetlands Inventory  
<http://www.fws.gov/wetlands/>

ICLUS Data for Northeast Region  
[http://www.epa.gov/ncea/global/iclus/inclus\\_nca\\_northeast.htm](http://www.epa.gov/ncea/global/iclus/inclus_nca_northeast.htm)

## **PLANNING**

American Planning Association  
<http://www.planning.org>

Planners Web - Provides city and regional planning resources  
<http://www.plannersweb.com>

## **FEMA RESOURCES**

Federal Emergency Management Agency (FEMA)  
[www.fema.gov](http://www.fema.gov)

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National Mitigation Framework

<http://www.fema.gov/national-mitigation-framework>

Federal Insurance and Mitigation Administration (FIMA)

<http://www.fema.gov/fima>

Community Rating System (CRS) <http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-rating-system>

FEMA Building Science

<http://www.fema.gov/building-science>

National Flood Insurance Program (NFIP)

<http://www.fema.gov/national-flood-insurance-program>

Floodplain Management & Community Assistance Program

<http://www.fema.gov/floodplain-management>

Increased Cost of Compliance (ICC): ICC coverage allows homeowners whose structures have been repeatedly or substantially damaged to cover the cost of elevation and design requirements for rebuilding with their flood insurance claim up to a maximum of \$30,000.

<http://www.fema.gov/national-flood-insurance-program-2/increased-cost-compliance-coverage>

National Disaster Recovery Framework

<http://www.fema.gov/national-disaster-recovery-framework>

Computer Sciences Corporation: contracted by FIMA as the NFIP Statistical Agent, CSC provides information and assistance on flood insurance to lenders, insurance agents and communities

[www.csc.com](http://www.csc.com)

Integrating the Local Natural Hazard Mitigation Plan into a Community's Comprehensive Plan: A Guidebook for Local Governments

<https://www.fema.gov/ar/media-library/assets/documents/89725>

Mitigation Best Practices Portfolio

<http://www.fema.gov/mitigation-best-practices-portfolio>

FEMA Multi-Hazard Mitigation Planning Website

<http://www.fema.gov/multi-hazard-mitigation-planning>

FEMA Resources Page <http://www.fema.gov/plan/mitplanning/resources.shtm>

Local Mitigation Plan Review Guide <http://www.fema.gov/library/viewRecord.do?id=4859>

Local Mitigation Planning Handbook complements and liberally references the Local Mitigation Plan Review Guide above

<http://www.fema.gov/library/viewRecord.do?id=7209>

HAZUS

<http://www.fema.gov/protecting-our-communities/hazus>

Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards

<http://www.fema.gov/library/viewRecord.do?id=6938>

Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials  
<http://www.fema.gov/library/viewRecord.do?id=7130>

Mitigation Planning for Local and Tribal Communities  
Independent Study Course  
<http://training.fema.gov/EMIWeb/IS/is318.asp>

Region 1 Mitigation Contacts  
Marilyn Hilliard  
Senior Planner  
Phone: (617) 956-7536  
Email: [marilyn.hilliard@fema.dhs.gov](mailto:marilyn.hilliard@fema.dhs.gov)

Nan Johnson  
Community Planner  
Phone: 617-956-7672  
Email: [nan.johnson@fema.dhs.gov](mailto:nan.johnson@fema.dhs.gov)  
Massachusetts; Rhode Island; Vermont

Brigitte Ndikum-Nyada  
Community Planner  
Phone: 617-956-7614  
Email: [brigitte.ndikum-nyada@fema.dhs.gov](mailto:brigitte.ndikum-nyada@fema.dhs.gov)  
Connecticut; Maine; New Hampshire  
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## **OTHER FEDERAL RESOURCES**

U.S. Army Corps of Engineers: Provides funding for floodplain management planning and technical assistance and other water resources issues. [www.nae.usace.army.mil](http://www.nae.usace.army.mil)

Natural Resources Conservation Service: Technical assistance to individual land owners, groups of landowners, communities, and soil and water conservation districts. [www.nrcs.usda.gov](http://www.nrcs.usda.gov)

NOAA Coastal Services Center <http://www.csc.noaa.gov/>

Rural Economic and Community Development: Technical assistance to rural areas and smaller communities in rural areas on financing public works projects. [www.rurdev.usda.gov](http://www.rurdev.usda.gov)

Farm Service Agency: Manages the Wetlands Reserve Program (useful in open space or acquisition projects by purchasing easements on wetlands properties) and farmland set aside programs  
[www.fsa.usda.gov](http://www.fsa.usda.gov)

National Weather Service: Prepares and issues flood, severe weather and coastal storm warnings. Staff hydrologists can work with communities on flood warning issues; can give technical assistance in preparing flood-warning plans. [www.weather.gov](http://www.weather.gov)

Economic Development Administration (EDA): Assists communities with technical assistance for economic development planning [www.osec.doc.gov/eda/default.htm](http://www.osec.doc.gov/eda/default.htm)

National Park Service: Technical assistance with open space preservation planning; can help facilitate meetings and identify non-structural options for floodplain redevelopment. [www.nps.gov](http://www.nps.gov)

Fish and Wildlife Services: Can provide technical and financial assistance to restore wetlands and riparian habitats. [www.fws.gov](http://www.fws.gov)

Department of Housing & Urban Development [www.hud.gov](http://www.hud.gov)

Small Business Administration: SBA can provide additional low-interest funds (up to 20% above what an eligible applicant would qualify for) to install mitigation measures. They can also loan the cost of bringing a damaged property up to state or local code requirements. [www.sba.gov/disaster](http://www.sba.gov/disaster)

Environmental Protection Agency [www.epa.gov](http://www.epa.gov)

Sustainability/Adaptation/Climate Change

Why the Emergency Management Community Should be Concerned about Climate Change: A discussion of the impact of climate change on selected natural hazards

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<http://www.cna.org/sites/default/files/research/WEB%2007%2029%2010.1%20Climate%20Change%20and%20the%20Emergency%20Management%20Community.pdf>

Resilient Sustainable Communities: Integrating Hazard Mitigation& Sustainability into Land Use

<http://www.earth.columbia.edu/sitefiles/file/education/documents/2013/Resilient-Sustainable-Communities-Report.pdf>

U.S. EPA

<http://www.epa.gov/climatechange/>

NOAA National Ocean Service (NOS)

<http://oceanservice.noaa.gov/>

The Northeast Climate Research Center (NRCC) folks were heavily involved in climate data in the NCA, below. They have a wealth of historic climate data and weather information, trends, etc.

<http://www.nrcc.cornell.edu/>

NOAA RISA for the Northeast (Regional Integrated Sciences and Assessments) <http://ccrun.org/home>

Community and Regional Resilience: Perspectives from hazards, disasters, and emergency management

[http://www.resilientus.org/library/FINAL\\_CUTTER\\_9-25-08\\_1223482309.pdf](http://www.resilientus.org/library/FINAL_CUTTER_9-25-08_1223482309.pdf)

National Fish, Wildlife and Plants Climate Adaptation Strategy [www.wildlifeadaptationstrategy.gov](http://www.wildlifeadaptationstrategy.gov)

ICLEI Local Governments for Sustainability <http://www.icleiusa.org/>

Kresge Foundation Survey

<http://www.kresge.org/news/survey-finds-communities-northeast-are-trying-plan-for-changes-climate-need-help-0>

New England's Sustainable Knowledge Corridor <http://www.sustainableknowledgecorridor.org/site/>

The Strategic Foresight Initiative (SFI)

[http://www.fema.gov/pdf/about/programs/oppa/findings\\_051111.pdf](http://www.fema.gov/pdf/about/programs/oppa/findings_051111.pdf)

Northeast Climate Choices [http://www.climatechoices.org/ne/resources\\_ne/nereport.html](http://www.climatechoices.org/ne/resources_ne/nereport.html)

Northeast Climate Impacts Assessment <http://www.northeastclimateimpacts.org/>

Draft National Climate Assessment Northeast Chapter released early 2013 <http://ncadac.globalchange.gov/>



Northeast Chapter of the National Climate Assessment of 2009:

<http://www.globalchange.gov/images/cir/pdf/northeast.pdf>

ClimateNE

[www.climate-northeast.com](http://www.climate-northeast.com)

Scenarios for Climate Assessment and Adaptation <http://scenarios.globalchange.gov/>

Northeast Climate Science Center <http://necsc.umass.edu/>

FEMA Climate Change Adaptation and Emergency Management

<https://www.fhhs.dhs.gov/content/climate-change-adaptation-and-emergency-management-0>

Climate Central <http://www.climatecentral.org>

## OTHER RESOURCES

New England States Emergency Consortium (NESEC): NESEC conducts public awareness and education programs on natural disaster and emergency management activities throughout New England. Resources are available on earthquake preparedness, mitigation, and hurricane safety.

[www.nesec.org](http://www.nesec.org)

Association of State Floodplain Managers (ASFPM): ASFPM has developed a series of technical and topical research papers, and a series of proceedings from their annual conferences.

[www.floods.org](http://www.floods.org)

National Voluntary Organizations Active in Disaster (VOAD) is a non-profit, nonpartisan membership organization that serves as the forum where organizations share knowledge and resources throughout the disaster cycle - preparation, response, recovery and mitigation. <http://www.nvoad.org/>

## ADDITIONAL WEBSITES

Sponsor	Internet Address	Summary of Contents
Natural Hazards Research Center, U. of Colorado	<a href="http://www.colorado.edu/hazards/">http://www.colorado.edu/hazards/</a>	Searchable database of references and links to many disaster-related websites.
National Emergency Management Association	<a href="http://nemaweb.org">http://nemaweb.org</a>	Association of state emergency management directors; list of mitigation projects.
NASA – Goddard Space Flight Center “Disaster Finder:	<a href="http://disasterfinder.gsfc.nasa.gov/DisasterManagement/">http://disasterfinder.gsfc.nasa.gov/DisasterManagement/</a> /	Searchable database of sites that encompass a wide range of natural disasters.
NASA Natural Disaster Reference Database	<a href="http://ftpwww.gsfc.nasa.gov/ndrd/main/html">http://ftpwww.gsfc.nasa.gov/ndrd/main/html</a>	Searchable database of worldwide natural disasters.
U.S. State & Local Gateway	<a href="http://www.statelocal.gov/">http://www.statelocal.gov/</a>	General information through the federal-state partnership.
National Weather Service	<a href="http://nws.noaa.gov/">http://nws.noaa.gov/</a>	Central page for National Weather Warnings, updated every 60 seconds.
USGS Real Time Hydrologic Data	<a href="http://waterdata.usgs.gov/nwis/rt">http://waterdata.usgs.gov/nwis/rt</a>	Provisional hydrological data

Dartmouth Flood Observatory	<a href="http://www.dartmouth.edu/~floods">http://www.dartmouth.edu/~floods</a>	Observations of flooding situations.
FEMA, National Flood Insurance Program, Community Status Book	<a href="http://www.fema.gov/about/programs/nfip/index.shtm">http://www.fema.gov/about/programs/nfip/index.shtm</a>	Searchable site for access of Community Status Books
Florida State University Atlantic Hurricane Site	<a href="http://www.met.fsu.edu/explores/tropical.html">http://www.met.fsu.edu/explores/tropical.html</a>	Tracking and NWS warnings for Atlantic Hurricanes and other links
National Lightning Safety Institute	<a href="http://lightningsafety.com/">http://lightningsafety.com/</a>	Information and listing of appropriate publications regarding lightning safety.
NASA Optical Transient Detector	<a href="http://thunder.msfc.nasa.gov/research.html">http://thunder.msfc.nasa.gov/research.html</a>	Space-based sensor of lightning strikes
LLNL Geologic & Atmospheric Hazards	<a href="http://www.llnl.gov/hmc/">http://www.llnl.gov/hmc/</a>	General hazard information developed for the Dept. of Energy.
The Tornado Project Online	<a href="http://www.tornadoproject.com/">http://www.tornadoproject.com/</a>	Information on tornadoes, including details of recent impacts.
National Severe Storms Laboratory	<a href="http://www.nssl.noaa.gov/">http://www.nssl.noaa.gov/</a>	Information about and tracking of severe storms.
Earth Satellite Corporation	<a href="http://www.earthsat.com/">http://www.earthsat.com/</a>	Flood risk maps searchable by state.
USDA Forest Service Web	<a href="http://www.fs.fed.us/land">http://www.fs.fed.us/land</a>	Information on forest fires and land management.

# **Appendix D: Hazard Mitigation Resource Profiles**

The following are resources that can be used in Hazard Mitigation projects:

U.S. Army Corps of Engineers

Contacts:

John Kennelly, Chief, Special Studies Section (for Flood Plain Management Services activities), Phone: (978) 318-8505, Fax: (978) 318-8080, E-mail: [John.R.Kennelly@usace.army.mil](mailto:John.R.Kennelly@usace.army.mil)

Mike Keegan, Chief, Project Planning Section (for Section 14, 103, and 205 authorities), Phone: (978) 318-8087, Fax: (978) 318-8080, E-mail: [Michael.F.Keegan@usace.army.mil](mailto:Michael.F.Keegan@usace.army.mil)

**Address:** US Army Corps of Engineers  
New England District  
696 Virginia Road  
Concord, Massachusetts 01742-2751

Description and Mission:

The Corps of Engineers is a multi-disciplinary engineering and environmental organization that has been identifying and meeting the water resources needs of the nation. These needs have been in the areas of flood damage reduction, flood plain information and management, navigation, shore protection, environmental restoration, water supply, streambank protection, recreation, and fish and wildlife resources conservation, as well as technical assistance in other water resources areas.

The New England District (NAE) of the Corps of Engineers is responsible for managing the Corps' civil responsibilities in a 66,000 square-mile region encompassing the six New England states east of the Lake Champlain drainage basin. The District and its leadership are headquartered in Concord, Massachusetts. The missions of the New England District are many and varied. They include:

- flood damage reduction
- navigation improvements and maintenance
- natural resource management
- streambank and shoreline protection
- disaster assistance
- environmental remediation and engineering
- engineering and construction management support to other agencies

Flood Mitigation Involvement:

As a result of the catastrophic floods in 1936, 1938 and 1955, the Corps was called upon to undertake a comprehensive flood damage reduction program. Since then the Corps has built many flood control structures throughout New England. These include 35 dams and reservoirs, five hurricane protection barriers (two are operated by the Corps) and approximately 60 local flood protection projects. The New England District has also completed two nonstructural projects involving the relocation of flood prone property and the acquisition of natural flood storage areas. The Corps also provides technical assistance to states and municipalities in locally constructed flood damage mitigation projects and to promote wise and informed use of floodplain and natural retention areas in order to minimize potential future flood damages.

#### Mitigation Goals and Objectives:

The New England District has two primary mitigation objectives with respect to flood damage reduction. The first objective is the operation and maintenance of the 35 flood control reservoirs and two hurricane barriers that provide protection to the Connecticut, Merrimack, Thames, Naugatuck, and Blackstone River Basins. The second objective is to continue to work with the states and communities in New England to address flooding problems affecting the region.

#### Projects Desired:

The Corps of Engineers has several programs available under its Civil Works authorities to address flooding problems. These programs provide assistance either through the construction of structural and nonstructural projects to mitigate the flooding problem or by providing technical information to assist mitigation performed at the state or local level. Flood damage reduction projects constructed by the Corps of Engineers must demonstrate, based on current Federal guidelines, that the flood damages prevented by the project's construction exceed its total cost. The Corps must also demonstrate that the 10-year frequency flood discharge at the point of concern is equal to or greater than 800 cubic-feet per second (cfs). Technical assistance provided by the Corps does not need to meet the above criteria.

#### COE Resources with Respect to Hazard Mitigation:

The New England Division assists in meeting national, regional and local needs through a variety of means. Congressionally authorized water resources investigations have resulted in the planning, design and implementation of many flood control and flood damage reduction projects. Work conducted under a Congressional authorization can be extensive and there is currently no monetary limit of funding. Typically, there is a 1-2 year minimum delay in the identification of a proposed investigation and the funding of that work. The first phase of study, the Reconnaissance investigation, is 100 percent Federally funded and must be completed within twelve months. The second phase, the Feasibility investigations, must be cost-shared with a local sponsor where the sponsor provides 50 percent of the cost of the feasibility study. Congress in a Water Resources Development Act must specifically authorize construction of any project resulting from a General Investigation study. The cost of implementation for flood damage reduction projects is generally 65 percent Federal and 35 percent non-Federal.

Through the Continuing Authorities Programs of the Corps many structural and non-structural local protection project reducing or eliminating damages from flooding have been constructed. Investigations initiated under the Corps Continuing Authorities do not require specific congressional authorization are initiated simply with a request from the State or community to the New England District. The following is a list of Continuing Authorities applicable to flood mitigation:

**Section 14 - Emergency Stream Bank & Shoreline Protection:** This work consists of evaluating alternatives to provide emergency protection to public facilities, such as highways and bridges that are threatened due to erosion. The current Federal limit on Section 14 projects is \$500,000. The local sponsor is required to provide 25 percent of the cost of developing plans and specifications and of construction.

**Section 103 - Beach Erosion:** Investigations conducted under this authority are to determine methods of protecting public facilities that have been threatened by beach erosion. Currently there is a Federal limit of \$2,000,000 and the local sponsor is required to contribute 35 percent of plans, specifications and construction. The local sponsor is also required to cost-share equally the cost of the feasibility investigation that exceeds \$100,000. The first \$100,000 is at full Federal expense.

**Section 205 - Flood Damage Reduction:** Investigations are conducted under this program to assist local communities to identify flooding problems and to formulate and construct alternatives for flood damage reduction. The local sponsor is required to cost-share equally in the cost of the feasibility investigation that exceeds \$100,000 and the Federal limit is \$5,000,000. The local sponsor is required to contribute 25 percent of the cost of plans, specifications and construction.

**Section 208 - Snagging and Clearing:** This emergency program is designed to reduce flood damage potential by identifying and removing obstructions that contribute to flooding by causing higher flood stages in the floodways. The Federal limit under this program is \$500,000 and the local sponsor is required to contribute 25 percent of the cost of plans, specifications and construction.

The New England Division also has two Planning Assistance Programs, which provide opportunities for the States to obtain assistance in addressing water resource issues. These programs are the Section 22, Planning Assistance to the States (PAS) program and the Section 206, Flood Plain Management Services (FPMS) program.

**Planning Assistance to States Program (PAS):** The Planning Assistance to States Program is designed to assist the States in developing comprehensive plans to meet State planning goals. The program is extremely flexible in the type and the methodology of investigations. Studies conducted under the PAS program require a 50/50 cost share with a local sponsor. The existing funding limits are \$300,000 per state and a national budget not to exceed \$5,000,000.

**Flood Plain Management Services (FPMS):** The FPMS Program is designed for the Corps to assist States and local communities in improving management of flood plains by performing technical assistance and conducting special investigations. Cost recovery has been implemented in this program effective in FY 1991. Under cost recovery, assistance provided to Federal agencies and private interests must be fully reimbursed by those customers. States and local communities are still provided technical assistance at 100 percent Federal cost. One of the major efforts being conducted under the FPMS program at this time is the preparation of Hurricane Evacuation Studies. These studies are jointly funded with the Federal Emergency Management Agency.

Ice Engineering Research Division  
U.S. Army Cold Regions Research and Engineering Laboratory

Contact:  
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**Address:** US Army Cold Regions Research and Engineering Laboratory  
Ice Engineering Research Division  
72 Lyme Road  
Hanover, NH 03755-1290

**Description and Mission:**

The US Army Cold Regions Research and Engineering Laboratory (CRREL) is a Corps of Engineers' research laboratory that is dedicated to multi-disciplinary engineering and research that addresses the problems and opportunities unique to the world's cold regions. CRREL exists largely to solve the technical problems that develop in cold regions, especially those related to construction, transport, and military

operations. Most of these problems are caused by falling and blowing snow, snow on the ground, ice in the air and in the ground, river ice, ice on seas and lakes, and ice effects on manmade materials. CRREL serves the Corps of Engineers and its clients in three main areas:

- Traditional military engineering, which deals with problems that arise during conflict;
- Military construction and operations technology, i.e., the building and maintenance of military bases, airfields, roads, ports, and other facilities; and
- Civil works, which involves the Corps in such things as flood protection, navigation on inland waterways and coastal engineering.

CRREL also deals with cold regions problems for the other defense services, for civilian agencies of the federal government, and to some extent for state agencies, municipalities and private industry.

CRREL's Ice Engineering Research Division (IERD) was created to research, analyze and solve ice problems in and around water bodies, including ice jam flooding and ice accumulation in lock chambers, to ice buildup at water intakes and the destructive forces that moving ice exerts on riverine or coastal structures. In cooperation with the New England District (NAE) of the Corps of Engineers (located in Concord, MA), IERD personnel provide technical assistance before, during and after ice jam flood emergencies. IERD research has resulted in the design and construction of a number of low-cost ice control structures as well as nonstructural mitigation measures. IERD also provides instruction on dealing with river ice problems to local emergency management agencies.

#### Flood Mitigation Involvement:

IERD is frequently called upon by the various Corps Districts to provide technical assistance to states and municipalities in the form of emergency mitigation. IERD is also involved with Corps and local agencies in developing locally constructed flood damage mitigation projects and promoting wise and informed use of floodplain areas in order to minimize potential future flood damages.

#### Mitigation Goals and Objectives:

The IERD has two primary mitigation objectives with respect to flood damage reduction. The first objective is to work with the Corps and other federal, state and local agencies to design and implement ice control methods to reduce ice-related flood potential. The second is to work with the states and communities nationwide as well as in New England to address ice-related emergency flooding problems affecting the region.

#### Projects Desired:

CRREL and IERD are a national resource ready to apply our unique facilities and capabilities to solve problems and conduct innovative, state-of-the-art research and technical support. There are a number of mechanisms that enable IERD and the rest of CRREL to partner with various Federal, non-DoD and private sector entities. The Federal Technology Transfer Act of 1986 (15 USC 3710a) allows CRREL to collaborate with any non-Federal partner on research and technical support consistent with the mission of the laboratory. The Intergovernmental Cooperation Act (31 USC 6505) lets CRREL work with state and local governments on a broad range of reimbursable projects. Under the "Authority to Sell" (10 USC 2539b), CRREL can provide test and evaluation services to the states and the private sector. This includes the testing and evaluation of materials, equipment, models, computer software, and other items. The laboratory can also provide support to other Federal agencies via the Economy in Government Act (31 USC 1535) through MOUs/MOAs that establish a framework for the partnership and provide a concise description of the planned

work. CRREL's 35 active Cooperative Research and Development Agreements (CRADAs) with industry and academia and 17 Intergovernmental Cooperation Agreements with states and local governments in 1998 demonstrate a robust program in this area and the relevance of CRREL's research to many segments of American society beyond DoD.

The Corps of Engineers has several programs available under its Civil Works authorities to address flooding problems. These programs provide assistance either through the construction of structural and nonstructural projects to mitigate the flooding problem or by providing technical information to assist mitigation performed at the state or local level. Flood damage reduction projects constructed by the Corps of Engineers must demonstrate, based on current Federal guidelines, that the flood damages prevented by the project's construction exceed its total cost. The Corps must also demonstrate that the 10-year frequency flood discharge at the point of concern is equal to or greater than 800 cubic-feet per second (cfs). Technical assistance provided by the Corps does not need to meet the above criteria. Through the Corps, IERD has been involved in Section 205 Flood Damage Reduction program, Section 22 Planning Assistance to States Program (PAS)) projects, the Section 206 Flood Plain Management Services (FPMS) program funded jointly with FEMA, and numerous instances of technical assistance.

CRREL IERD Resources with Respect to Hazard Mitigation:

**Corps:** CRREL works jointly with the Corps' New England Division to address regional and local ice-related hazard mitigation needs through a variety of means. Congressionally authorized water resources investigations have resulted in the planning, design and implementation of many flood control and flood damage reduction projects. Work conducted under a Congressional authorization can be extensive and there is currently no monetary limit of funding. Typically there is a 1-2 year minimum delay in the identification of a proposed investigation and the funding of that work. The first phase of study, the Reconnaissance investigation, is 100 percent Federally funded and must be completed within twelve months. The second phase, the Feasibility investigations, must be cost-shared with a local sponsor where the sponsor provides 50 percent of the cost of the feasibility study. Congress in a Water Resources Development Act must specifically authorize construction of any project resulting from a General Investigation study. The cost of implementation for flood damage reduction projects is generally 65 percent Federal and 35 percent non-Federal.

Through the Continuing Authorities Programs of the Corps many structural and non-structural local protection project reducing or eliminating damages from flooding have been constructed. Investigations initiated under the Corps Continuing Authorities do not require specific congressional authorization are initiated simply with a request from the State or community to the New England District. The following is a list of Continuing Authorities applicable to flood mitigation:

**Section 205 - Flood Damage Reduction:** Investigations are conducted under this program to assist local communities to identify flooding problems and to formulate and construct alternatives for flood damage reduction. The local sponsor is required to cost-share equally in the cost of the feasibility investigation that exceeds \$100,000 and the Federal limit is \$5,000,000. The local sponsor is required to contribute 25 percent of the cost of plans, specifications and construction.

**Section 22 - Planning Assistance to States Program (PAS):** The Planning Assistance to States Program is designed to assist the States in developing comprehensive plans to meet



State planning goals. The program is extremely flexible in the type and the methodology of investigations. Studies conducted under the PAS program require a 50/50 cost share with a local sponsor. The existing funding limits are \$300,000 per state and a national budget not to exceed \$5,000,000.

**Section 206 - Flood Plain Management Services (FPMS):** The FPMS Program is designed for the Corps to assist States and local communities improve management of flood plains by performing technical assistance and conducting special investigations. Cost recovery has been implemented in this program effective in FY 1991. Under cost recovery, assistance provided to Federal agencies and private interests must be fully reimbursed by those customers. States and local communities are still provided technical assistance at 100 percent Federal cost. One of the major efforts being conducted under the FPMS program at this time is the preparation of Hurricane Evacuation Studies. These studies are jointly funded with the Federal Emergency Management Agency.

**Personnel:**

IERD was created to research, analyze and solve ice problems in and around water bodies. The technical experience of the staff and their in-depth research and field capabilities combine with CRREL's unique Ice Engineering Facility to form one of the premier ice engineering organizations in the world. IERD has a staff of 15 engineers and technicians experienced in technical analyses, methods and engineering solutions to ice problems -- that is, any situation where the effects of ice cause flooding, increase operational and maintenance requirements of water control projects, impede navigation, or adversely impact the environment in cold regions.

**Equipment and Facilities:**

The Ice Engineering Facility was built to increase the research capabilities of the U.S. Army Cold Regions Research and Engineering Laboratory. It is a two-story building approximately 160 by 210 feet containing three primary cold spaces: the test Basin, Flume, and Research Area. They have recently designed and built a new Wind Tunnel Facility. In addition, there is a machine room in the basement, an instrumentation corridor separating the flume and test basin spaces, a shop/storage area, and one sample-storage cold room.

The Test Basin was designed primarily for large-scale work on ice forces on structures, such as drill platforms and bridge piers, and for tests using model icebreakers. The Basin is 30 feet wide, 8 feet deep and 120 feet long. The room is designed to operate at any temperatures between +65° and -10°F with very even temperature distribution, which results in uniform ice thickness. Other studies conducted in the Test Basin concern the formation of ice pressure ridges, ice problems in and around navigation locks and vertical uplift forces.

The Flume is situated in a room where the temperature can be regulated between +65° and -20° F. The Flume is 2 by 4 feet in cross section and 120 feet long. It can tilt from +2° to -1° slope, have a flow capacity of nearly 14 cubic feet per second and have a refrigerated bottom. Some other studies conducted in the Flume are the formation of ice covers and frazil ice, the hydraulics of ice-covered rivers, the formation of ice jams, and the effect of ice covers on sediment transport and scour.

Possibly the most versatile portion of the Ice Engineering Facility is the Research Area. This room is 80 by 160 feet clear span and has a temperature range of +65° to -10°F. Piping capable of providing a flow of 1, 2, 4 or 8 cubic feet per second is located on one side of the room, and a large drain trough is on the other. The floor is designed for loads up to 400

pounds per square foot. Models of reaches can be constructed in this area to test ways to alleviate ice jams through channel modification. Tests of the bearing capacity of large ice sheets and cold-testing of vehicles and structures are a few of the other potential uses of this space. Tests conducted in this room will alleviate much of the flooding caused by ice jams.

USDA, Natural Resources Conservation Service

Contacts:

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**Address:** Federal Building  
2 Madbury Road  
Durham, NH 03824

Description and Mission:

The Natural Resources Conservation Service (NRCS) is a Federal agency within the US Department of Agriculture. The mission of the NRCS is to help people conserve, improve and sustain our natural resources and environment. NRCS, formerly the Soil Conservation Service, is the lead federal agency for conservation on private land. NRCS provides conservation technical assistance through local conservation districts and Resource Conservation and Development (RC&D) Councils to individuals, communities, watershed groups, tribal governments, federal, state, and local agencies, and others. NRCS has an interdisciplinary staff of professional engineers, planners, biologists, foresters, agronomists, and soil scientists working together to provide the necessary technical assistance to solve resource or environmental problems. NRCS products typically include conservation plans, study reports, engineering designs, and resource maps.

Authorities and Funding:

NRCS state and field offices derive funding from two possible sources, direct Federal appropriations and reimbursable agreements with agencies and units of government. NRCS manages several programs; Environmental Quality Incentive Program (EQIP), Wildlife Habitat Incentives Program (WHIP), Wetland Reserve Program (WRP), Forestry Incentives Program (FIP), and Farmland Protection Program (FPP) which provide cost-share assistance to landowners and users (primarily agricultural or forestry land) to install conservation practices to restore and protect natural resources. NRCS can also provide technical assistance ranging from preliminary reviews to complete detail designs to landowners/users solving resource problems even if financial assistance is not being provided for the installation of conservation practices. This assistance is dependent on staff availability and priorities.

NRCS also manages the Emergency Watershed Protection (EWP) program, which can provide financial and technical assistance to units of government and groups to repair damages sustained from a natural disaster (flood, fire, hurricane, tornado) creating an imminent hazard to life and property. The restoration efforts must be environmentally and economically cost effective and typically includes clearing debris from clogged stream channels, stabilizing eroded stream banks and restoring vegetation for stabilization

purposes. NRCS can also provide technical assistance to watershed associations or groups to develop comprehensive plans for improving or protecting the watershed environment (water quality, flood reduction, wildlife habitat).

**Mitigation Involvement:**

The NRCS can provide technical assistance to conduct inventories, to complete watershed or site-specific plans, or to develop detail engineering and construction designs for conservation applications that will help reduce future damages from natural disasters. Some examples of past mitigation efforts include: floodplain management studies for towns, site assessments of stream flow impairments, stabilization designs to protect structures which could sustain severe damages from another storm event, and small watershed plans addressing flooding problems. Some of these products can be provided through other conservation assistance efforts. However, the major jobs would require a reimbursable agreement with the state or towns to complete the work.

**Mitigation Goals and Objectives:**

With respect to hazard mitigation, the goal of the NRCS in New Hampshire is to meet the needs of the State and local governments by providing timely technical assistance to support recovery and restoration efforts. NRCS can contribute this technical assistance by interacting directly with NH HSEM at the state level and having field staff working directly with Town Emergency Management officials at the local level. Short-term goals are to establish contacts with local officials and the conservation districts at the field office level to facilitate quicker response times. Intermediate and long-term objectives are to improve the cooperative efforts of working with NH HSEM and establish additional contacts for providing timely technical assistance at the local level.

**Projects/Planning Desired:**

NRCS would like to work with local watershed associations to develop comprehensive plans addressing resource and environmental needs and opportunities in the priority watersheds as identified in the Unified Watershed Assessment. These plans can provide the basis for targeting and requesting special funding to meet the needs of the local watershed association. Technical assistance for planning and designing along with public information dissemination are the typical activities the agency can provide in this effort.

**NRCS Resources with respect to Hazard Mitigation**

**Personnel:**

NRCS in New Hampshire has a workforce of 45 staff members along with 5 multi-state staff members. Approximately 22 staff members consisting of engineers, biologists, foresters, conservation planners, and technicians are available to provide some assistance in mitigation efforts. Support staff of a GIS specialist, computer specialist and public information specialist could assist in providing information for public outreach. This staff is available to provide limited assistance under present program funding authorities. However, larger projects would require reimbursement for planning and design assistance.

**Equipment, Physical Facilities and Other Capabilities:**

All of the field offices and State office have computers and access to the internet. All of the field offices have survey equipment and all engineers have the use of CADD software. All field offices have access to small meeting rooms and access to the Federal

Telecommunications System. Government vehicles are located at all field offices for use by government employees and could be made available in emergencies.

Northeast States Emergency Consortium (NESEC)

Contacts:

Edward S. Fratto, Executive Director: Phone: (781) 224-9876, Fax: (781) 224-4350  
E-Mail: [www.nesec.org](http://www.nesec.org)

Kristin M. O'Brien, Assistant Executive Director: Phone: (781) 224-9876 ; e-mail: [www.nesec.org](http://www.nesec.org)

**Address:** Northeast States Emergency Consortium  
419 Main Street, Suite 5  
Wakefield, MA 01880

Organization Description:

The Northeast States Emergency Consortium, Inc. (NESEC) is a 501(c)(3) not-for-profit natural disaster mitigation and emergency management organization, located in Wakefield, Massachusetts. NESEC is the only multi-hazard consortium of its kind in the country and is supported and funded by the Federal Emergency Management Agency (FEMA). The eight Northeast States of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont form the consortium. NESEC has a full-time Executive Director, and Assistant. It is governed by a Board of Directors. The Board is comprised of the Directors of the State Emergency Management Agencies from each of the six New England States and the States of New York and New Jersey.

Organization Mission:

NESEC works in partnership with government and private organizations to reduce losses of life and property from natural disasters in the Northeast United States. The Northeast States are vulnerable to most of the natural hazards, including hurricanes, earthquakes, coastal and inland flooding, tornadoes and micro-bursts, forest fires, drought, lightning, blizzards, and other forms of severe weather. Our developed urban areas and the desire to build and live on waterfront property have increased our degree of risk from natural hazards.

Mitigation Programs:

**Grants:** NESEC raises funds from government and private sources to support local mitigation projects. These funds are awarded on a competitive basis in the form of grants in the range of \$500-5,000. The name of this program is called the **Power of Prevention**. All grant programs are administered in cooperation with the New Hampshire Homeland Security and Emergency Management (NH HSEM). Communities interested in participating should contact NH HSEM.

**HAZUS:** NESEC assists FEMA PROJECT IMPACT Communities in the use of HAZUS as a planning platform for incorporating multi-hazard disaster prevention initiatives. NESEC can produce a HAZUS report using default data for each of the initial PROJECT IMPACT Communities. Priority is given to PROJECT IMPACT communities; however, assistance may be provided to other communities as resources allow. This report provides an excellent starting point for communities wishing to utilize HAZUS to identify potential

hazards. The NESEC HAZUS Report is multi-hazard and usually contains information on earthquakes, tornadoes, flood and wind.

There is no fee or charge for producing the default HAZUS Report and meeting with the community to discuss the results. All HAZUS support is arranged in cooperation with the New Hampshire Homeland Security and Emergency Management (NH HSEM). Communities interested in participating should contact NH HSEM.

Emergency Generators: NESEC assists communities to establish a partnership with their electric utilities and service companies. The partnership would conduct an energy efficiency audit of the community, recommend cost saving measures, and implement a cost saving plan. Monthly savings could be used to fund emergency generator(s) for local critical facilities. The utility or energy service company could then lease, install, and maintain generator(s) in a community.

The community would pay a monthly charge for the lease agreement. This charge would not exceed the savings derived through energy efficiency measures, so there would be no capital outlay or additional cost to the community. In fact, some communities may be able to reduce their monthly electric bills in an amount that exceeds the cost of the generator(s) lease agreement.

Monthly savings and utility participation will vary from state to state and community-to-community depending on present electric power usage and efficiency measures and deregulation. There is no fee or charge for assisting communities in establishing partnerships with electric utilities. NESEC assistance will be provided as resources allow. All emergency generator support is arranged in cooperation with the New Hampshire Homeland Security and Emergency Management (NH HSEM). Communities interested in participating should contact NH HSEM.

#### Federal Mitigation Grant Programs

##### Pre-Disaster Mitigation Grant Program

The Pre-Disaster Mitigation (PDM) program provides funds to states, territories, tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds. <http://www.fema.gov/government/grant/pdm/index.shtm>

##### Hazard Mitigation Grant Program

The Hazard Mitigation Grant Program (HMGP) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. <http://www.fema.gov/government/grant/hmgp/index.shtm>

#### Flood Mitigation Assistance Program

The Flood Mitigation Assistance (FMA) program was created as part of the National Flood Insurance Reform Act of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the [National Flood Insurance Program](#).

FEMA provides FMA funds to assist states and communities in implementing measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes and other structures insurable under the National Flood Insurance Program.

<http://www.fema.gov/government/grant/fma/index.shtm>

# **Appendix E: Documentation of the Planning Process**

## **Chesterfield Hazard Mitigation Plan Update**

### **Work Group**

#### **Meeting #1**

### **AGENDA**

**March 25, 2021**

**9:00 a.m.**

#### **Join Zoom Meeting**

<https://us02web.zoom.us/j/81522691953?pwd=M3BVbFUvYWpXcmcrd2VtRFk3Q1ZRUT09>

**Meeting ID: 815 2269 1953**

**Passcode: 314944**

or

**Join by Phone: (646) 558-8656**

#### **1. Introduction**

- a. Discuss the process to update the plan and the addition of recently added hazards to the State Hazard Mitigation Plan

#### **2. Status of Previous Hazard Mitigation Actions**

- a. Review the Action Plan from the existing Hazard Mitigation Plan to determine what has been completed, deleted, or deferred to the updated plan

#### **3. Risk Assessment**

- a. Determine the *Impact, Probability* and *Overall Risk* of each potential hazard

#### **4. Identify Past and Potential Hazards**

- a. Review each hazard type and other information on the chart provided in the existing plan
- b. Add any new hazards that have occurred since the previous plan was adopted
- c. Add any potential hazard concerns

#### **5. Next Meeting**

- a. Potential date: April 22, 2021



## **Chesterfield Hazard Mitigation Plan Update**

### **Work Group**

**Meeting #2**

### **AGENDA**

**April 22, 2021**

**9:00 a.m.**

**Join Zoom Meeting**

<http://bit.ly/Apr22ChHMWG21>

**Meeting ID: 815 1504 7792**

**Passcode: 858217**

**1. Identify Past and Potential Hazards**

- b. Review each hazard type and other information on the chart provided in the existing plan
- b. Add any new hazards that have occurred since the previous plan was adopted
- c. Add any potential hazard concerns

**2. Risk Assessment**

- a. Determine the *Impact, Probability* and *Overall Risk* of each potential hazard

**3. Existing Mitigation Strategies and Proposed Improvements**

- a. Review the list of existing strategies and programs. Determine any needed improvements

**4. Meeting Schedule**

- a. Meeting #3 - May 13, 2021
- b. Meeting #4 - June 3, 2021
- c. Meeting #5 - June 26, 2021

## **Chesterfield Hazard Mitigation Plan Update**

### **Work Group**

**Meeting #3**

### **AGENDA**

**May 13, 2021**

**9:00 a.m.**

**Join Zoom Meeting**

<http://bit.ly/May13ChHMWG21>

**Meeting ID: 822 0041 4940**

**Passcode: 631760**

**or**

**Join by phone: (646) 558-8656**

- 1. Critical Facilities**
  - a. Provide final edits to critical facilities
- 2. Potential Strategies: Filling Gaps in Coverage**
  - a. Review potential strategies matrix and determine which should be included in the Action Plan
- 3. Determine New Mitigation Strategies**
  - a. Identify new strategies to include in the Action Plan
- 4. Meeting Schedule**
  - a. Meeting #4 - June 3, 2021 at 9:00 a.m.
  - b. Meeting #5 - June 26, 2021 at 9:00 a.m.

## **Chesterfield Hazard Mitigation Plan Update**

### **Work Group**

**Meeting #4**

### **AGENDA**

**June 3, 2021**

**9:00 a.m.**

**Join Zoom Meeting**

<http://bit.ly/Jun3ChHM21>

**Meeting ID: 827 1773 4238**

**Passcode: 163189**

**or**

**Join by Phone: (646) 558-8656**

1. Identify and Prioritize Mitigation Actions for Each Hazard
  - a. Identify specific locations to be added to the Action Plan.
  - b. Use the STAPLEE Chart to identify and rank actions for each hazard.
2. Prepare an Action Plan
  - a. Determine the *Who*, *When* and *Funding Source* for each action identified in the STAPLEE Chart.
3. Next Meeting: June 26, 2021 at 9:00 a.m.

## **Chesterfield Hazard Mitigation Plan Update**

### **Work Group**

#### **Meeting #5**

### **AGENDA**

**June 24, 2021**

**9:00 a.m.**

#### **Join Zoom Meeting**

<http://bit.ly/Ju24ChHMWG21>

**Meeting ID:** 873 9163 3791

**Passcode:** 609328

**or**

**Join by Phone: (646) 558-8656**

1. Develop the Action Plan
2. Review Key Chapters of the Draft Plan
  - a. Review and edit chapters 3, 4, and 7
  - b. Review other parts of the plan as needed
3. Discuss the final steps to FEMA approval

# **Appendix F: Project Status Sheet**

The following form can be used to keep track of projects identified in the hazard mitigation plan that are in progress or that have been completed.

Project Title	Page # in Plan	Date of Project Completion	Comments