

# **Berlin**

## **Hazard Mitigation**

### **Plan**

### **Update 2016**

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**This Plan integrates the following:**

- **Hazard Mitigation Plan Update (FEMA)**
- **Community Wildfire Protection Plan (DRED)**

**July 6, 2016**  
**Final Plan Adoption**

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**Prepared for the City of Berlin and NH Homeland Security &  
Emergency Management**

**By**  
**The Berlin Planning Team**

**With assistance from Mapping and Planning Solutions**

**B**  
**E**  
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**L**  
**I**  
**N**

*“Plans are worthless, but planning is everything. There is a very great distinction because when you are planning for an emergency you must start with this one thing: The very definition of “emergency” is that it is unexpected, therefore it is not going to happen the way you are planning.”*

*-Dwight D. Eisenhower*

#### HAZARD MITIGATION PLAN DEFINITIONS

“A natural hazard is a source of harm or difficulty created by a meteorological, environmental, or geological event.”

“Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards (44CFR 201.2). Hazard mitigation activities may be implemented prior to, during, or after an event. However, it has been demonstrated that hazard mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs.”

(Source: Local Mitigation Plan Review Guide, FEMA, October 1, 2011)



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**Cover: City of Berlin**

**Photo Credit: [https://www.flickr.com/photos/americanadian\\_8/353288725](https://www.flickr.com/photos/americanadian_8/353288725); Mark R. Ducharme Photography**

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## Acknowledgements

This Plan integrates elements to qualify it as a Community Wildfire Protection Plan (CWPP) according to the US Forest Service and the Department of Resources and Economic Development.

The Plan was created through a grant from New Hampshire Homeland Security & Emergency Management (NH-HSEM). The following organizations have contributed invaluable assistance and support for this project:

- New Hampshire Homeland Security & Emergency Management (HSEM)
- Federal Emergency Management Agency (FEMA)
- NH Office of Energy & Planning (NHOEP)
- Mapping and Planning Solutions (MAPS)
- NH Forests & Lands (DRED)

**This Plan is an update to the previous Berlin Hazard Mitigation Plan, adopted August 16, 2010.**

**Approval Notification Dates for 2016 Update**

Approved Pending Adoption (APA):.....July 5, 2016  
 Jurisdiction Adoption: ....., 2016  
 CWPP Approval: ....., 2016  
 Plan Approval Date (FEMA):....., 2016  
 Plan Distribution (MAPS): ....., 2016

## City of Berlin Hazard Mitigation Planning Team

The City of Berlin would like to thank the following people for the time and effort spent to complete this Plan; the following people have attended meetings and/or been instrumental in completing this Plan:

Randy Trull ..... Berlin EMD & Fire Chief	Adam Cloutier ..... Berlin EMS
Jim Wheeler..... Berlin City Manager	Paul Gagne..... Berlin EMS
Pamela Laflamme..... Berlin Community Development Director	Lisa Crossland..... Berlin EMS
Michael Perreault..... Berlin Public Works Department	Chris Dubey..... Berlin EMS Director
Thaddeus Soltys..... Berlin Fire Department	Mary-Jo Landry..... Berlin Housing
Henry Noel..... Berlin Waste Water Treatment	Amy Holmes ..... North Country PHN
Barney Valliere ..... Berlin Police Department	Heidi Lawton..... NH HSEM
Peter Higbee..... Berlin City Council	Olin Garneau ..... Mapping & Planning Solutions
Linda White..... Berlin Housing & HR Manager	June Garneau ..... Mapping & Planning Solutions
Donny Labrecque ..... Berlin Water Department	

Many thanks for all the hard work and effort given by each and every one of you. This Plan would not exist without your knowledge and experience. The City of Berlin also thanks the Federal Emergency Management Agency and NH Homeland Security and Emergency Management as the primary funding sources for this Plan.

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## Executive Summary

The Berlin Hazard Mitigation Plan Update 2016 was compiled to assist the City of Berlin in reducing and mitigating future losses from natural or human-caused hazardous events. The Plan was developed by participants of the City of Berlin Hazard Mitigation Planning Team, interested stakeholders, the general public and Mapping and Planning Solutions (MAPS). The Plan contains the tools necessary to identify specific hazards and aspects of existing and future mitigation efforts.

This Plan is an update to the 2010 Berlin Hazard Mitigation Plan. In an effort to produce an accurate and current planning document, the Planning Team used the 2010 Plan as a foundation, building upon that Plan to provide more timely information.

**This Plan addresses the following natural hazards and human-caused hazards.**

### **Natural Hazards**

- |  |   |
|--|---|
| 1) Severe Winter Weather (snow & ice storms) | 8) Tornados & Downburst (macro & micro) |
| 2) Extreme Temperatures                      | 9) Hailstorms                           |
| 3) Flooding (local roads)                    | 10) Landslide, Erosion & Mudslide       |
| 4) Severe Thunder & Lightning Storms         | 11) Earthquake                          |
| 5) Hurricane & Tropical Storms               | 12) Flooding (dam failure)              |
| 6) Wildfire                                  | 13) Drought                             |
| 7) Riverine Flooding (including ice jams)    |   |

### **Human-Caused Hazards**

- |   |                           |
|---|---------------------------|
| 1) Epidemic/Pandemic/Influenza, etc.    | 4) Terrorism              |
| 2) Hazardous Materials – Transport      | 5) Extended Power Failure |
| 3) Hazardous Materials – Fixed Location |                           |

This Plan also provides a list of Critical Infrastructure & Key Resources (CIKR) categorized as follows: Necessary for Emergency Response Facilities (ERF), Not Necessary for Emergency Response Facilities (NERF), Facilities and Populations to Protect (FPP) and Potential Resources (PR). In addition, this plan addresses the City's involvement in The National Flood Insurance Program (NFIP).

This hazard mitigation plan was designed to include a detailed study and analysis of wildfires. The original goal was to produce separate plans but that concept produced excessive overlap and cost. To streamline the process, the Community Wildfire Protection Plan (CWPP) was fully integrated into this hazard mitigation plan as were risks from human-caused hazards.

Although mitigation action items are the main focus of this Plan, it is at times difficult to arrive at true mitigation projects. Some communities, though faced with an array of natural hazards, are able to adequately cope with the impact of these hazards. For example, although *Severe Winter Weather* is often a common hazard in New Hampshire and more often than not considered to be the most likely to occur, most New Hampshire communities handle two-three foot snow storms with little or no disruption of services. On the other hand, an unexpected ice storm can have disastrous effects on a community. Mitigation for this type of sudden storm is difficult to achieve;

establishing warming and cooling centers, establishing notification systems, providing public outreach, tree trimming, opening shelters and perhaps burying overhead power lines are just a few of the action items that may be put in place.

In summary, finding mitigation action items for every hazard that effects a community is at times difficult. In addition, with today's economic constraints, cities and towns are less likely to have the financial ability to create some mitigation action items, such as burying power lines. In preparing this Plan, the Berlin Planning Team has considered a comprehensive list of mitigation action items that could diminish the impact of hazards but has also decided to maintain a list of preparedness action items for future reference and action.

To simplify the language in the Plan, the following abbreviations and acronyms will be used:

Berlin Hazard Mitigation Plan Update 2016.....	the Plan or this Plan
Berlin .....	the City or the Community
Hazard Mitigation Planning Team.....	the Team
Hazard Mitigation Plan.....	HMP
Emergency Operations Plan .....	EOP
Community Wildfire Protection Plan .....	CWPP
Mapping and Planning Solutions .....	MAPS
Mapping and Planning Solutions Planner.....	the Planner
NH Homeland Security & Emergency Management .....	HSEM
Federal Emergency Management Agency .....	FEMA

For more acronyms, please refer to *Appendix F: Acronyms*

**Mission Statement:**

To make Berlin less vulnerable to the effects of hazards through the effective administration of hazard mitigation planning, wildfire hazard assessments, and a coordinated approach to mitigation policy and planning activities.

**Vision Statement:**

The community of Berlin will reduce the impacts of natural hazards and other potential disasters through implementing mitigation measures, public education and deliberate capital expenditures within the community. Homes and businesses will be safer and the community's ISO rating may be improved.



## Chapter 1: Hazard Mitigation Planning Process

### A. Authority & Funding

The Berlin Hazard Mitigation Plan Update 2016 was prepared in accordance with the Disaster Mitigation Act of 2000 (DMA), Section 322 Mitigation Planning, signed into law by President Clinton on October 30, 2000. This hazard mitigation plan was prepared by the Berlin Hazard Mitigation Planning Team under contract with New Hampshire Homeland Security & Emergency Management (NH-HSEM) operating under the guidance of Section 206.405 of 44 CFR Chapter 1 (10-1-97 Edition) and with the assistance and professional services of Mapping and Planning Solutions. This Plan was funded by HSEM through grants from FEMA (Federal Emergency Management Agency); matching funds for team members' time were also part of the funding formula.

### B. Purpose & History of the FEMA Mitigation Planning Process

*The ultimate purpose of Disaster Mitigation Act of 2000 (DMA) is to:*

*"...establish a national disaster hazard mitigation program -*

- To reduce the loss of life and property, human suffering, economic disruption and disaster assistance costs resulting from natural disasters; and*
- To provide a source of pre-disaster hazard mitigation funding that will assist States and local governments (including Indian tribes) in implementing effective hazard mitigation measures that are designed to ensure the continued functionality of critical services and facilities after a natural disaster".<sup>1</sup>*

DMA 2000 amends the Robert T. Stafford Disaster Relief and Emergency Assistance Act by, among other things, adding a new section "322 – Mitigation Planning" which states:

*"As a condition of receipt of an increased Federal share for hazard mitigation measures under subsection (e), a State, local, or tribal government shall develop and submit for approval to the President a mitigation plan that outlines processes for identifying the natural hazards, risks, and vulnerabilities of the area under the jurisdiction of the government."<sup>2</sup>*

HSEM's goal is to have all New Hampshire communities complete a local hazard mitigation plan as a means to reduce future losses from natural or human-caused events before they occur. HSEM outlined a process whereby communities throughout the state may be eligible for grants and other assistance upon completion of this hazard mitigation plan (see Appendix B).

The Berlin Hazard Mitigation Plan Update 2016 is a planning tool to use to reduce future losses from natural and human-caused hazards as required by the Disaster Mitigation Act of 2000; this plan does not constitute a section of the City's Master Plan, however mitigation action items from this Plan may be incorporated into future Master Plan updates.

The DMA places new emphasis on local mitigation planning. It requires local governments to prepare and adopt jurisdiction-wide hazard mitigation plans as a condition to receiving Hazard Mitigation Grant Program (HMGP) project grants. Local governments must review yearly and update this plan every five years to continue program eligibility.

<sup>1</sup> Disaster Mitigation Act (DMA) of 2000, Section 101, b1 & b2

<sup>2</sup> Disaster Mitigation Act (DMA) of 2000, Section 322a

### C. Jurisdiction

This Plan addresses one jurisdiction – the City of Berlin, NH.

### D. Scope of the Plan & Federal & State Participation

A community's hazard mitigation plan often identifies a vast number of natural hazards and is somewhat broad in scope and outline. The scope and effects of this plan were assessed based on the impact of hazards and wildfires on: *Critical Infrastructure & Key Resources (CIKR); current residential buildings; other structures within the City; future development; administrative, technical and physical capacity of emergency response services; and response coordination between federal, state and local entities.*

In seeking approval as a Hazard Mitigation Plan and a Community Wildfire Protection Plan (CWPP), the planning effort included participation of Homeland Security and Emergency Management, the US Forest Service, the Department of Resources and Economic Development (DRED), the NH Office of Energy & Planning (OEP) as well as routine notification of upcoming meetings to the state and federal entities above. Designation as a CWPP will allow a community to gain access to federal funding for hazardous fuels reduction and other mitigation projects supported by the US Forest Service. By merging the two federal planning processes (hazard and wildfires), duplication is eliminated and the City has access to a larger pool of resources for pre-disaster planning.

The Healthy Forest Restoration Act (HFRA) of 2003 includes statutory incentives for the US Forest Service to give consideration to local communities as they develop and implement forest management and hazardous fuel reduction projects. For a community to take advantage of this opportunity, it must first prepare a CWPP. This hazard mitigation planning process not only satisfies FEMA's criteria regarding wildfires and all other hazards but also addresses the minimum requirements for a CWPP:

- **Collaboration:** *A CWPP must be collaboratively developed by local and state government representatives, in consultation with federal agencies and other interested parties.*
- **Prioritized Fuel Reduction:** *A CWPP must identify and prioritize areas for hazardous fuel reduction treatments and recommend the types and methods of treatment that will protect one or more at-risk communities and essential infrastructure.*
- **Treatment of Structural Ignitability:** *A CWPP must recommend measures that homeowners and communities can take to reduce the ignitability of structures throughout the area addressed by the plan.<sup>3</sup>*


Finally, as required under Code of Federal Regulations (CFR), Title 44, Part 201.6(c) (2) (ii) and 201.6(c) (3) (ii), the Plan must address the Community's participation in the National Flood Insurance Program (NFIP), its continued compliance with the program and as part of vulnerability assessment, the Plan must address the NFIP insured structures that have been repetitively damaged due to floods.

<sup>3</sup> Healthy Forest Restoration Act; HR 1904, 2003; Section 101-3-a.b.c; [http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=108\\_cong\\_bills&docid=f:h1904enr.txt.pdf](http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=108_cong_bills&docid=f:h1904enr.txt.pdf)

## E. Public & Stakeholder Involvement

Public and stakeholder involvement was stressed during the initial meeting and community officials were given a matrix of potential team members (page 17). Community officials were urged to contact as many people as they could to participate in the planning process, including not only residents but also officials and residents from surrounding communities; the City of Berlin understands that natural hazards do not recognize corporate boundaries.

It was noted that there are two elementary schools (Brown Elementary and Hillside Elementary), a middle school (Berlin Middle School), a high school (Berlin High School) and a college (White Mountain Community College) in Berlin. Although they were invited, no representative from the school district or the college participated in the planning meetings. By placing a press release (below) in the Berlin Daily Sun and on the City's website, many interested citizens and stakeholders had the opportunity to become aware of the hazard mitigation planning taking place in Berlin.



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**City of Berlin Commences Hazard Mitigation Planning**  
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*Mapping and Planning Solutions  
 P.O. Box 283  
 Twin Mountain, NH 03595*

**Press Release**  
 for immediate release

April 29, 2015  
 Contact: June Garneau  
 603.846.5720

**City of Berlin Commences Hazard Mitigation Planning**

The Berlin Emergency Management Director/Fire Chief and other City Officials have held two meetings with June Garneau, Mapping and Planning Solutions to discuss the required five-year update to the Berlin Hazard Mitigation Plan. As a result of these meetings the City is conducting a series of Hazard Mitigation Plan planning meetings over the next few months.

Through this series of public meetings, the Hazard Mitigation Planning Team will address issues such as flooding, hurricanes, drought, landslides and wildfires and determine efforts the City can take to mitigate the effects of both natural and human-caused hazards. By examining past hazards, the Planning Team will establish priorities for future mitigation projects and efforts that can be taken to increase public awareness of hazards in general.

The Hazard Mitigation Planning Team is still being formed; the public and any interested stakeholders are invited to participate. All interested parties should contact Chief Randall Trull, Fire Chief and Emergency Management Director, at 752-3135 if they wish to be included in the process.

Future planning meetings have been scheduled for May 6<sup>th</sup> and June 3<sup>rd</sup>; all meetings are planned for 9:30 AM and currently scheduled to be held at White Mountains Community College. Please call ahead to reconfirm the time and location of each meeting. The general public is encouraged to attend and participate in all meetings whether or not they are a part of the Planning Team.

As mandated by the Disaster Mitigation Act of 2000, all communities are required to complete a local hazard mitigation plan in order to qualify for FEMA funding should a natural disaster occur. The planning processes are made possible through grants from the Federal Emergency Management Administration (FEMA).

For more information on the hazard mitigation planning process, please contact June Garneau at Mapping and Planning Solutions, (603) 846-5720.

THE BERLIN DAILY SUN, Tuesday, May 12, 2015 — Page 5

## Berlin begins Hazard Mitigation Planning

By KIRSTAN LUKASAK  
THE BERLIN DAILY SUN

BERLIN — The Berlin Emergency Management Director/Fire Chief Randall Trull and other city officials have held two meetings with June Garneau of Mapping and Planning Solutions to discuss the required five-year update to the Berlin Hazard Mitigation Plan. As a result of these meetings the City is conducting a series of Hazard Mitigation Plan planning meetings over the next few months.

Through this series of public meetings, the Hazard Mitigation Planning Team will address issues such as flooding, hurricanes, drought, landslides and wildfires and determine efforts the City can take to mitigate the effects of both natural and human-caused hazards.

By examining past hazards, the Planning Team will establish priorities for future mitigation projects and efforts that can be taken to increase public awareness of hazards in general.

The Hazard Mitigation Planning Team is still being formed; the public

and any interested stakeholders are invited to participate. All interested parties should contact Chief Trull, at 752-3135 if they wish to be included in the process.

A future planning meetings have been scheduled for June 3; all meetings are planned for 9:30 a.m. and currently scheduled to be held at White Mountains Community College. Please call ahead to reconfirm the time and location of each meeting. The general public is encouraged to attend and participate in all meetings whether or not they are a part of the Planning Team.

As mandated by the Disaster Mitigation Act of 2000, all communities are required to complete a local hazard mitigation plan in order to qualify for FEMA funding should a natural disaster occur. The planning processes are made possible through grants from the Federal Emergency Management Administration (FEMA).

For more information on the hazard mitigation planning process, please contact June Garneau at Mapping and Planning Solutions, 846-5720.

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To promote additional stakeholder participation, the Planner also sent monthly schedule updates to over 300 state-wide stakeholders including such agencies as NH DOT, NH Forests & Lands and the American Red Cross.



### MAPS EOP & Hazard Mitigation Meetings | 2015

New or changed Emergency Operations or Hazard Mitigation meetings; highlighted by "Counties".

Status update: 5/20/15

Day	Date	Time	Town/Location	Plan Type	HSEM Field Rep	County
Thursday	May 21	8:30 AM	Gorham Police Department	EOP	Heidi Lawton	Coos
Friday	May 22	8:30 AM	Gorham Police Department	EOP	Heidi Lawton	Coos
Tuesday	May 26	9:30 AM	Conway Town Offices	EOP	Heidi Lawton	Carroll
Tuesday	May 26	6:00 PM	Stewartstown Town Offices	EOP	Heidi Lawton	Coos
Wednesday	May 27	9:00 AM	Lincoln Town Offices	HMP	Paul Hatch	Grafton
Wednesday	May 27	6:00 PM	Stratford Town Offices	HMP	Heidi Lawton	Coos
Thursday	May 28	10:00 AM	East Kingston Fire Station	EOP	Julia Chase	Rockingham
Friday	May 29	10:00 AM	Waterville Valley Public Safety Building	EOP	Paul Hatch	Grafton
Monday	Jun 1	6:00 PM	Stewartstown Town Offices (tentative)	EOP	Heidi Lawton	Coos
Tuesday	Jun 2	9:30 AM	Conway Town Offices	EOP	Heidi Lawton	Carroll
Tuesday	Jun 2	6:00 PM	Lisbon Railroad Depot	HMP	Paul Hatch	Grafton
Wednesday	Jun 3	9:30 AM	Berlin - Room 211 @ WMCC	HMP	Heidi Lawton	Coos
Wednesday	Jun 3	6:30 PM	Randolph Town Offices	EOP	Heidi Lawton	Coos
Friday	Jun 5	10:00 AM	Waterville Valley Public Safety Building (t)	EOP	Paul Hatch	Grafton
Monday	Jun 8	6:00 PM	Monroe Fire Station	EOP	Paul Hatch	Grafton
Tuesday	Jun 9	9:00 AM	Campton Town Offices	EOP	Paul Hatch	Grafton
Tuesday	Jun 9	2:00 PM	Raymond Fire Station	EOP	Julia Chase	Rockingham
Thursday	Jun 11	5:00 PM	Sandwich Town Offices	EOP	Heidi Lawton	Carroll
Monday	Jun 15	6:00 PM	Stewartstown Town Offices (tentative)	EOP	Heidi Lawton	Coos
Tuesday	Jun 16	10:00 AM	North Conway Fire Station	EOP	Heidi Lawton	Carroll
Tuesday	Jun 16	6:00 PM	Dorchester Town Hall	EOP	Paul Hatch	Grafton
Wednesday	Jun 17	9:00 AM	Lincoln Town Offices	HMP	Paul Hatch	Grafton
Friday	Jun 19	10:00 AM	Waterville Valley Public Safety Building (t)	EOP	Paul Hatch	Grafton
Monday	Jun 22	6:00 PM	Monroe Fire Station	EOP	Paul Hatch	Grafton
Tuesday	Jun 23	9:00 AM	Plymouth State University - Langdon Woods	EOP	Paul Hatch	Grafton
Wednesday	Jun 24	9:30 AM	Berlin - Room 211 @ WMCC	HMP	Heidi Lawton	Coos

Two of Berlin's Meetings

It is noted that attendance at the Berlin meetings was excellent; attendance included not only emergency responders but also many of the important department heads, including the City Manager. The meetings were robust and informative and aided greatly in the preparation of this Plan.

While much effort was made to promote public participation at the Berlin hazard mitigation meetings, no general community members took the opportunity to participate, therefore no comments from private citizens are included in this Plan. Comments from all Team members that did participate were integrated into the narrative discussion and were incorporated into the essence of the document.

§201.6(b) requires that there be an open public involvement process in the formation of a plan. This process shall provide an opportunity for the public to comment on the Plan during its formation as well as an opportunity for any neighboring communities, businesses, and others to review any existing plans, studies, reports, and technical information and incorporation of those in the Plan, to assist in the development of a comprehensive approach to reducing losses from natural disasters.

### ***F. Incorporation of existing plans, studies, reports and technical information***

The planning process included a complete review of the Berlin Hazard Mitigation Plan of 2010 for updates, development changes and accomplishments. In addition, as noted in the Bibliography and in footnotes located throughout the Plan many other documents were used to create this mitigation plan. Some, but not all, of those plans and documents are listed as follows:

The Berlin Hazard Mitigation Plan (2010).....	Compare & Contrast
The Berlin Wildfire Mitigation Plan (2007) .....	Compare & Contrast
The Berlin Master Plan (2010) .....	Future Development
Berlin City Report (2014) .....	Structure Value Data
Area Hazard Mitigation Plans (Gorham, Randolph, Carroll).....	Formats & Mitigation Ideas
The Berlin Subdivision Regulations (1998).....	Subdivision Regulations
Floodplain Ordinance (part of Zoning Ordinance) .....	Floodplain Regulations
Census 2010 Data .....	Population Data
The NH DRA Summary of Inventory of Valuation MS-1 2015 for Berlin .....	Structure Evaluation
The Economic & Labor Market Information Bureau Community Response .....	Population Trends
The American Community Survey (ACS 2010-2014) .....	Population Trends
NH Forest Forests & Lands (DRED).....	DRED Fire Report
NH Office of Energy & Planning .....	Flood Losses
The NH Department of Revenue property tax valuation by property type .....	Property Information

Other technical manuals, federal and state laws as well as research data were combined with these elements to produce this integrated hazard mitigation plan. Please refer to the Bibliography in *Appendix A: Bibliography* and the Plan's footnotes.



## G. Hazard Mitigation Planning Process & Methodology

The planning process consisted of twelve specific steps; some steps were accomplished independently while other areas were interdependent. Many factors affected the ultimate sequence of the planning process such as the number of meetings, community preparation, attendance and other community needs. The planning process resulted in significant cross-talk regarding all types of natural and human-caused hazards by team members.

All steps were included but not necessarily in the numerical sequence listed. The list of steps is as follows:

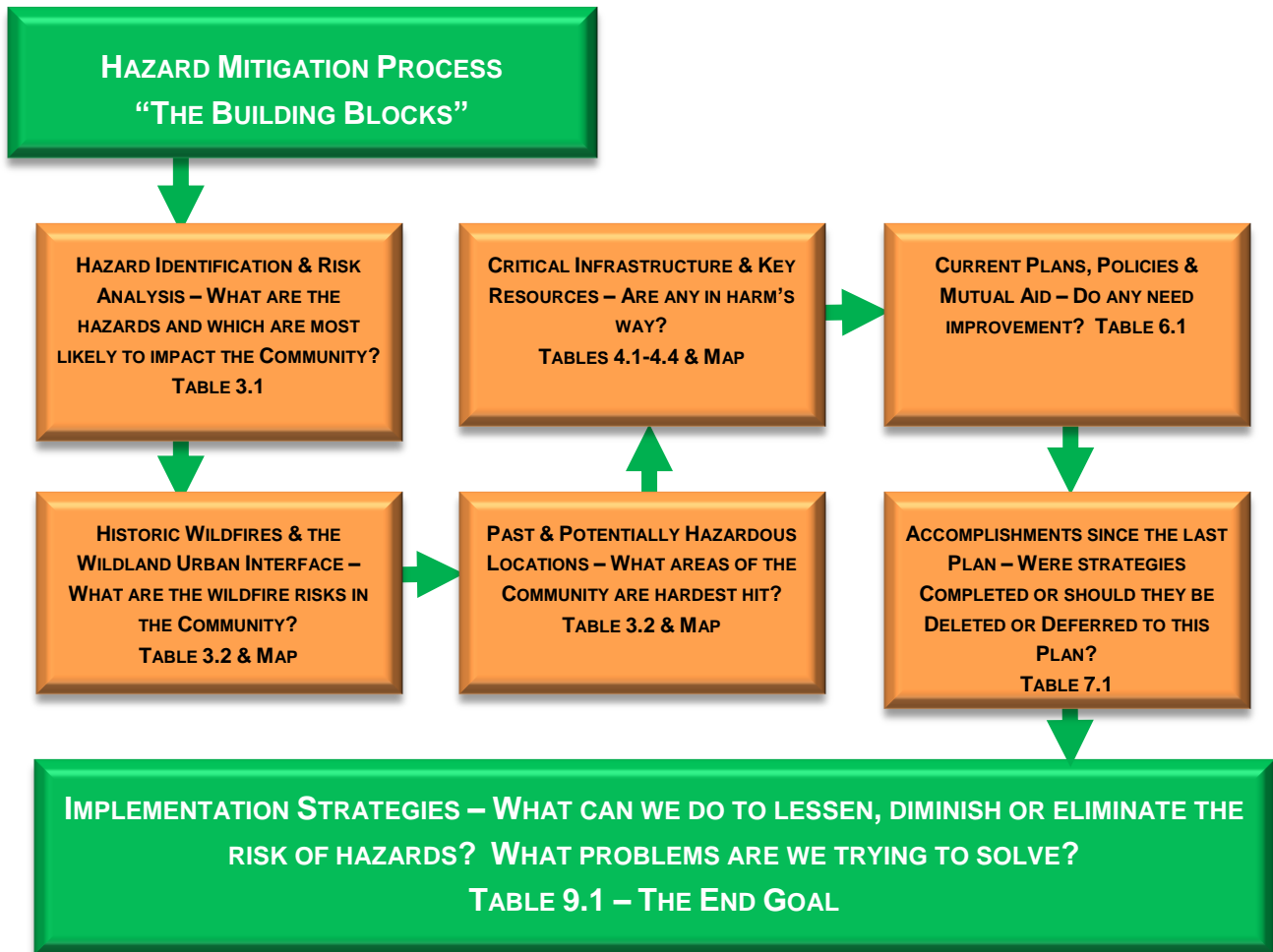
### PLANNING STEPS

- Step 01: Team Formation and Orientation, Goal Identification
- Step 02: Formulate Hazards List, Hazards Description and Threat Matrix  
*Table 3.1 – Hazard Risk Analysis*
- Step 03: Profile, List and Map Historic and Potential Hazards, Wildfire, Natural and Human-Caused  
*Table 3.2 – Historic and Potential Hazards*
- Step 04: Profile, List and Map Critical Infrastructure & Key Resources  
*Tables 4.1 to 4.4 – Critical Infrastructure & Key Resources*
- Step 05: Assess Community's participation in National Flood Insurance Program  
*Chapter 3, Section C*
- Step 06: Introduction, Emergency Services, Current & Future Development Trends, City Statistics  
*Chapter 2, Sections A, B and C and Table 2.1, City Statistics*
- Step 07: List Existing Mitigation Strategies & Brainstorm to Identify Potential Mitigation Strategies  
*Table 6.1 – Current Plans, Policies and Mutual Aid*
- Step 08: Examine the Mitigation Strategies from the Prior Plan  
*Table 7.1 – Accomplishments since Prior Plan(s) Approval*
- Step 09: Evaluate and Categorize Potential Mitigation Action Items  
*Tables 8.1 - Potential Mitigation Strategies & the STAPLEE*
- Step 10: Prioritize Mitigation Action Items to Determine Action Plan  
*Table 9.1 – The Mitigation Action Plan*
- Step 11: Team Review of Plan Contents for Submission to HSEM/FEMA
- Step 12: Adopt and Monitor the Plan

Using a “building block” approach, the base, or foundation, for the mitigation plan update was the prior plan. Each table that was completed had its starting point with the last hazard mitigation plan completed by the Community.

Ultimately, the “building blocks” lead to the final goal, the development of prioritized mitigation “action items” that when put into an action plan, would lessen or diminish the impact of natural hazards on the City.

## H. Hazard Mitigation Building Blocks & Tables



## I. Hazard Mitigation Goals

Before identifying new mitigation actions to be implemented, the Team established and adopted the following broad hazard mitigation goals. The goals that are in the 2013 State of New Hampshire Multi-Hazard Mitigation Plan were reviewed as were the goals that were in the prior Berlin Hazard Mitigation Plan. After discussing these goals, the Berlin Hazard Mitigation Team (2016) agreed to the following goals for this Plan.

### COMMUNITY & RESOURCE PROTECTION

- To improve upon the protection of the general population, the citizens of Berlin and visitors, from all natural and human-caused hazards.
- To reduce Berlin's potential exposure to risk with respect to natural and human-caused hazards.
- To minimize the damage and public expense which might be caused to public and private buildings and infrastructure due to natural and human-caused hazards.

**COORDINATION & COMMUNICATION**

- To improve the City of Berlin's:
  - *Emergency preparedness and communication network.*
  - *Disaster response and recovery capability.*
- To identify, introduce and implement improvements to establish and maintain a reliable communication system.
- To improve communication capabilities so that the citizens of Berlin can be notified in the most efficient manner as possible.
- To ensure that regular communication occurs between various departments and with local, regional and state officials; to have up-to-date plans in place to address various emergency situations and ensure that those involved are aware of their responsibilities.

**OUTREACH & EDUCATION**

- To build an awareness of public responsibility for hazard mitigation as well as steps that the City is taking.
- To raise the awareness and acceptance of hazard mitigation opportunities through public education and outreach programs.
- To increase public awareness of the fire risk and the City's potential liability with respect to wildfires.

**DAMAGE PREVENTION & REDUCTION**

- To reduce the potential impact of natural and human-caused disasters on the City of Berlin's:
  - *Emergency Response Capability*
  - *Critical Infrastructure & Key Resources*
  - *Private property*
  - *Economy*
  - *Natural environment*
  - *Historic treasures and interests, as well as other tangible and intangible characteristics that add to the quality of life of the citizens and visitors to Berlin.*
- To identify, introduce and implement cost effective hazard mitigation measures so as to accomplish the City's Goals and Objectives.
- To reduce the occurrence of road closures and road erosion due to localized flooding within the City of Berlin.
- To reduce communication and transportation isolation.
- To respond to recent mill closures and the utilization of potentially hazardous land remaining.



## J. Narrative Description of the Process

The Plan was developed with substantial local, state and federal coordination; completion of this new hazard mitigation plan required significant planning preparation. All meetings were geared to accommodate brainstorming, open discussion and an increased awareness of potential hazardous conditions in the City.

The planning process included a complete review of the 2010 Berlin Hazard Mitigation Plan. Using the 2010 Plan as a base, each element of the old plan was examined and revised to reflect changes that had taken place in development and in the priorities of the Community. In addition, referring to the 2010 Plan, the Team was able to reassess strategies from the past and to improve upon mitigation these strategies for the future.

The following narrative explains how the 2010 Berlin Hazard Mitigation Plan was used during each step of the planning process to make revisions that resulted in this Plan.

### Meeting 1, April 8, 2015

The first full meeting with the Berlin Hazard Mitigation Team was held. Meeting attendance included Randy Trull (EMD & Fire Chief), Michael Perreault (Public Works Director), Thaddeus Soltys (Assistant Fire Chief), Henry Noel (Waste Water Treatment Plant Superintendent), Barney Valliere (Police Department), Jim Wheeler (City Manager), Peter Higbee (City Council), Linda White (Housing & HR Manager), Adam Cloutier (Berlin EMS), Paul Gagne (Berlin EMS), Chris Dubey (Berlin EMS Director), Mary-Jo Landry (Housing), Donny Labrecque (Water Department), Olin Garneau (Mapping and Planning Solutions) and June Garneau (Mapping and Planning Solutions).

To introduce the Team to the planning process, June reviewed the evolution of Hazard Mitigation Plans, the funding, the 12 Step Process (handout), the collaboration with other agencies and the Goals (handout). June also explained the need to sign-in, track time (handout) and to provide public notice to encourage community involvement.

Work then began on *Table 2.1, City Statistics*. Most of the work on this table was complete with the exception of a few items that June would either determine through GIS or get at a later date. There was some discussion about the weekend and summer population numbers in Berlin but in general the Team felt that the data that had been obtained from the Census Bureau and the Economic and Labor Department Bureau's Community Profile accurately represented the City's population.

#### HAZARDS MITIGATION POTENTIAL TEAM MEMBERS

##### FEDERAL

US Forest Service

##### STATE

Department of  
Transportation  
DRED

RC&D (Non-Profit)

##### LOCAL

Selectmen (Past/Present)

City Manager/Administrator

City Planner

Police Chief

Fire Chief

Emergency Management

Emergency Services

Fire Warden

Health Services

Education/School

Recreation Directors

Public Works Director

Road Agent

Water Management

Public Utilities

Waste Management

Dam Operators

Major Employers

##### LOCAL - SPECIAL INTEREST

Land Owners

Home Owners

Forest Management

Timber Management

Tourism & Sportsman's

Groups

Developers & Builders

##### EXPERTS

GIS Specialists

Watershed Oversight

Environmentalists

Media

Next on the Agenda were hazard identification and the completion of Table 3.1. After the hazards had been identified, the Team then assessed the risk severity and probability by ranking each hazard on a scale of 1-5 (5 being catastrophic) based on the following:

The Human Impact..... Probability of Death or Injury  
The Property Impact..... Physical Losses and Damages  
The Business Impact.... Interruption of Service

The rankings were then calculated to reveal the hazards which pose the greatest risks to the Community; 13 natural hazards and five human-caused hazards were identified. After analyzing these hazards using Table 3.1, Severe Winter Storm (snow & ice storms), Extreme Temperatures and Flooding (local roads) were designated as the primary concerns.

With time running out June thanked the Team members for their participation and set the next meeting date for April 22, 2015.

#### Meeting 2, April 22, 2015

Meeting attendance included Randy Trull, Michael Perreault, Thaddeus Soltys, Henry Noel, Barney Valliere, Linda White, Chris Dubey, Mary-Jo Landry, Donny Labrecque, Pamela Laflamme (Community Development Director), Olin Garneau and June Garneau.

The meeting began with a review of Table 3.1 to determine if the hazards and their order of "risk" still seemed accurate. A good deal of discussion took place before changes were made; June agreed to forward the revised table to the Team.

After the review of Table 3.1, the Team went on to provide descriptions of each hazard and how they could, or do, impact the City of Berlin specifically. In order to gain more knowledge of the impact of these hazards, June asked the Team to describe each hazard as it relates to Berlin.

For example, some of the questions asked were:

- How often do these hazards occur?
- Do the hazards damage either the roads or structures?
- Have the hazards resulted in loss of life?
- Are the elderly and functional needs populations particularly at risk?

#### Meeting 1 – April 8, 2015

##### **1) Introduction**

- a) Evolution of Hazard Mitigation Plans & Community Wildfire Protection Plans
- b) Reasons for Hazard Mitigation and Update
- c) Community involvement to solicit input on how to mitigate the effects of hazards
- d) Devise a plan that lessens, diminishes or completely eliminates the threat of Hazards to the City

##### **2) The Process**

- a) Funding
- b) Review of 12 Step Process & The Team (handout)
- c) Collaboration with other Agencies (HSEM, WMNF)

##### **3) Meetings**

- a) Community Involvement - Public Notice, Press Release
- b) Stakeholders
- c) Signing In, Tracking Time, Agendas, Narrative (handout)

##### **4) Today's Topics**

- a) City Information
- b) Hazard Identification & Analysis
- c) Hazard Descriptions

##### **5) Next Meeting**

- a) Homework – Critical Infrastructure & Key Resources
- b) Digital Photos – contributions welcome

##### **6) Future Meetings**

- a) April 22, 2015 @ 9:30 AM
- b) May 6, 2015 @ 9:30 AM

#### Meeting 2 – April 22, 2015

##### **1) Previous Meeting**

- a) Discussed the evolution of Hazard Mitigation Plans and the Process,
- b) Worked on....
  - i) Table 2.1, City Information
  - ii) Table 3.1, Hazard Identification & Analysis

##### **2) Today's Topics**

- a) Review Table 3.1
- b) Provide local Hazard Descriptions
- c) Work on Table 3.2, Past Hazard Events
- d) Work on Tables 4.1-4.4, Critical Infrastructure & Key Resources (time allowing)

##### **3) Homework & Next Meeting**

- a) Review any information send by MAPS
- b) Future Meetings
  - i) Table 6.1, Current Plans, Policies & Mutual Aid
  - ii) Table 7.1, Accomplishments since the Prior Plan
  - iii) Table 8.1, The STAPLEE process
  - iv) Table 9.1, The Mitigation Action Plan
- c) Digital Photos – contributions welcome

##### **4) Future Meetings**

- a) May 6, 2015 @ 9:30 AM

- What has been done in the past to cope with the hazards?
- Was outside help requested?
- Are the hazards further affected by an extended power failure?

In addition to bringing more awareness to the hazards, these questions provided information to further analyze the impact of the hazards on the Community. A great deal of time was spent discussing the hazards in Berlin creating a very detailed explanation of each hazard. June noted that these descriptions would be used in Chapter 5.

With time running out, the Team decided to save the last few hazards for the following meeting. June thanked the Team for their work and reviewed the topics for the next meeting: the completion of the hazard descriptions, a review of the Plan's "Goals", a look at past hazard events and potential hazardous areas and an assessment of the City's Critical Infrastructure & Key Resources. The next meeting was scheduled for Wednesday, May 6, 2015.

### Meeting 3, May 6, 2015

Meeting attendance included Randy Trull, Thaddeus Soltys, Henry Noel, Barney Valliere, Jim Wheeler, Peter Higbee, Adam Cloutier, Paul Gagne, Chris Dubey, Mary-Jo Landry, Olin Garneau and June Garneau.

Picking up where we had left off at the last meeting, the Team first finished the hazard descriptions. June then provided the Team with a handout outlining the "Goals" as they would appear in this Plan. The goals were roughly based on those from the 2013 State Hazard Mitigation Plan and goals that had been prior hazard mitigation plans. The Team reviewed the goals and were asked if any additional goals should be added; none were added.

The Team began work on *Table 3.2, Historic Hazard Identification*, a list of past and potentially hazardous locations and/or events. First, they looked at the hazards that were listed in the 2010 Hazard Mitigation Plan and in the 2007 Wildfire Mitigation Plan and determined which they would like to see kept in this Plan.

The Team then examined the record of Presidential Disaster Declarations that have taken place in recent years, a record that shows substantial increase over past decades. Looking at this record of disasters allowed the Team to think back and brainstorm on events that have taken place in the past five years.

Mitigation strategies were discussed to protect structures and to educate the City's citizens about the risk in the high risk and WUI areas. It was determined that the City would acquire Firewise materials to have available at the City Offices.

Moving on, the Team looked at the CIKR from the last hazard mitigation plan to determine if any changes should be made. June had populated the *Tables 4.1–4.4, Critical Infrastructure & Key Resources (CIKR)* with facilities that had been identified in the 2010 Hazard Mitigation Plan and in the 2007 Wildfire Mitigation Plan. The Emergency Response Facilities, the Non-Emergency Response Facilities, the Facilities & Populations to Protect and the

#### Meeting 3 – May 6, 2015

##### 1) Previous Meeting

- a) Reviewed Table 3.1 and made changes
- b) Worked on Hazard Descriptions

##### 2) Today's Topics

- a) Work on Table 3.2, Past Hazard Events
- b) Work on Tables 4.1-4.4, Critical Infrastructure & Key Resources
- c) Work on Table 6.1, Current Plans, Policies & Mutual Aid (time allowing)

##### 3) Homework & Next Meeting

- a) Review any information send by MAPS
- b) Future Meetings
  - i) Table 7.1, Accomplishments since the Prior Plan
  - ii) Table 8.1, The STAPLEE process
  - iii) Table 9.1, The Mitigation Action Plan
- c) Digital Photos – contributions welcome

##### 4) Future Meetings

- a) June 3, 2015 @ 9:30 AM

Potential Resources were examined and a few minor adjustments were made for this Plan. In addition, the evacuation routes, helicopter landing zones and bridges on the evacuation routes were defined.

With time running out it was determined to wait until the next meeting to finish Table 4.1-4.4 hazard risks. The next meeting was set for June 3, 2015 and the meeting was adjourned.

#### Meeting 4, June 3, 2015

Meeting attendance included Randy Trull, Michael Perreault, Thaddeus Soltys, Henry Noel, Jim Wheeler, Peter Higbee, Linda White, Adam Cloutier, Chris Dubey, Donny Labrecque, Olin Garneau and June Garneau.

The first thing on the agenda was to finish Table 4.1-4.4 hazard risks from the previous meeting. The Team provided a rough assessment of the hazard risk for each of the CIKR based on a scale of 1-3, with 1 indicated little or no risk. As part of this assessment, the particular hazard that may cause risk was also indicated.

Next on the agenda was *Table 7.1, Accomplishments since the Last Plan*. Having pre-populated the table with the mitigation strategies from the 2010 Plan, June led the Team through each strategy to determine which of these were “Completed”, should be “Deleted” or should be “Deferred” to this Plan as a new mitigation strategy. It was explained to the Team that those items that were “Deferred” would become “new strategies” for this Plan and be discussed again when we got to our final table, *Table 9.1, The Mitigation Action Plan*.

Some of the strategies from the 2010 Plan had been completed by the City; several were deleted as they were felt to be no longer useful and/or they were determined to be “emergency preparedness”, not mitigation. There were also some that had not yet been addressed and were deferred to this Plan.

Once again, time was running short. June took what little time was left to review the topics for the next meeting, the first of which would be *Table 6.1, Current Plans, Policies & Mutual Aid*. June also gave the Team a short rundown of the final tables, *Table 8.1, Potential Mitigation Strategies & the STAPLEE* and *Table 9.1, The Mitigation Action Plan* to give them a better idea of the direction we were ultimately headed. The next meeting was scheduled for Wednesday, June 24, 2015.

#### Meeting 5, June 24, 2015

Meeting attendance included Randy Trull, Michael Perreault, Henry Noel, Barney Valliere, Jim Wheeler, Linda White, Adam Cloutier, Chris Dubey, Mary-Jo Landry, Donny Labrecque, Heidi Lawton (NH-HSEM), Olin Garneau and June Garneau.

#### Meeting 4 – June 3, 2015

##### **1) Previous Meeting**

- a) Work on Table 3.2, Past Hazard Events
- b) Completed Hazard Description
- c) Discussed development
- d) Worked on Tables 4.1-4.4

##### **2) Today's Topics**

- a) Complete work on Tables 4.1-4.4, Critical Infrastructure & Key Resources
- b) Work on Table 6.1, Current Plans, Policies & Mutual Aid
- c) Work on Table 7.1, Accomplishments since the Prior Plan (time allowing)

##### **3) Homework & Next Meeting**

- a) Review any information send by MAPS
- b) Future Meetings
  - i) Table 7.1, Accomplishments since the Prior Plan
  - ii) Table 8.1, The STAPLEE process
  - iii) Table 9.1, The Mitigation Action Plan
- c) Digital Photos – contributions welcome

##### **4) Future Meetings**

- a) June 24, 2015 @ 9:30 AM

First on the agenda was a review of *Table 7.1, Accomplishments since the Last Plan*, the table that was completed at the last meeting. Having translated her notes from the meeting into paragraphs, June reviewed each item in Table 7.1 to see if the concepts and ideas of the Team remained intact and to verify the accuracy of the information. Although several of these strategies were determined to be emergency preparedness and not mitigation, the Team decided to keep them in the Plan as reminders to get these important action items completed.

*Table 6.1, Current Plans, Policies & Mutual Aid*, was next on agenda, a table that June had populated by using the 2010 Hazard Mitigation Plan and the 2007 Wildfire Hazard Mitigation Plan. Looking closely at the current mechanisms in place, the Team was able to determine whether the existing policies were effective or in “need of improvement”. June explained that, like the items from Table 7.1, the “Improvements Needed” items in Table 6.1 would become new “action items” for this Plan in Table 9.1

#### Meeting 5 – June 24, 2015

##### 1) Previous Meeting

- a) Finished up Tables 4.1-4.4 Hazard Risks
- b) Worked on Table 7.1, Accomplishments since the Prior Plan

##### 2) Today's Topics

- a) Review....
  - i) Table 7.1, Accomplishments since the Prior Plan
- b) Work on....
  - i) Table 6.1, Current Plans, Policies & Mutual Aid
- c) Discuss....
  - i) Critical Infrastructure & DHART Coordinate Mapping (save for later)
  - ii) Wildland Urban Interface (WUI)
  - iii) Mitigation Action Items (handout)

##### 3) Homework & Next Meeting

- a) Review any information send by MAPS
- b) Digital Photos – contributions welcome

##### 4) Future Meetings

- a) July 15, 2015 @ 9:30 AM

Last on the agenda, June discussed the Wildland Urban Interface (WUI) and projected a map of the Wildland Urban Interface over the Berlin base layer and topography. The WUI was determined using GIS analysis to create a 300 foot buffer from the center line of all Class I-V roads and then an additional 1320 foot buffer from the first buffer (see Map 2). This area is determined to be the area in which the urban environment interfaces with the wildland environment and the area that is most prone to the risk of wildfires. It should be noted that although the “WUI” was defined for the purpose of this Plan, many rangers and firefighters believe that cities and towns with substantial wooded land, such as Berlin, are entirely within the Wildland Urban Interface.

Before the meeting was adjourned the Team discussed Mitigation Action Items; June provided the Team with a comprehensive list of possible strategies and explained how she would be using FEMA’s *“Mitigation Ideas, A Resource for Reducing Risk to Natural Hazards”* while writing mitigation strategies. The next meeting was set for Wednesday, July 15, 2015.

#### Meeting 6, July 15, 2015

Meeting attendance included Randy Trull, Pamela Laflamme, Michael Perreault, Thaddeus Soltys, Henry Noel, Peter Higbee, Linda White, Adam Cloutier, Paul Gagne, Chris Dubey, Lisa Crossland (Berlin EMS), Heidi Lawton, Olin Garneau and June Garneau.

First on the agenda, June provided the Team with a recap of the progress that had been already made in the planning process. This recap included a brief look at each of the following completed tables:

- *Table 2.1 – City Statistics*
- *Table 3.1 – Hazard Threat Analysis*
- *Tables 4.1-4.4 – Critical Infrastructure & Key Resources*
- *Table 7.1 – Accomplishments since the Last Plan*



This review helped the Team understand how each of these tables served as a building block for the final two tables, *Table 8.1, Potential Mitigation Strategies & the STAPLEE* and *Table 9.1, The Mitigation Action Plan*.

Next, the Team reviewed *Table 6.1, Current Plans, Policies, & Mutual Aid* that was completed at the last meeting. Like *Table 7.1*, June reviewed each item in *Table 6.1* to see if the concepts and ideas of the Team remained intact and to verify the accuracy of the information. Minor changes were made to *Table 6.1*, leaving eight strategies from the last plan that were considered to need improvement and that were deferred to become new mitigation action items for this Plan. A few of these items also appeared in *Table 7.1*; together they would form just once action item.

June then provided the team with handouts that explained the STAPLEE process and the ranking and prioritizing methodology (see Chapters 8 & 9). Finally, June projected the final pre-populated table for the City's review. This table, a combination of *Table 8.1* and *Table 9.1*, enabled the Team to examine each strategy from *Tables 6.1* and *7.1* that they had previously determined to be either in need of improvement or deferred for further action.

#### Meeting 6 – July 15, 2015

##### **1) Previous Meeting**

- a) Finished up *Table 7.1*, Accomplishments since the Prior Plan
- b) Worked on....
  - i) *Table 6.1, Current Plans, Policies & Mutual Aid*
- c) Discussed....
  - i) Wildland Urban Interface (WUI)
  - ii) Mitigation Action Items

##### **2) Today's Topics**

- a) Work on....
  - i) *Table 9.1, Mitigation Action Items*
  - ii) STAPLEE
  - iii) Prioritizing and Ranking (time allowing)

##### **3) Homework & Next Meeting**

- a) Review any information send by MAPS
- b) Digital Photos – contributions welcome

##### **4) Future Meetings**

- a) \_\_\_\_\_

Using *Table 9.1*, the Team was now able to see and understand the “Action Items” for this hazard mitigation plan. Looking carefully at each “Action Item”, the Team was able to assign responsibility, the time frame for completion, the type of funding that would be required and the estimated cost of the action. After much discussion and a careful review, ultimately, the Team settled on 34 “Mitigation Action Items” they felt were achievable and that would help to diminish the impact of natural hazards in the future.

Once again, with time running out, June asked the Team to think about any additional mitigation action items they would like to see added to the Plan. The meeting was adjourned and the next was set for August 5, 2015.

#### Meeting 7, August 5, 2015

Meeting attendance included Randy Trull, Michael Perreault, Thaddeus Soltys, Henry Noel, Jim Wheeler, Peter Higbee, Amy Holmes (North Country PHN), Olin Garneau and June Garneau.

June asked the Team if there were any addition mitigation action items to add since the last Plan; the general consensus was that the list of action items was completed.

Next on the Agenda was the STAPLEE process, a systematic method used to gauge the quality of each of the Action Items. The Social (S), Technical (T), Administrative (A), Political (P), Legal (L), Economic (E) and Environmental (E) impact for each action item was discussed; this analysis then became *Table 8.1*. This had previously been explained to the Team, so they were prepared to do the analysis.

#### Meeting 7 - August 5, 2015

##### **1) Previous Meeting**

- a) Worked on....
  - i) *Table 9.1, Mitigation Action Items*

##### **2) Today's Topics**

- a) Work on....
  - i) STAPLEE
  - ii) Prioritizing and Ranking (time allowing)

##### **3) Homework & Next Meeting**

- a) Review any information send by MAPS
- b) Digital Photos – contributions welcome

##### **4) Future Meetings**

- a) August 12, 2015 @ 9:30 AM

When the STAPLEE process was complete, the final scores ranged from 16-21, with 21 being the highest score. The average of all scores was 19.67.

Next, June reviewed the explanation of the ranking and priority methods (see Chapter 9) prior to beginning work on ranking and prioritizing. June organized the “Action Items” by ranking them from 0-3, roughly in order of time frame, the City’s authority to get the strategy accomplished and the STAPLEE score. The Team reviewed the ranking and made a couple of changes based on the expected time frame.

Then within each rank, the Team assigned a priority; for example, if seven action items were ranked “1” then the priority rank was 1-7 (see explanation in Chapter 9). In this fashion, the Team was able to determine which action items were the most important within their rankings and in which order the action items would be accomplished.

With Tables 8.1 and 9.1 completed, the Team’s work was complete, with the exception of the final review. June agreed to put the final plan together and email a copy for the Team’s review. June explained the process from this point forward and thanked the Team for their hard work. No additional meeting was scheduled.

Documentation for the Planning process, including public involvement, is required to meet DMA 2000 (44CFR§201. (c) (1) and §201.6 (c) (1)). The Plan must include a description of the Planning process used to develop the Plan, including how it was prepared, who was involved in the process, and how other agencies participated. A description of the Planning process should include how the Planning team or committee was formed, how input was sought from individuals or other agencies who did not participate on a regular basis, what the goals and objectives of the Planning process were, and how the Plan was prepared. The description can be in the Plan itself or contained in the cover memo or an appendix.

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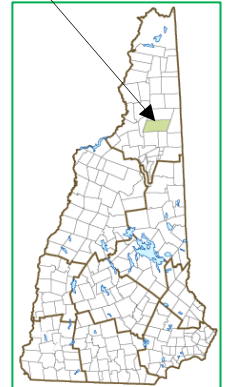
## Chapter 2: Community Profile

### A. Introduction

Berlin is located in Coos County in the Great North Woods Tourist Region in the north-central part of New Hampshire. The City is bordered by Milan to the north, Randolph and Gorham to the south and Unincorporated Places to the east and west. According to GIS 41.5% of Berlin is in the White Mountain National Forest.

The City is probably most well-known for the Androscoggin River and Jericho State Park. An abundance of recreational activities can be found in or around Berlin, including ATV riding, snowmobiling, hiking, boating and skiing; there are outdoor activities for every season. To support tourism in the Community, a number of hotels, motels and bed & breakfast establishments can also be found.

Berlin  
New Hampshire



### CITY GOVERNMENT

An eight-member City Council and a Mayor govern the City of Berlin; day-to-day operations are managed by a full-time City Manager. The City's departments include, but are not limited to Fire, Police, Public Works, Water & Sewer, Zoning, Library, Recreation, Planning, Park Authority, School and Industrial Development.

### DEMOGRAPHICS & HOUSING

Over the last 30 years, the population of Berlin has decreased drastically; the population change from 1980 to 2010 showed a decrease of 3033 according to US Census 2010. Berlin's population in 2013 was estimated to be 9,612.

The American Community Survey (ACS) 2008-2012 estimates a total of 5,141 housing units, most of which are single family (2,922). Multiple-family structures total 2,185 and mobile homes and other housing units number 34. The median household income is estimated to be \$36,811 (ACS 2008-2012) and the median age is 44.5 years.

### EDUCATION & CHILD CARE

Berlin students attend grades K-5 at either Brown Elementary School or Hillside Elementary School. Students in grades 6-8 attend school at Berlin Middle School and students in grades 9-12 attend school at Berlin High School. There are seven child care facilities in Berlin with a capacity of 558 and a college in the City; White Mountains Community College.

### NATURAL FEATURES

The City of Berlin covers approximately 61.5 square miles of land area and has 0.7 square miles of inland water.

The Androscoggin River flows from the north in Milan south to Gorham. Although the Androscoggin is beautiful, in times of high water it can be treacherous and a hazard to structures along its banks. The Androscoggin River is regulated by the hydro-electric dam system.

Vegetation in Berlin is typical of northern New England including both deciduous and conifer forests, open fields, swamp and riverine areas. Berlin's terrain lends itself to an abundance of lakes, ponds, streams and rivers.

## **TRANSPORTATION**

There are two major roadways running through Berlin. US Route 16 enters Berlin from Gorham in the south and travels north into Milan. NH Route 110 branches off of Route 16 and travels north-west through Milan and eventually Stark. Routes 16 and 110 are the City's major evacuation routes.

## **B. Emergency Services**

### **EMERGENCY OPERATION CENTER**

The City of Berlin maintains an Emergency Operations Center (EOC) as part of the City's emergency preparedness program. The EOC is where department heads, government officials and volunteer agencies gather to coordinate their response to a major emergency or disaster event. The EOC is where the officials responsible for responding to major emergencies and disasters assemble to direct and control the jurisdiction's response. The EOC goes into operation when city officials decide that the situation is serious enough to require a coordinated and other-than-routine response.

In Berlin the designated EOC is the Police Station. Security and maintenance of the EOC facilities will be carried out in accordance with EOC Standard Operating Procedures (SOPs) to be developed by the Emergency Management Director. If need be, the Fire Station will be used as a secondary EOC.

### **EMERGENCY MANAGEMENT DIRECTOR**

The Emergency Management Director (EMD) works closely with all emergency response managers as the City collectively prepares for and responds to emergencies. The EMD is located at the EOC and coordinates the community-wide response to the event.

### **BERLIN POLICE DEPARTMENT**

The Police Department staffs a full-time Chief and 21 full-time sworn officers. Berlin Police Officers are well-trained in the delivery of police services in an atmosphere of regional cooperation and have found value in working with other town and regional agencies, sharing resources, training and experience to provide a superior quality of life for the residents and visitors of Berlin. The Berlin Police Department has mutual aid agreements with all of their bordering police departments, the town of Gorham, NH State Police (Troop F) and with the County Sheriff.

### **BERLIN FIRE DEPARTMENT**

The Berlin Fire Department is a full-time fire department providing quality fire services to the residents and visitors of Berlin 24 hours a day, 365 days a year. The Department staffs a full-time Chief, 19 firefighters and operates one station within the Community. The Berlin Fire Department has mutual aid agreements with Gorham and Milan.

### **BERLIN PUBLIC WORKS DEPARTMENT**

The Berlin Public Works Department is a year-round, 24-hour as needed operation. The department staffs a full-time Director and 47 full-time employees including highway, sewer, recreation and waste water treatment. The department's mission is to support the citizens of Berlin through the safe operation, proper maintenance and future development of highway, supporting infrastructure and utilities in a manner that is cost conscience without sacrificing quality. The City of Berlin has a mutual aid agreement with Gorham.

***BERLIN DISPATCH***

Berlin Dispatch, located at the Police Station, receives 911 alerts from the State's two E-911 call centers in Concord and Laconia. Berlin Dispatch then notifies emergency responders in surrounding communities.

***STATE ENS EMERGENCY WARNING SYSTEM***

The City uses the State's Emergency Notification System (ENS) through Code Red as their emergency warning system. The City also has a siren with coded blasts that could be used at the time of an emergency. In addition the Berlin schools use the "One Call Now" reverse notification system.

***MEDICAL FACILITIES***

Androscoggin Valley Hospital in Berlin (25 beds) is the closest large healthcare facility.

***BERLIN EMS***

Berlin Ambulance is a year-round ambulance service operating 24-hours as needed. Berlin Ambulance is comprised of a full-time Director and nine full-time EMTs. Berlin EMS's mission is to provide primary responsibility for emergency medical services, rescue services and transportation in Berlin.

***EMERGENCY SHELTER(S)***

The primary shelter is the location to which evacuees are directed at the time of an emergency. In Berlin, the designated primary shelters are the Berlin High School. If the need arises and the Berlin High School is not available, the Recreation Department could be used as a secondary shelter.

***C. Berlin's Current & Future Development Trends***

Development in Berlin has been slow since the last Hazard Mitigation Plan in 2010, as it has been throughout the rest of New England. However, there have been some significant developments in recent years.

The old Fraser Paper mill in downtown Berlin has been torn down and replaced with Burgess BioPower, a biomass plant which is producing electricity for Eversource. "This state-of-the-art facility is fueled by wood chips and other renewable, clean, low-grade biomass materials."<sup>4</sup>

Another substantial development project is taking place on Jericho Mountain where five wind turbines have been approved by the City Council. Although the Jericho Mountain Windfarm will ultimately employ only three full-time persons, the hope is that tax revenue will help the City of Berlin.



***Burgess BioPower***  
***Photo Credit: Chris Jensen for NPR***

<sup>4</sup> PointProspect; Burgess BioPower; <http://www.pointprospectcom/burgess-biopower/>

A look at longer-term trends shows that there was a small amount of new home construction between 2004 and 2005. In 2007, new home construction permits dropped to one (see City-Data chart to right)<sup>5</sup>. The Hazard Mitigation Team reported that there is one proposed housing project on Jericho Road across from Jericho State Park, but otherwise there are no new home developments planned at this time; individual home development is expected to remain slow.

- 1997: 1 building, cost: \$60,000
- 1998: 2 buildings, average cost: \$165,900
- 2000: 2 buildings, average cost: \$113,600
- 2004: 5 buildings, average cost: \$130,000
- 2005: 4 buildings, average cost: \$130,000
- 2006: 3 buildings, average cost: \$171,000
- 2007: 1 building, cost: \$175,000
- 2009: 2 buildings, average cost: \$125,000
- 2010: 2 buildings, average cost: \$165,900

*Single-family new house construction permits. City-Data.com*

Other impactful developments include the construction and opening of the Federal Prison and the City's promotion of ATV Trails, particularly within the Jericho ATV Park and the connecting trails. The ATV/OHRV initiative hopes to bring more tourism to the area; by City ordinance, any street in the City can be used to access trails and businesses.

The Berlin Planning Department and the Berlin Planning Board work closely with other city officials to closely monitor building in hazardous areas. The Planning Department and Planning Board follow the City's local ordinances, zoning regulations, floodplain ordinance and subdivision regulations to ensure that any building in hazardous areas will be built to minimize vulnerability to the hazards identified in this Plan. The Duties & Responsibilities of the Planning Department, as shown in the box to the right, indicates the level of cooperation that is apparent in Berlin.<sup>6</sup> No development since 2010 has occurred in hazard prone areas and no development since 2010 has impacted the City's hazard vulnerability.

#### Duties & Responsibilities

The Berlin Planning Department works closely with the Berlin Planning Board to act on all land matters in the City. Together, they review all subdivisions of land, lot mergers, and site plans for new commercial construction or changes in use. The Planning Board also works to maintain the Zoning Ordinance for the community and proposes changes to the City Council as needed or requested. The City Planner works with other departments to develop future goals for the community that ensure citizens in the community are offered choices about where and how they will live and work.

The City recognizes the importance of growth, but also understands the impact that hazards can have on new facilities and homes if built within hazardous areas of the Community. Although the likelihood of substantial development in the near future in Berlin is low, City officials will continue to monitor any new growth and development, including new critical facilities, with regards to potentially hazardous events.

*Jericho Wind Farm Construction  
Photo Credit: JK Scanlan Company, LLC*



<sup>5</sup> City-Data, <http://www.city-data.com/city/Berlin-New-Hampshire.html>

<sup>6</sup> Source: [http://www.berlinnh.gov/Pages/BerlinNH\\_Planning/index](http://www.berlinnh.gov/Pages/BerlinNH_Planning/index)

TABLE 2.1: CITY STATISTICS

Table 2.1 - City Statistics				
Census Population Data	2010	2000	1990	1980
Berlin, NH - Census Population Data	10,051	10,331	11,889	13,084
Coos County	33,055	33,156	34,879	35,014
Elderly Population-% over 65 (ACS 2010-2014)	20.5%			
Median Age (ACS 2010-2014)	44.1			
Median Household Income (ACS 2010-2014)	\$36,358			
Families below the poverty level (ACS 2010-2014)	17.4%			
Change in Population-Summer (%)	10%			
Change in Population-Winter (%)	10%			
Housing Statistics (2010 Census)				
Total Housing Units	4,910			
Occupied Housing Units	4,178			
Owner Occupied Units	2,543			
Renter Occupied	1,635			
Vacant Housing Units	732			
Units for Seasonal, Recreational & Occasional Use	101			
Assessed structure value (2015-MS1)	\$835,886,100			
Regional Coordination				
County	Coos			
Tourism Region	Great North Woods			
Municipal Services & Government				
City Manager	Yes; appointed			
City Mayor	Yes; elected			
Board of Selectmen	No			
City Council	Yes (8); elected			
Planning Board	Yes; appointed			
School Board	Yes; elected			
Zoning Board of Adjustment	Yes; appointed			
Conservation Committee	No			
Master Plan	2010			
Emergency Operation Plan (EOP)	2013			
Hazard Mitigation Plan (HMP)	2010			
Zoning Ordinances	Yes; 2009			
Subdivisions Regulations	Yes; 1998			
Capital Improvement Plan	Yes; annually			
Capital Reserve Funds	Yes; segregated funds			
Building Permits Required	Yes			
City Web Site	Yes; <a href="http://www.berlinnh.gov/Pages/index">http://www.berlinnh.gov/Pages/index</a>			

Table 2.1 - City Statistics

<i>Floodplain Ordinance</i>	Special Flood Hazard Area Overlay Zone (Sec. 17-153 of the Berlin Zoning Ordinance)
<i>Member of NFIP</i>	15-Jun-82
<i>Flood Insurance Rate Maps (DFIRMS)</i>	20-Feb-13
<i>Flood Insurance Rate Study (FIS)</i>	20-Feb-13
<b>Percent of Local Assessed Valuation by Property Type-2014 (NH Department of Revenue)</b>	
<i>Residential Buildings</i>	59.1%
<i>Commercial Land &amp; Buildings</i>	12.1%
<i>Other (including Utilities)</i>	28.9%
<b>Emergency Services</b>	
<i>City Emergency Warning System(s)</i>	State ENS; Siren (coded)
<i>School Emergency Warning System(s)</i>	Call One
<i>Emergency Page</i>	No
<i>Facebook Page</i>	City Facebook page
<i>ListServ</i>	No
<i>Local Newspapers</i>	Berlin Daily Sun; Berlin Reporter
<i>Local TV Stations</i>	WMUR (9); WMTV (8); WGME (13); WCSH (6)
<i>Local Radio</i>	NPR (107.1); WHOM (94.9); WPKQ (103.7)
<i>Police Department</i>	Yes; Full-time (21 sworn officers and a Chief)
<i>Police Dispatch</i>	Berlin Dispatch
<i>Police Mutual Aid</i>	Gorham
<i>Animal Control Officer</i>	No
<i>Fire Department</i>	Yes; Full-time (19 firefighters and a Chief)
<i>Fire Dispatch</i>	Berlin Dispatch
<i>Fire Mutual Aid</i>	Gorham and Milan
<i>Fire Stations</i>	One
<i>Fire Warden</i>	Yes
<i>Emergency Medical Services</i>	Berlin EMS (9 including Director)
<i>EMS Dispatch</i>	Berlin Dispatch
<i>Emergency Medical Transportation</i>	Berlin EMS
<i>HazMat Team</i>	North Country Emergency Response Team (NCERT)
<i>Established Emergency Management Director (EMD)</i>	Yes
<i>Established Deputy EMD</i>	No
<i>Public Health Network</i>	North Country Regional Health Network
<i>Health Officer</i>	Yes
<i>Building Inspector</i>	Yes
<i>Established Public Information Officer (PIO)</i>	Yes (Police Lieutenant)
<i>Nearest Hospital(s)</i>	Androscoggin Valley Hospital - 25 Beds
<i>Local Human Society or Veterinarians</i>	North Country Animal Hospital (Gorham)
<i>Primary EOC</i>	Police Station

Table 2.1 - City Statistics

Secondary EOC	Fire Station	
Primary Shelter	Berlin High School	
Secondary Shelter	Recreation Department	
Utilities		
City Sewer	Municipal	
Department of Public Works (Highway & Sewer)	Yes (47 employees including sewer, highway, recreation, waste water treatment plant)	
Public Works Director	Yes	
Public Works Mutual Aid	Gorham	
Water Supply	Berlin Water Works	
Waste Water Treatment Plant	Yes	
Electric Supplier	Eversource	
Natural Gas Supplier	TransCanada	
Cellular Telephone Access	Yes	
High Speed Internet	Yes	
Telephone Company	Fairpoint	
Transportation		
Primary Evacuation Routes	NH Route 16 & 110	
Nearest Interstate	I-93; Exit 35	
Nearest Airstrip	Berlin Municipal; 5,200 ft. asphalt runway	
Nearest Commercial Airport(s)	Portland (ME) International (99 miles)	
	Manchester-Boston Regional (147 miles)	
Public Transportation	North Country Transit (NCT)	
Railroad	St. Lawrence & Atlantic	
Education & Childcare		
Elementary School	Brown (k-2) & Hillside (3-5) Elementary Schools	
Elementary School	Berlin Middle School (6-8)	
Middle School/High School	Berlin High School (9-12)	
School Administrative Unit	SAU 3	
Licensed Childcare Facilities	7 facilities, 558 capacity	
Conserved Land as a Percent of Land in the Community		
	Square Miles	Percent of City Land
*Approximate Square Miles in Community	61.50	100.0%
*Approximate Total Conserved Land (%)	38.19	62.1%
*Approximate Federal Owned land (%)	25.52	41.5%
*Approximate State Owned Land (%)	12.35	20.1%
*Approximate State Municipal/County Land (%)	0.32	0.5%
*Approximate Private Land (%)	0.00	0.0%



**Table 2.1 - City Statistics**
**Fire Statistics\*\***

Wildfire Fire Calls (14)	None
Coos County Fire Statistics (14)	18 fires, 5.3 acres
State Forest Fires FY (14)	112 fires, 72 acres

*\*Information derived using GIS Analysis*

*\*\*Information derived from the NH Division of Forests and Lands, Fire Warden & State Forest Ranger Report, November 2014; <http://www.nhdfi.org/fire-control-and-law-enforcement/fire-statistics.aspx> and from City of Berlin*

*Information found in Table 2.1, unless otherwise noted, was derived from the Economic & Labor Market Information Bureau, NH Employment Security, 2016. Community Response Received 6/26/15; <http://www.nhes.nh.gov/elmi/products/cp/profiles-pdf/berlin.pdf> and from the City of Berlin*



**Pleasant Street Flooding, 1953**  
**Photo Credit: City of Berlin**



## Chapter 3: Hazard Identification

### A. Description of the Hazards

The first step in hazard mitigation is to identify hazards; the Team determined that thirteen natural hazards have potential to affect the Community. The hazards listed below and in Table 3.1 were classified based upon their relative threat score (as calculated in Column F in Table 3.1) and separated into three categories using Jenks' Optimization, which is also known as natural breaks classification. *"The natural breaks classification process is a method of manual data classification that seeks to partition data into classes based upon natural groups within the data distribution."*<sup>7</sup>

By using this grouping process, the plan demonstrates each hazard's likelihood of occurrence in combination with its potential effect on the City of Berlin. This process illustrates a comprehensive hazard statement and assists the City with understanding which hazards should receive the most attention. Strict determination of the probability of occurrence is contained within Column D in Table 3.1; hazards are assessed based upon their likelihood of the hazard's manifestation within a 25 year period.

#### THE NATURAL HAZARDS

The natural hazards which are **MOST LIKELY** to affect Berlin include:

- Severe Winter Weather (including ice storms)
- Extreme Temperatures
- Flooding (local roads)
- Severe Thunder & Lightning Storms

The natural hazards which **MAY AFFECT** Berlin include:

- Hurricanes & Tropical Storms
- Wildfires
- Riverine Flooding (including ice jams)
- Tornadoes & Downbursts

The natural hazards which are **LESS LIKELY TO AFFECT** Berlin include:

- Hailstorms
- Landslide Erosion & Mudslide
- Earthquake
- Flooding (dam failure)
- Drought

Table 3.1 provides estimates of the level of impact each listed hazard could have on humans, property and business and averages them to establish an index of "severity". The estimate of "probability" for each hazard is multiplied by its severity to establish an overall "relative threat" factor. This matrix also shows the frequency of future occurrence (based on a 25-year window).

Based on this analysis, the most likely natural disaster threat to Berlin is Severe Winter Weather (snow & ice storms) due to a variety of factors as described in Chapter 5. The second most likely threat is Extreme Temperatures and the third is Flooding (local roads). However, it should be noted that five human-caused hazards were discussed by the Team including Epidemic/Pandemic/Influenza, Hazardous Material – Transport, Hazardous Material – Fixed Location, Terrorism and Extended Power Failure.

In light of recent events (Hurricanes Irene & Sandy), it should be noted that hurricanes can cause significant damage in Berlin as a result of both wind strength and flash flooding creating road closures and damage. The Team indicated hurricanes as "may affect Berlin" although the likelihood of high winds and heavy rains extending to north-central New Hampshire in most hurricane events is rare, as is the likelihood of high category hurricanes occurring in New England in general.

<sup>7</sup> ESRI, <http://support.esri.com/en/knowledgebase/GISDictionary/term/natural%20breaks%20classification>

**TABLE 3.1: HAZARD THREAT ANALYSIS**

Table 3.1 - Hazard Threat Analysis							
Hazards will are most likely to affect the Community				A natural hazard is a source of harm or difficulty created by a meteorological, environmental or geological event.			
Hazards which may affect the Community							
Hazards which are less likely to affect the Community							
Scoring for Probability (Columns A, B & C)	Scoring for Likelihood of Occurrence (Column D)	Column A	Column B	Column C	Column D	Columns A+B+C/3	Columns D x E
1=Very Low (0-20%)		What is the probability of death or injury?	What is the probability of physical losses & damage?	What is the probability of interruption of service?	Probability of this occurring within 25 years?	Average of Human, Property & Business Impact	Relative Threat
2=Low (21-40%)							
3=Moderate (41-60%)							
4=High (61-80%)		Human Impact	Property Impact	Business Impact	Probability of Occurrence	Severity	Risk Severity x Occurrence
5=Very High (81-100%)							
Natural Hazards							
1) Severe Winter Weather (snow & ice storms)		4.0	5.0	5.0	5.0	4.7	23.3
2) Extreme Temperatures		3.0	2.0	2.0	5.0	2.3	11.7
3) Flooding (local roads)		1.0	3.0	2.0	5.0	2.0	10.0
4) Severe Thunder & Lightning Storms		2.0	2.0	2.0	5.0	2.0	10.0
5) Hurricane & Tropical Storms		3.0	3.0	3.0	3.0	3.0	9.0
6) Wildfire		2.0	3.0	3.0	3.0	2.7	8.0
7) Riverine Flooding (including ice jams)		1.0	3.0	1.0	4.0	1.7	6.7
8) Tornados & Downburst (macro & micro)		2.0	4.0	4.0	2.0	3.3	6.7
9) Hailstorms		2.0	3.0	1.0	3.0	2.0	6.0
10) Landslide, Erosion & Mudslide		1.0	4.0	4.0	2.0	3.0	6.0
11) Earthquake		4.0	4.0	4.0	1.0	4.0	4.0
12) Flooding (dam failure)		3.0	4.0	4.0	1.0	3.7	3.7
13) Drought		1.0	1.0	1.0	2.0	1.0	2.0
Human-Caused Hazards							
1) Epidemic/Pandemic/Influenza, etc.		5.0	1.0	3.0	5.0	3.0	15.0
2) Hazardous Material - Transport		5.0	5.0	5.0	2.0	5.0	10.0
3) Hazardous Material - Fixed Location		3.0	5.0	5.0	2.0	4.3	8.7
4) Terrorism		5.0	5.0	5.0	1.0	5.0	5.0
5) Extended Power Failure		4.0	3.0	3.0	1.0	3.3	3.3

## B. Risk Assessment

The next step in hazard mitigation planning was to identify the location of past hazard events and if possible, what facilities or areas were impacted. The Team used *Table 3.1, Hazard Threat Analysis*, to identify potential threats and prioritize their threat potential. The Team then used a base map that included the 100-year floodplain, political boundaries, water bodies, the road network and aerial photos to locate all of the past hazard events on the base map. This step in the planning process serves as a stepping stone for predicting where future hazards could potentially occur. The Team identified past events in Berlin, Coos County and the State and listed them in *Table 3.2, Historic Hazard Identification*.

To assess the fire base risk, a formula based on the following criteria was used:

- **Ignitability** – Using the 2001 NH Land Cover Assessment GIS Layer - A value between 0 and 9 was assigned based on ignitability to 23 land cover categories from open water to pitch pine forest.
- **Slope** - A value of 1-10 was assigned to various gradients of slope.
- **Aspect** - A value of 0-8 was assigned to various aspects from flat to southwest facing slopes.

These criteria were combined using GIS analysis and weighted equally to determine risk levels throughout the City. Once the analysis and mapping was complete in GIS, a matrix was created showing varying risk levels: low, medium and high. Each risk level was assigned a color and was mapped over a base-map of the City, see *Appendix G: Map Documents, Map 1: Base Risk Analysis*.

## C. Berlin National Flood Insurance Program (NFIP) Status

Berlin has been a member of the National Flood Insurance Program since June 15, 1982. The floodplain areas of Berlin are primarily along the Androscoggin River, Dead Rivers and Jericho, Horne and Tinker Brooks; there are other small streams and brooks throughout the City that may also experience flooding.

According to the NH Office of Energy and Planning, there are a total of 38 policies in force for a total amount of \$8,056,200. Of these policies, 29 are residential, four are non-residential and five are 2-4 family. There have been losses paid and no repetitive losses in the City of Berlin.<sup>8</sup> The location of structures that lie within the floodplain as well as the floodplain itself can be seen on *Map 3, Past & Potential Areas of Concern*, located in *Appendix G: Map Documents*, of this Plan.

As part of the Zoning Ordinance, City of Berlin, New Hampshire, Sec. 17-153. Special Flood Hazard Area Overlay Zone, Berlin's floodplain ordinance clearly outlines the requirements and states:

In 1968, although well-intentioned government flood initiatives were already in place, Congress established the National Flood Insurance Program (NFIP) to address both the need for flood insurance and the need to lessen the devastating consequences of flooding. The goals of the program are twofold: to protect communities from potential flood damage through floodplain management, and to provide people with flood insurance.

For decades, the NFIP has been offering flood insurance to homeowners, renters and business owners, with the one condition that their communities adopt and enforce measures to help reduce the consequences of flooding. Source: [http://www.floodsmart.gov/floodsmart/pages/about/nfip\\_overview.jsp](http://www.floodsmart.gov/floodsmart/pages/about/nfip_overview.jsp)

<sup>8</sup> NH Office of Energy & Planning; Jennifer Gilbert; February 2015

1. "The purpose of the Special Flood Hazard Area Overlay zone is to limit the nature and intensity of development of flood prone areas to those uses which can be appropriately and safely located in the flood plain and thereby serve the following objectives:
  - a. Secure safety from floods
  - b. Prevent loss of life and reduce property damage and other losses and risks associated with flood conditions.
  - c. Preserve the location, character and extent of natural drainage courses and
  - d. Maintain ecological balance.

*Certain areas of the City of Berlin, New Hampshire are subject to periodic flooding, causing serious damages to properties within these areas. Relief is available in the form of flood insurance as authorized by the National Flood Insurance Act of 1968. Therefore, the city of Berlin, New Hampshire has chosen to become a participating community in the National Flood Insurance Program, and agrees to comply with the requirements of the National Flood Insurance Act of 1968 (P.L. 90-488, as amended) as detailed in this Special Flood Hazard Area Overlay Zone.*

2. The following regulation in this Ordinance shall apply to all land designated as special flood hazard areas by the Federal Emergency Management Agency (FEMA) in its "Flood Insurance Study for the County of Coos NH", dated February 20, 2013, together with the associated Flood Insurance Rate Maps dated February 20, 2013, which are declared to be a part of this ordinance and hereby incorporated by reference These maps and study are on file with the City Clerk, the Planning Department, and the Building Inspector."<sup>9</sup>

The Special Flood Hazard Area Overlay Zone continues for nine additional sections summarized as follows:

3. Provide a "Definition of Terms".
4. Discusses the requirement for "a building permit issued by the Building Inspector."
5. States that the Building Inspector "shall review...to determine whether proposed building sites will be reasonable safe from flooding..." and if the "...site is located in a special flood hazard zone area, all new construction or substantial improvements shall...be adequately anchored...be constructed to be resistant to flood damages...be constructed with electrical...and other service facilities that are designed...to prevent water from entering..."
6. Discusses "new or replacement water and sewer systems...designed to minimize or eliminate infiltration of flood waters into the systems..."
7. Discusses information that shall be furnished to the Building Inspector:
  - a. "The as-built elevation (in relation to NGVD) of the lowest floor (including basement) and include whether or not such structures contain a basement."
  - b. "If the structure has been flood-proofed, the as-built elevation (in relation to NGVD) to which the structure was flood-proofed."
  - c. "Any certification of flood-proofing."

<sup>9</sup> Zoning Ordinance, City of Berlin, New Hampshire, Sec. 17-153.Special Flood Hazard Area Overlay Zone

8. States that the “applicant certifies that all necessary permits have been received from governmental agencies...” Also discussed is the review and approval process by the Special Use Permit Grant Authority (SUPGA), the Public Works Director...and the Water Works Superintendent...”
9. Discusses notification to the Wetlands Bureau of NH DES, certification by a registered professional engineer and encroachments on a designated “Regulatory Floodway”. “No encroachments, including fill, new construction, substantial improvements, and other development are allowed within the floodway that would result in any increase in flood levels within the community during base flood discharge”.
10. States that “...the Building Inspector shall determine the 100 year flood elevation...” in Zones AE and A and goes on to detail the required criteria in Zones A and AE. This section also discusses required criteria for “manufactured homes”, “fully enclosed areas below the lowest floor that are subject to flooding” and “recreational vehicles”.
11. Section 11 discusses variances and the appeal process.

As a community that is acutely aware of potential flooding, the Berlin City Council and the Hazard Mitigation Planning Team are most always aware of new construction and/or substantial improvements that take place in the City. Although Berlin has a relatively small designated Special Flood Hazard Area, the Team felt that it is worthwhile to have NFIP brochures and information available at City Hall for current homeowners and potential developers (see Mitigation Strategy #14, Tables 8.1 & 9.1).

**Severe Repetitive Loss (SRL) Properties--**  
 NFIP-insured buildings that, on the basis of paid flood losses since 1978, meet either of the loss criteria described on page SRL 1. SRL properties with policy effective dates of January 1, 2007, and later will be afforded coverage (new business or renewal) only through the NFIP Servicing Agent's Special Direct Facility so that they can be considered for possible mitigation activities. *Source:* <http://www.fema.gov/national-flood-insurance-program/definitions#R>

The City of Berlin, through its floodplain management and other best practices, complies with the National Flood Insurance Program requirements. The Team understands that the benefits of the NFIP also extend to structures that are not in the 100-year floodplain. The City will continue to work with the Office of Energy and Planning and will carefully monitor its continued compliance with the NFIP.

The City of Berlin's flood map and the Critical Infrastructure & Key Resources (CIKR) that are in the floodplain are shown in *Appendix G: Map Documents, Map 3 Past & Potential Areas of Concern*.

### ***D. Profile of Past, Present & Potential Wildfire Events in Berlin***

Historic fires can serve to help residents determine where future fires may occur, understand how the landscape and land use may have changed over time and assist with determining priorities for future mitigation strategies.

The Berlin Planning Team noted that very few significant wildfires have occurred in Berlin in the recent past but that many of the Community's residences are located in the Wildland Urban Interface (WUI). It was noted that if the right conditions were in place, a large wildfire could occur. Berlin's forested lands include many of the factors associated with potential wildfire including steep terrain, a significant softwood forest and large areas where clear cuts and blow downs have occurred. In addition, there is a limited municipal water supply in parts of Berlin so the fire department must rely on static water sources to fight fires.

The Berlin Fire Department reported a total of 517 calls for service during the fiscal year 2014 from July 1, 2013 to June 30, 2014. As shown in the chart to the right, trash fires, outside fires and hazardous conditions combined equaled 18% of the total fire calls.<sup>10</sup>

### E. Probability of Future Potential Disasters

Due to Berlin's geographic location, forested lands, steep hills, heavy snow pack and topography, there is always a possibility of future disasters in Berlin. The City of Berlin has been impacted in the past by natural disasters, including flooding, river ice jams, lightning, severe winter storms, severe wind and tropical storms. In addition, the potential exists for tornado and earthquake damage although there is no record of these events striking the City.

The four most concerning hazards in Berlin are **Severe Winter Weather** (includes ice storms), **Extreme Temperatures**, **Flooding** (local roads) and **Severe Thunder & Lightning Storms**. Below is a brief synopsis of probability of these hazards; Chapter 5 provides more detailed information on the impact of these hazards.

#### SEVERE WINTER STORMS (SNOW & ICE)

Severe winter weather events, particularly ice storms, are felt to pose a high risk to the people of Berlin. It is not uncommon for snow storms to unload 2-3 feet of snow in a single storm; fortunately with this common occurrence also comes a vast knowledge of how to deal with the situation. In fact, large snowstorms with heavy accumulation are generally handled quite well by the Berlin Public Works Department and are often welcomed by outdoor winter recreationists. The winter of 1968-69 brought extraordinary accumulations in Berlin and throughout the entire north country of New Hampshire. Snow load on the roof of the Notre Dame Arena in Berlin became so heavy during this storm that the arena's roof, built in 1947, collapsed under the weight of the snow.<sup>11</sup>

**Collapse of the roof at Notre Dame Arena, 1969**  
Photo Credit: Berlin History,  
<http://berlinhistory.weebly.com/>



Building Fires	15	3%
Cooking Fires	4	1%
Chimney	10	2%
Trash Fires	8	2%
Vehicle Fires	6	1%
Outside Fires	28	5%
Hazardous Conditions	57	11%
Rescue / Emergency Medical Service Incident	65	13%
Vehicle Accident	38	7%
Leak Spill / Hazardous Materials	24	5%
Carbon Monoxide Emergencies	18	3%
Building Collapse emergencies	0	0%
Service Call	54	10%
Good Intent	15	3%
False Alarm System Malfunction	88	17%
False Alarm Malicious	10	2%
Electrical Issues	13	3%
Water Problem	16	3%
DHART	32	6%
Sprinkler	10	2%
Police assist	0	0%
Bomb	0	0%
Severe Weather	3	1%
Reported as Other	3	1%
Total Calls to March 2014	517	

<sup>10</sup> 2014 FD Annual Report 2014; [http://www.berlinnh.gov/Pages/BerlinNH\\_Fire/annreport/2014](http://www.berlinnh.gov/Pages/BerlinNH_Fire/annreport/2014)

<sup>11</sup> <http://berlinhistory.weebly.com/past-events.html>



Ice storms on the other hand pose a serious threat as they are unpredictable, can create a mass amount of damage and result in long-lasting power outages. Much of the City is above 1,000 feet above sea level and therefore very susceptible to ice storms and the subsequent damage they can cause; elevations in Berlin range from approximately 1,020' at the lowest point to 3,901' at the top of Mount Weeks. The ice storm of 1998 had significant impact in Berlin, particularly on Mount Forist which rises quickly from the city center. The 2008 Ice Storm did not impact Berlin.

The probability of future ice storms and heavy snow storms occurring in Berlin is high. Ice storms create accessibility and isolation concerns for the citizens of Berlin and make emergency response extremely difficult.

### **EXTREME TEMPERATURES (HOT & COLD)**

Extreme temperatures are significant in Berlin, principally because there are high elderly and poor populations. Berlin is recorded as having the highest elderly population in the State; approximately 20.5% of the population is 65 and older and 17.4% of the population is in poverty according to the 2010-2014 American Community Survey.<sup>12</sup>

The winters of 2013-2014 and 2014-2015 saw extended periods of extreme cold; the Team reported that the temperature did not rise above freezing during either of these winters and was in fact below zero for many days. These lengthy and cold winters are a particular burden on the elderly, particularly when fuel assistance maximums have been met. Long, cold winters also place a burden on the poor who may not have appropriate clothing and shelter and on the ambulance crews who respond to multiple cold-related emergencies each winter.

In addition, extreme cold has a major impact on the public water system in the City. In 2014, the Jericho Road line did not thaw until May and the line broke in May 2015. The winter of 2015 brought 6-7 feet of underground frost; the City assisted in thawing over 250 houses and four of the main water lines were still frozen in April 2015.

Extreme heat, although not as significant as extreme cold, also carries a high probability. Any temperature above 90 degrees, particularly when laden with excessive humidity, causes problems for the elderly and the poor. The housing stock in Berlin is aging; on average, most homes were built in the late 1930's and do not have air conditioning. To add to the situation, the City's residents do not have access to common "cooling centers" such as malls, town pools and lakes. Jericho Lake is one option, but for those who are elderly or poor, transportation to the lake is an issue.

The probability of extreme temperatures, particularly extreme cold, is very high in Berlin and northern New Hampshire in general.

### **FLOODING (LOCAL ROADS)**

Flooding from heavy rain is a common occurrence in Berlin. Heavy rains, saturated ground and rapid snowmelt create overburdened culverts, road washouts and road closures. It is likely that the future will bring more flooding in Berlin, along Glen Avenue in the southern part of the City and on the 60 mile Class V road network due to underperforming culverts throughout the City. Road flooding is also a common occurrence on Industrial Park Road and at the confluence of the Dead River and the Androscoggin River.

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<sup>12</sup> Economic & Labor Market Information Bureau, NH Employment Security, January 2016; Community Response Received 6/26/15

## SEVERE THUNDERSTORMS & LIGHTNING

Severe Thunderstorms and Lightning are a considerable threat in Berlin. Lightning has struck several buildings in the City including a building on Jericho Road, the Fire Station, Saint Anne's Church and a home on Washington Street. With changes in climate and the severity of summer storms, there is a good probability that lightning will strike again in Berlin.

## CLIMATE CHANGE

Although not identified as a natural hazard in this Plan, no Plan can be considered complete today without some discussion of the impact that climate change has had on weather patterns. *"The challenges posed by climate change, such as more intense storms, frequent heavy precipitation, heat waves, drought, extreme flooding, and higher sea levels, could significantly alter the types and magnitudes of hazards impacting states in the future",* as FEMA stated in its new State Mitigation Plan Review Guide<sup>13</sup>. By including climate change in the new hazard mitigation guide for state planners, FEMA is recognizing the reality of climate change. Communities in New Hampshire, such as Berlin, should become increasingly aware of the effects of climate change on the natural hazards that are already being experienced.

## STATE HAZARD MITIGATION PLAN

The NH State Hazard Mitigation Plan includes many of the same potential hazards that have been identified in Berlin. Several of the State's hazards however, were excluded from this Plan. These include the following:

<u>State Hazard</u>	<u>Reason for exclusion from Berlin's Plan</u>
Coastal Flooding .....	Distance away from the sea
Radon .....	Felt to be an individual homeowner's responsibility
Radiological .....	Distance away from a nuclear power plant
Fire & Hazardous Materials .....	Addressed with "Wildfire" and "Hazardous Materials-Transport & Fixed"
Snow Avalanche .....	No known areas of avalanche that would impact people or structures

## HAZARD PROBABILITY COMBINED WITH POWER FAILURE

Any potential disaster in Berlin is particularly impactful if combined with power failure, as would most likely be the case with severe winter storms, blizzards and ice storms, hurricanes, tropical storms and windstorms. The food supply of individual citizens could become depleted quickly should a power failure last for a week or more. An outage during the winter months could result in frozen pipes and the lack of water and heat, a particular concern for the City's elderly citizens who comprise approximately 20.5% of the population. In addition, winter in New England commonly brings very low temperatures, while high temperatures can be experienced in the summer.

## HAZARD PROBABILITY COMBINED TRANSPORTATION

NH Route 16 serves as north-south highway for those travelling from the Conway/Jackson region to Berlin; NH Route 16 then continues north through Milan, Dummer and Errol and into Maine. NH Route 110 (West Milan Road) runs from Berlin's city center travelling north-west into Milan; NH Route 110 is a major thoroughfare for traffic traveling from the Berlin-Gorham area to connect to other northern NH communities and on into Canada via US Route 3. NH Route 16 travels through the city center as Main Street and Riverside Drive.

<sup>13</sup> State Mitigation Plan Review Guide, FEMA, Released March 2015, Effective March 2016, Section 3.2, page 13



As mentioned earlier in this chapter, both of Berlin's major roadways are well-travelled and both carry a considerable amount of traffic. The two highways are often travelled by large trucks carrying goods from all parts of New Hampshire and Maine. Both highways are often impacted by weather events that create poor driving conditions.

A number of other roads serve the City, many of which are narrow and winding and subject to severe winter weather. The City maintains approximately 60 miles of Class V roads, 53.2 miles of which are paved and 6.8 miles of which are unpaved.<sup>14</sup>

Berlin's roads are beautiful in the spring, fall and summer months, but when affected by flooding, winter snow conditions and ice they become treacherous. In these conditions, vehicular accidents, wildlife collisions and truck accidents involving hazardous materials are always a possibility. A major ice storm or other significant event can make egress and access difficult for individuals and first responders.

**Table 3.1, Table 3.2 and Chapter 5, Section B provide more information on past and potential hazards in Berlin.**

**TABLE 3.2: HISTORIC HAZARD IDENTIFICATION**

**2010 HMPT ..... 2010 Hazard Mitigation Planning Team**  
**2016 HMPT ..... 2016 Hazard Mitigation Planning Team**  
**DR..... Presidential Disaster Declarations (DR) since 1953**  
**EM ..... Emergency Declarations (EM) since 1953**

Type of Event	Date	Location	Impact	Source
<b>Past Flooding Hazards including Riverine, Heavy Rainfall, Rapid Snowmelt, Ice Jam Flooding &amp; Local Road Flooding:</b> Riverine flooding is the most common disaster event in the State of NH. Significant riverine flooding in some areas of the State occurs in less than ten year intervals and seems to be increasing with climate change. The entire State of NH has a high flood risk. Areas prone to flooding and road erosion were mapped and can be seen on <b>Map 3, Past &amp; Potential Areas of Concern</b> ; flood events have the potential to impact the Community on a city wide basis.				
Riverine Flooding (including ice jams)	1953	Pleasant & Main Streets	The Dead River flooded in 1953 causing significant damage to Pleasant and Main Street. ( <i>Map 3, ID #1</i> )	2016 HMPT
Flooding	Spring 1969	City Wide	Heavy snowmelt caused major flooding everywhere	2010 HMPT
Flooding	June & July 1998	City Wide	Saw major flooding	2010 HMPT
Nor'easter, Severe Storms & Flooding	April 15-23, 2007	All Ten NH Counties	<b>Presidential Disaster Declaration DR-1695:</b> Flood damages; FEMA & SBA obligated more than \$27.9 million in disaster aid following the April nor'easter. (Aka: Tax Day Storm); no significant impact in Berlin.	FEMA & 2016 HMPT
Severe Storms & Flooding	May 26-30, 2011	Coos & Grafton County	<b>Presidential Disaster Declaration DR-4006:</b> May Flooding Event, May 26th-30th 2011 Coos & Grafton County. (Aka: Memorial Day Weekend Storm); no significant impact in Berlin.	FEMA & 2016 HMPT

<sup>14</sup> GIS Analysis of NH DOT Road Layer; local roads Class V

Type of Event	Date	Location	Impact	Source
Flooding (Tropical Storm Irene)	August 26-September 6, 2011	Carroll, Coos, Grafton, Merrimack, Belknap, Strafford & Sullivan	<b>Presidential Disaster Declaration DR-4026 and Emergency Declaration EM-3333:</b> Tropical Storm Irene Aug 26th- Sept 6, 2011 Carroll, Coos, Grafton, Merrimack, Belknap, Strafford, & Sullivan Counties; Tropical Storm Irene brought flooding to several areas including the sanitation system, Lancaster Street (several homes had flood damage) and some flood damage to the water system; mitigation projects after Irene received FEMA funding. ( <i>Map 3, ID #2</i> )	FEMA & 2016 HMPT
Flooding	Re-occurring	Glen Avenue	Road flooding on Glen Avenue (near the Irving Station) has occurred in the past and has potential to occur again in the future. ( <i>Map 3, ID #3</i> )	2016 HMPT
Flooding	Re-occurring	Industrial Park Road	Road flooding on Industrial Park Road has occurred in the past and has potential to occur again in the future. ( <i>Map 3, ID #4</i> )	2016 HMPT
Flooding	Re-occurring	Watson Street	Road flooding on Watson has occurred in the past and has potential to occur again in the future; causes the road and some basements to flood. ( <i>Map 3, ID #5</i> )	2016 HMPT
<b>Past Wildfire Hazards:</b> New Hampshire is heavily forested and is therefore vulnerable to wildfire, particularly during periods of drought. The proximity of many populated areas to the State's forested land exposes these areas to the potential impact of wildfire. Wildfires were mapped in <b>Map 2, Historic Wildfires &amp; the Wildland Urban Interface</b> ; wildfires have the potential to impact the Community on a city wide basis.				
Wildfire	Early 1990's	Cates Hill Road	Local and cause unknown ( <i>Not Mapped</i> )	2016 HMPT
Wildfire	1995	York Pond Road	Kilkenny side; 6-7 acres; ( <i>Map 2, ID #1</i> )	2016 HMPT
Wildfire	2002	Mt. Jasper	6-7 acres; ( <i>Map 2, ID #2</i> )	2016 HMPT
Wildfire	2003	Mt. Jasper	6-7 acres; ( <i>Map 2, ID #3</i> )	2016 HMPT
Wildfire	2003	Behind Hospital	3-4 acres; ( <i>Map 2, ID #4</i> )	2016 HMPT
Wildfire	April 2006	Cascade Mt.	Cascade Mountain (Gorham); 98 acres; smoking; Class C fire; Berlin was first to be called in although this fire was actually in Gorham ( <i>Not Mapped</i> )	2016 HMPT
Wildfire	May 2015	Wentworth Avenue	Unpermitted and unattended brush fire; Class 4 red flag day; 3-4 acres; no structural damage; fire in woods and destroyed two snowmobiles; ( <i>Map 2, ID #5</i> )	2016 HMPT

Type of Event	Date	Location	Impact	Source
<p><b>Past High Wind Hazards including Hurricanes, Tropical Storms, Tornadoes, Downbursts &amp; Windstorms:</b> Tornadoes are spawned by thunderstorms and occasionally by hurricanes; tornadoes may occur singularly or in multiples. A downburst is a severe localized wind blasting down from a thunderstorm. Downburst activity is prevalent throughout NH and is becoming more common with climate change; most downbursts go unrecognized unless significant damage occurs. Hurricanes develop from tropical depressions which form off the coast of Africa. New Hampshire's exposure to direct and indirect impacts from hurricanes is real, but modest, as compared to other states in New England. A hurricane that is downgraded to a Tropical Storm is more likely to have an impact in New Hampshire. One hazard was mapped and can be seen on <b>Map 3, Past &amp; Potential Areas of Concern</b>; tornadoes and other wind events have the potential to impact the Community on a city wide basis.</p>				
Hurricane Bob, Severe Storm	August 18-20, 1991	City & Region Wide	<b>Presidential Disaster Declaration DR-917:</b> Other than heavier than usual rain, there was no impact from Hurricane Bob.	FEMA & 2016 HMPT
Tornadoes & Downbursts	2002	Berlin	Damaging downburst struck Berlin; trees down and minor property damage.	FEMA & 2016 HMPT
Hurricane Katrina Evacuation	August 29-October 1, 2005	All Ten NH Counties	<b>Presidential Emergency Declaration EM-3258:</b> Assistance to evacuees from the area struck by Hurricane Katrina and to provide emergency assistance to those areas beginning on August 29, 2005, and continuing; The President's action makes Federal funding available to the State and all 10 counties of the State of New Hampshire; no impact in Berlin.	FEMA & 2016 HMPT
Tropical Storm Irene	August 26-September 6, 2011	Carroll, Coos, Grafton, Merrimack, Belknap, Strafford & Sullivan	<b>Presidential Disaster Declaration DR-4026 and Emergency Declaration EM-3333:</b> Tropical Storm Irene Aug 26th- Sept 6, 2011 Carroll, Coos, Grafton, Merrimack, Belknap, Strafford, & Sullivan Counties; see above under flooding.	FEMA & 2016 HMPT
Tornado	Summer 2010	Berlin	A tornado did touch down in Berlin in 2010 causing minor property and tree damage.	2016 HMPT
Hurricane Sandy	October 26-November 8, 2012	Belknap, Carroll, Coos, Grafton & Sullivan	<b>Presidential Disaster Declaration DR-4095 &amp; Emergency Declaration EM-3360:</b> Hurricane Sandy came ashore in NJ and brought high winds, power outages and heavy rain to all ten counties in the State of New Hampshire. The declaration covers damage to property from the storm that spawned heavy rains, high winds, high tides and flooding over the period of October 26-November 8, 2012; heavy rain occurred in Berlin but there was no significant damage.	FEMA & 2016 HMPT

Type of Event	Date	Location	Impact	Source
<b>Past Severe Winter Weather Hazards including Nor'easters, Blizzards &amp; Ice Storms:</b> Severe winter weather in NH may include heavy snow storms, blizzards, nor'easters and ice storms, particularly at elevations over 1,000 feet above sea level. Generally speaking, NH will experience at least one of these hazards during any winter season; however, most NH communities are well prepared for such hazards. These hazards were not mapped; severe winter weather and ice storms have the potential to impact the Community on a city wide basis.				
Record Snowfall	Winter 1968-69	City & Region Wide	Total accumulation for the 1968-69 winter was very heavy; the area saw several major snow storms, one which resulted in nearly 50" of snow in a single 24-hour period; Notre Dame Arena collapsed resulting in one fatality.	2016 HMPT
High Winds, Tidal Surge, Coastal Flooding & Snow	16-Feb-78	City & Region Wide	<b>Presidential Disaster Declaration DR-549:</b> Blizzard of 1978; snow accumulations were handled by the Berlin Department of Public Works; there was no significant impact in Berlin.	FEMA & 2016 HMPT
Ice Storm	January 7-25, 1998	City & Region Wide	<b>Presidential Disaster Declaration DR-1199:</b> Severe ice storm in Northern NH; Berlin received heavy forest damage at elevations of 1,000' feet or more; some slash remains on the forest floor; some road closures including Cates Hill Road; loss of power in the City for a little more than a day.	FEMA & 2010 HMPT & 2016 HMPT
Snowstorm	March 5-7, 2001	Cheshire, Coos, Grafton, Hillsborough, Merrimack & Strafford	<b>Presidential Emergency Declaration EM-3166:</b> Declaration covers jurisdictions with record and near-record snowfall from the late winter storm that occurred March 2001; snow accumulations were handled by the Berlin Department of Public Works; there was no significant impact in Berlin.	FEMA & 2016 HMPT
Snow	December 6-7, 2003	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack & Sullivan	<b>Presidential Emergency Declaration EM-3193:</b> The declaration covers jurisdictions with record and near-record snowfall that occurred over the period of December 6-7, 2003; like the rest of Northern NH, Berlin saw close to three feet of snow during this storm but the accumulation was handled by the Berlin Department of Public Works.	FEMA & 2016 HMPT
Snow	February 10-11, 2005	Carroll, Cheshire, Coos, Grafton & Sullivan	<b>Presidential Emergency Declaration EM-3208:</b> FEMA had obligated more than \$1 million by March 2005 to help pay for costs of the heavy snow and high winds; Total aid for the February storm is <b>\$1,121,727.20</b> (Coos: \$11,650) <b>EM 3208-002:</b> The Federal Emergency Management Agency (FEMA) obligated more than \$6.5 million to reimburse state and local governments in New Hampshire for costs incurred in three snow storms that hit the state earlier this year, according to disaster recovery officials. Total aid for all three storms is \$6,892,023.87 (January: \$3,658,114.66; February: \$1,121,727.20; March: \$2,113,182.01); snow accumulations were handled by the Berlin Department of Public Works; there was no significant impact in Berlin.	FEMA & 2016 HMPT

Type of Event	Date	Location	Impact	Source
Severe Winter Storm & Ice Storm	December 11-23, 2008	All Ten NH Counties	<b>Presidential Disaster Declaration DR-1812 &amp; Emergency Declaration EM-3297:</b> Damaging ice storms to entire state including all 10 NH counties; fallen trees and large scale power outages; nearly \$15 million in federal aid had been obligated by May 2009; snow accumulations were handled by the Berlin Department of Public Works; there was no significant impact in Berlin.	FEMA & 2016 HMPT
Severe Snow Storm	October 29-30, 2011	All Ten NH Counties	<b>Presidential Emergency Declaration EM-3344:</b> Severe storm during the period of October 29-30, 2011; all ten counties in the State of New Hampshire. (Aka: Snowtober); snow accumulations were handled by the Berlin Department of Public Works; there was no significant impact in Berlin.	FEMA & 2016 HMPT
Severe Winter Storm	February 8, 2013	All Ten NH Counties	<b>Presidential Emergency Declaration DR-4105:</b> Nemo; heavy snow in February 2013; snow accumulations were handled by the Berlin Department of Public Works; snow accumulations were handled by the Berlin Department of Public Works; there was no significant impact in Berlin.	FEMA & 2016 HMPT
<b>Past Earthquake Hazards:</b> According to the NH State Hazard Mitigation Plan, New Hampshire is considered to lie in an area of "Moderate" seismic activity when compared to other areas of the United States. New Hampshire is bordered to the north and southwest by areas of "Major" activity. Generally, earthquakes in NH cause little or no damage and have not exceeded a magnitude of 5.5 since 1940. These hazards were not mapped; earthquakes have the potential to impact the Community on a city wide basis.				
Earthquake	12/20/40	Ossipee, NH	Magnitude 5.5	State Hazard Mitigation Plan 2013
Earthquake	12/24/40	Ossipee, NH	Magnitude 5.5	
Earthquake	12/28/47	Dover NH-Foxcroft, ME	Magnitude 4.5	
Earthquake	06/10/51	Kingston, RI	Magnitude 4.6	
Earthquake	04/26/57	Portland, ME	Magnitude 4.7	
Earthquake	04/10/62	Middlebury, VT	Magnitude 4.2	
Earthquake	06/15/73	Quebec Border / NH	Magnitude 4.8	
Earthquake	01/19/82	West of Laconia, NH	Magnitude 4.5	
Earthquake	06/23/10	Ontario-Quebec Border	Magnitude 5.0	
Earthquake	06/26/10	Boscawen, NH	Magnitude 3.1	
Earthquake	08/23/11	Virginia	Magnitude 5.8	
Earthquake	09/18/12	Concord, NH	Magnitude 1.2	
Earthquake	10/16/12	Waterboro, ME	Magnitude 4.0; felt in Berlin but no damage	

Type of Event	Date	Location	Impact	Source
Earthquake	1988	5 Kilometers North of Berlin	Magnitude 4.0; felt in Berlin but no damage	2016 HMPT
Earthquake	1989	Near Berlin	Magnitude 4.1; felt in Berlin but no damage	
<b>Past Drought Hazards:</b> Droughts are generally not as damaging or disruptive as floods and other hazards and they are more difficult to define. A drought is a natural hazard that evolves over months or even years and can last as long as several years to as short as a few months. According to the NH State Hazard Mitigation Plan, New Hampshire has a low probability, severity and overall risk for drought. These hazards were not mapped; however droughts have the potential to impact the Community on a city wide basis.				
Drought	1929-1936	Statewide	Regional	NH Drought Historical Event - NH DES
Drought	1939-1944	Statewide	Severe in southeast and moderate elsewhere	
Drought	1947-1950	Statewide	Moderate	
Drought	1960-1969	Statewide	Regional longest recorded continuous spell of less than normal precipitation	
Drought	2001-2002	Statewide	Third worst drought on record	
<b>Other Past or Potential Hazards:</b> Human-caused hazards and other unusual hazardous events have been noted throughout NH. Among others, one concern is the transport of hazardous material through communities by rail and tractor-trailer. These hazards were not mapped; other natural or human-caused hazards have the potential to impact the Community on a city wide basis.				
Extreme Temperatures	Winter 2014-2015	City Wide	Berlin experienced a colder than normal winter; problems were experienced with the City's water system; 250 homes had to have waterlines thawed; ground had 6-7' of frost.	2016 HMPT
Severe Thunder & Lightning	Past	Several Locations	In the past, lightning has struck several buildings in Berlin; a building on Jericho Road was struck by lightning and destroyed; the antenna at the Fire Station was struck and took out radio systems; St. Anne's Church was struck by lightning which took slate shingles off the roof; a home on Washington Street was struck in 2014.	2016 HMPT
Hailstorm	Summer of 2014	City Wide	An unusual hailstorm hit Berlin causing minor property and vehicle damage	2016 HMPT
Landslide, Erosion & Mudslide	Potential	Hillside near Godfrey Dam	Potential for landslide to occur near the Godfrey Dam in the Kilkenny Range (public water source) which could damage a water transmission line.	2016 HMPT
Landslide, Erosion & Mudslide	Potential	City Wide	Potential for aging retaining walls located throughout the City to cave in due to erosion; due to the steepness of the terrain, many of these walls, which were built many years ago, hold back substantial development; one wall on East Milan Road adjacent to Androscoggin River, could take out the road if failed.	2016 HMPT
Landslide, Erosion & Mudslide	Potential	City Wide	Potential for new ATV/Snowmobile trails to erode, particularly on the trails to Mount Jasper; could affect the infrastructure near High School.	2016 HMPT

Type of Event	Date	Location	Impact	Source
Flooding (dam failure)	Potential	Jericho Lake Dam	Depending on the degree of breach, potential damage to structures could occur if the earthen dam at Jericho Lake were to fail; a large floodplain could mitigate some of the impact.	2016 HMPT
Flooding (dam failure)	Potential	Aziscohos Dam	A dam failure upstream at the Aziscohos Dam (a controlled dam) could have a devastating impact on the City of Berlin; other dams could fail in a domino effect and although it is expected to take 5 days to reach Berlin, the flood waters could submerge White Mountains Community College, Main Street and a good part of downtown Berlin; it is predicted that it would follow the 100-year floodplain.	2016 HMPT
Epidemic/Pandemic/Influenza, etc.			Although the Team did not identify specific examples or past occurrences of these hazards, it was felt worthwhile to list them as potential hazards to the City. See Table 3.1, Hazard Threat Matrix and Chapter 5 for more details on these hazards.	
Hazardous Material - Transport				
Hazardous Material - Fixed Location				
Terrorism				
Extended Power Failure				

\*Historic hazard events were derived from the following sources unless noted otherwise:

- Website for NH Disasters: <http://www3.gendisasters.com/mainlist/newhampshire/Tornados>
- FEMA Disaster Information: <http://www.fema.gov/disasters>
- The Tornado Project: <http://www.tornadopproject.com/alltorns/nhtorn.htm>
- The Tornado History Project: <http://www.tornadohistoryproject.com/>
- The Disaster Center (NH): <http://www.disastercenter.com/newhamp/tornado.html>
- <http://www.Earthquaketrack.com>

**For more information on state & county-wide past events, see *Appendix D: Presidential Disaster and Emergency Declarations***



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## Chapter 4: Critical Infrastructure & Key Resources (CIKR)

With Team discussion and brainstorming, Critical Infrastructure & Key Resources (CIKR) within Berlin were identified and mapped for this Plan. The “ID” number in the following lists is also represented as a CIKR in *Appendix G: Map Documents, Map 4: Critical Infrastructure and Key Resources and Map 5, Downtown Berlin Critical Facilities*. Facilities located in adjacent towns were not mapped (NM). The Hazard Risk rating was based on a scale of 1-3 with 1 indicating little or no risk.

**TABLE 4.1 - EMERGENCY RESPONSE FACILITIES (ERF) & EVACUATION**

Emergency Response Facilities (ERF)				
ERFs are primary facilities and resources that may be immediately needed during an emergency response.				
Map ID	Facility	Expected use of the Facility	Hazard Risk	
1	Police Station	Primary EOC & Law Enforcement	All Hazards & HazMat Transport	2
2	Berlin Fire Station	Secondary EOC & Fire/EMS	All Hazards	1
3	Berlin Ambulance	EMS	All Hazards	1
4	Androscoggin Valley Hospital	Medical Services	All Hazards & Wildfire, HazMat Fixed	2
5	Public Works Garage	Heavy Equipment, Sand, Gravel and Fuel	All Hazards & HazMat Transport	2
6	Berlin High School	Primary Shelter	All Hazards & Wildfire	1
7	Towers on Cates Hill	Communications	All Hazards & High Winds, Wildfire	2
8	City Hall	Public Health & Town Government	All Hazards & Flood	1
Helicopter Landing Zones (ERFH)				
9	Androscoggin Valley Hospital	Helicopter Landing Zone	All Hazards & Wildfire, HazMat Fixed	2
10	Berlin Ball Fields	Helicopter Landing Zone	All Hazards	1
NM	Berlin Municipal Airport (Milan)	Helicopter Landing Zone	All Hazards	1
Bridges & Culverts on the Evacuation Routes or Access Routes to Evacuation (ERFB)				
11	Cleveland Bridge @ Androscoggin	Bridge on Evacuation Route	All Hazards	1
12	Main Street Bridge @ Dead River	Bridge on Evacuation Route	All Hazards & Flooding	2
13	East Milan Road @ Horne Brook	Bridge on Evacuation Route	All Hazards & Flooding	1
14	Hutchins Street @ Bean Brook	Bridge on Evacuation Route	All Hazards & Flooding	1
15	Coos Street Box Culvert	Bridge on Evacuation Route	All Hazards & Flooding	1
16	Twelfth Street Bridge @ Androscoggin	Important Bridge to get to evacuation route	All Hazards	1
17	Cole Street Bridge @ Dead River	Important Bridge to get to evacuation route	All Hazards & Flooding	2

Emergency Response Facilities (ERF)				
18	Mason Street @ Androscoggin (span 1)	Important Bridge to get to evacuation route	All Hazards	1
19	Mason Street @ Androscoggin (span 2)	Important Bridge to get to evacuation route	All Hazards	1
20	RR Bridge Cascade Hill @ Androscoggin	Important Bridge to get to evacuation route	All Hazards	1
21	Footbridge on Bridge Street @ Androscoggin	Important Bridge to get to evacuation route	All Hazards	1
22	Pleasant Street @ Dead River	Important Bridge to get to evacuation route	All Hazards & Flooding	2
Evacuation Routes (Shown on Map #4)				
NH Route 16	Primary Evacuation Route	All Hazards & Flooding	2	
NH Route 110	Primary Evacuation Route	All Hazards & HazMat Transport	1	
East Milan Road	Primary Evacuation Route	All Hazards	1	
Unity/Hutchins/Coos Street	Primary Evacuation Route	All Hazards	1	
Success Pond Road	Secondary Evacuation Route	All Hazards & Flooding	1	
Western Avenue	Secondary Evacuation Route	All Hazards	1	

**TABLE 4.2 – NON- EMERGENCY RESPONSE FACILITIES (NERF)**

Non-Emergency Response Facilities (NERF)				
NERFs are facilities, that although they are critical, they are not necessary for the immediate emergency response efforts; this includes facilities to protect public health and safety, utilities, and provide backup to emergency facilities.				
Map ID	Facility	Expected use of the Facility	Hazard Risk	
23	Berlin Water Works (Willow Street)	Water Department	All Hazards	1
24	Berlin Water Works (St. Laurent Lane)	Water Treatment Plant (Primary)	All Hazards & Wildfire	1
25	Berlin Water Works (East Milan Road)	Water Treatment Plant (Off-line); Aquifer and Wells; active backup supply	All Hazards & HazMat Transport	2
26	Waste Water Treatment Plant (Shelby Street)	Waste Water Treatment & Main Office	All Hazard	1
27	Watson Street Pump Station	Waste Water Pump Station (Primary)	All Hazards & Flooding	3
28	Berlin Recreation Department	Secondary Shelter	All Hazards & HazMat Transport	2
29	Substation	Electric	All Hazards	1
30	Brookfield Power (main control office)	Flow of river north of Berlin	All Hazards & Flooding	2
NM	Fairpoint	Communications	All Hazards	1

**TABLE 4.3 – FACILITIES & POPULATIONS TO PROTECT (FPP)**

Facilities & People to Protect (FPP)				
FPPs are facilities that need to be protected because of their importance to the Town and to residents who may need help during a hazard event.				
Map ID	Facility	Expected use of the Facility	Hazard Risk	
4	Androscoggin Valley Hospital	Patients & Staff	All Hazards & Wildfire, HazMat Fixed	2
31	Brown Elementary (Main Street)	School	All Hazards & Flooding	2
32	Hillside Elementary (Hillside Avenue)	School	All Hazards	1
33	Berlin Middle (Hillside Avenue)	School	All Hazards	1
6	Berlin High School (Madison Avenue)	School	All Hazards & Wildfire	1
34	Tri County Head Start (Sullivan)	School	All Hazards	1
35	White Mountains Community College	Child Care & School	All Hazards & Flooding, HazMat Fixed	2
36	Day by Day (Pleasant Street)	Child Care	All Hazards	1
37	Mini Mounties (Berlin HS)	Child Care	All Hazards	
38	ELC (Mt Forist Street)	School	All Hazards & HazMat Transport	2
39	Kids Only (Main Street)	Child Care	All Hazards	1
28	Recreation Center (First Avenue)	Gathering of People	All Hazards & HazMat Transport	2
40	St. Kieran's Community Art Center (Emery)	Gathering of People	All Hazards	1
41	Northern Forest Heritage Park (Main)	Gathering of People	All Hazards	1
42	Notre Dame Arena	Gathering of People	All Hazards & Flooding, HazMat Transport	2
43	White Mt. Chalet (E. Milan Road)	Gathering of People	All Hazards & Flooding, Wildfire	1
44	Northern NH Correctional Facility	Prison	All Hazards & Wildfire	1
45	FCI Berlin	Prison	All Hazards & Wildfire	1
46	St. Anne's Church (Historic Register)	Historic Significance	All Hazards & Lightning	1
47	Russian Orthodox Church (Historic Register)	Historic Significance	All Hazards	1
48	United Methodist Church (Historic Register)	Historic Significance	All Hazards	1
49	Logging Piers-Heritage Park	Historic Significance	All Hazards & Flooding	1

Facilities & People to Protect (FPP)				
50	Brown House - Heritage Park (Historic Register)	Historic Significance	All Hazards	1
51	St. Vincent de Paul (Providence Avenue)	Nursing Home & Rehab	All Hazards	1
52	Coos County Nursing Home (Cates Hill Road)	Nursing Home	All Hazards & Wildfire	1
53	St. Regis House (Main Street)	Elderly Living	All Hazards	1
54	Northern Lights (25 Success Street)	Elderly Housing	All Hazards	1
55	Berlin Housing Authority (Cole)	Elderly Housing	All Hazards & HazMat Transport	2
56	Notre Dame Housing (School)	Elderly Housing	All Hazards	1
57	Cornerstone Housing (Main)	Elderly Housing	All Hazards & Flooding	2
58	Verdun Street Home (Verdun Street)	Group Home	All Hazards	1
59	Brookside Housing (Maynesboro)	Housing Project	All Hazards & Wildfire	1
60	Northern Human Services (Willard)	Functional Needs Population	All Hazards	1
NM	Nansen Ski Jump (Milan)	Historic Significance	All Hazards & Wildfire	1
NM	Berlin Housing Authority (Church)	Elderly Housing	All Hazards	1

**TABLE 4.4 – POTENTIAL RESOURCES (PR)**

Potential Resources (PRs)	
PRs are potential resources that could be helpful for emergency response in the case of a hazard event. Below is a list of local potential resources; for a complete list of potential resources, please refer to the Berlin Emergency Operations Plan (2013)	
Resource	Expected use of the Resource
Berlin School System Busses (SAU3)	Mass Transportation
Tri-County Cap	Mass Transportation
Caron Building Center	Lumber & Materials
White Mountain Lumber	Lumber & Materials
Rockingham Electric	Electrical Supplies
Ted Laccase	Contractor
Couture Construction	Contractor
AD Excavating	Contractor
Presby Steel	Steel supply & manufacturing

Potential Resources (PRs)	
Capone Industries	Steel supply & manufacturing
Pike Industries	Heavy Equipment, Sand, Gravel
White Mt. Ridge Runners	Snowmobiles-Transportation
Androscoggin Valley ATV	OHRV-Transportation
State Prison	Man Power
FCI Prison	Man Power
Local Businesses	Man Power
American Red Cross	Man Power
Public Works/Fire Dept. other City employees	Man Power
Neighboring Towns	Man Power
NH DOT Division 1	Man Power
Pharmacies & AVH	Medical Supplies
Nursing Homes	Medical Supplies
Coos County Family Health	Medical Supplies
Berlin Public Works	Gasoline, diesel
NH DOT (Gorham)	Gasoline, diesel
National Guard Armory	Gasoline, diesel, heavy equipment, medical supplies, water, man power
Berlin Schools	Food & Water
Nursing homes & senior meals site	Food & Water
Local grocery for non-perishables	Food & Water
Pharmacies	Food & Water
City Fire Trucks (2)/500 gallon tanks	Water (non-potable)
WMOU	Radio

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## Chapter 5: Hazards Effects in Berlin

### A. Identifying Vulnerable Structures

Because damages from floods and wildfires are more predictable than damages from other disasters, it is important to identify the critical facilities and other structures that are most likely to be damaged by these events. Using GIS analysis and aerial imagery, at-risk structures were identified throughout the City.

First, all Critical Infrastructure and Key Resources (CIKR) falling within the FEMA flood zone were identified in GIS (Tables 4.1-4.4). A total of 10 CIKRs were found in the flood zone as seen in the chart to the right. Nine of the CIKR found in the flood zone are bridges and are expected to be at or near water. One additional CIKR, the historic logging piers, are in fact in the Androscoggin River.

16	ERFB	Twelfth Street Bridge/Androscoggin	Berlin	Bridge on Evac
18	ERFB	Mason Street Bridge (#1)	Berlin	Bridge on Evac
19	ERFB	Mason Street Bridge (#2)	Berlin	Bridge on Evac
21	ERFB	Footbridge @ Androscoggin	Berlin	Bridge on Evac
11	ERFB	Cleveland Bridge/Androscoggin	Berlin	Bridge on Evac
17	ERFB	Cole Street Bridge	Berlin	Bridge (not on evac)
20	ERFB	RR Bridge/Androscoggin	Berlin	Not on evac
13	ERFB	East Milan Rd/Horne Brook	Berlin	Evac Bridge
14	ERFB	Hutchins St/Bean Brook	Berlin	Evac Bridge
49	FPP	Logging Piers	Berlin	Historic

More information on flood hazards is available in three separate sections in Section C of this Chapter.

Next, a similar analysis using GIS was done for wildfire and the Wildland Urban Interface (WUI). A total of six CIKR were found to be in the WUI (see chart to right); all of these facilities have ample defensible space around them and are not likely to be in harm's way or cause a wildfire.

25	NERF	Berlin Water Works (East Milan Rd)
26	NERF	Waste Water Treatment (Shelby St)
29	NERF	Substation
30	NERF	Brookfield Power
35	FPP	White Mountains Community College
45	FPP	FCI Berlin

Because much of the landcover in Berlin that is outside of the City's downtown area is primarily forest land, it was assumed that virtually every structure outside of downtown is at some risk for wildfire. Wildfires and the Wildland Urban Interface (WUI) are discussed in "Wildfire" in Section C of this Chapter.

**Table 3.1, The Hazard Threat Analysis, is used to evaluate the probability and the potential impact of all other hazards besides flooding**

### B. Calculating the Potential Loss

It is difficult to ascertain the amount of damage that could be caused by a natural or human-caused hazard because the damage will depend on the hazard's extent and severity, making each hazard event somewhat unique. Therefore, we have used the assumption that hazards that impact structures could result in damage to either 0-1% or 1-5% of Berlin's structures, depending on the nature of the hazard and whether or not the hazard is localized.

MS-1 Assessed Value of All Structures			
2015	Value	1% Damage	5% Damage
Residential	\$188,461,795	\$1,884,618	\$9,423,090
Manufactured Housing	\$1,077,800	\$10,778	\$53,890
Commercial	\$35,322,305	\$353,223	\$1,766,115
Other Utilities	\$0	\$0	\$0
Tax Exempt	\$465,416,000	\$4,654,160	\$23,270,800
Utilities	\$145,608,200	\$1,456,082	\$7,280,410
Total	\$835,886,100	\$8,358,861	\$41,794,305
Provided by the City, 3/4/16			

Based on this assumption, the potential loss from any of the identified hazards would range from **\$0 to \$8,358,861** or **\$8,358,861 to \$41,794,305** based on the 2015 Berlin city valuations which lists the assessed value of all structures in Berlin to be **\$835,886,100** (see chart above).

Human loss of life was not included in the potential loss estimates, but could be expected to occur, depending on the severity and type of the hazard.

### C. Natural Hazards

Descriptions below represent the “**local impact**” to the Community for the hazards that were identified by the Team. For the “**extent**” of these hazards, please refer to *Appendix C, The Extent of Hazards*, which includes charts such as the Saffir-Simpson Hurricane Wind Scale, the Beaufort Wind Scale, the National Weather Service Heat Index, the Sperry-Piltz Ice Accumulation Index and the Fujita Scale for tornados.

#### 1) Severe Winter Weather (snow & ice storms) ..... \$8,358,861 to \$41,794,305

##### SNOW STORMS

Heavy snowstorms typically occur from December through April. New England usually experiences at least one or two heavy snow storms with varying degrees of severity each year. Power outages, extreme cold and impacts to infrastructure are all effects of winter storms that have been felt in Berlin in the past. All of these impacts are a risk to the Community, including isolation and increased traffic accidents. Damage caused by severe winter snowstorms varies according to wind velocity, snow accumulation, duration and moisture content. Seasonal accumulation can also be as significant as an individual snowstorm. Heavy overall winter accumulations can impact the roof-load of some buildings.

Berlin has experienced significant individual snowstorms as well as years during which high accumulations have occurred. The winter of 1969 brought record-breaking snow totals to the entire region; in Berlin however, school was only closed once that year. The winter of 2003 was also reported as one of the higher accumulation years as was 2010. Berlin’s roads are often impacted by poor weather conditions and this combined with the steep terrain can make travel difficult; this makes travel particularly difficult for Berlin Ambulance if traveling through the notches is required.

The topography of Berlin, with large mountains and deep river valleys makes winter weather conditions that much more threatening. Severe winter snow storms or blizzards can shut all of Berlin’s roads down at least temporarily and thus preventing many of the City’s citizens from going to work and prevent visitors from arriving. Fortunately, in New England, most road crews are able to handle 2-3’ snow storms with a little time on their side.

##### ICE STORMS

Of more concern in Berlin than 2-4’ snow storms are ice storms, though the probability of the occurrence of a major ice storm is lower than that of a major snowstorm. A significant ice storm can inflict several million dollars’ worth of damage to forests and structures. The 1998 Ice Storm inflicted some damage to the higher elevations (over 1,000 feet) of Berlin causing ice on trees, downed power lines, closed roads, limited EMS access and power outages. Mt. Forist was particularly hit hard. Cates Hill Road was closed during the 1998 Ice Storm; however, power outages lasted only a little more than a day. The 2008 Ice Storm did not impact Berlin.

Due to the widespread nature of ice storms and the excessive damage this type of storm is able to produce, the potential loss value is estimated to be between 1% and 5% of the total assessed value of all structures in Berlin.

## 2) Extreme Temperatures..... Structure loss value was not estimated

### EXTREME COLD & EXTREME HEAT

For those who are familiar with Northern New England weather, it is obvious that temperature extremes are very common. Winter temperatures can fall below -30°F and summer temperatures, laden with high humidity can soar to nearly 100°F. In the past, there was more concern about extreme cold temperatures, but with improved heating systems and local communications, most New Hampshire residents are able to cope with extreme cold.

Also of concern today are extreme heat conditions. Few residents, particularly the elderly and vulnerable populations, have air conditioners and are less able to cope with extreme heat.

Extreme temperatures both hot and cold, are a particular concern in the City of Berlin. Berlin has one of the highest populations of elderly residents in the State (20.5%) and an average housing stock of homes built in 1938. More homes do not have air conditioners than those that do. In addition, the median household income (\$36,358) is lower than many New Hampshire communities and the poverty level (17.4%) is among the highest in the state. There are no malls, no town pool and no warming centers; during extended heat waves, the only relief for many can be found at Jericho Lake. Unfortunately, there is no public transportation to Jericho Lake, a possible hindrance to those who are economically challenged.<sup>15</sup>

Extreme cold has been and continues to be a concern, for many of the same reasons that are mentioned above. In addition, emergency responders, particularly the ambulance and hospital, are often overburdened as a result of recreational accidents (ATV's & snowmobiles). The planning Team felt that climate change is having an impact with what seems to be colder and snowier winters and longer periods of temperatures above 90 degrees. The City's water supply is also severely impacted by long very cold winters as it is not uncommon for main lines to still be frozen into the spring.

Extreme temperatures when combined with power failure are of the most concern; power failure would result in no water, heat and air conditioning for the City's vulnerable population. Both city officials and the Community as a whole should be concerned and should look after its citizens to ensure that extreme temperatures do not create a life or property threatening disaster.

The cost of extreme temperatures is difficult to calculate as it is not based on the loss of structures. The expected loss value would be primarily on the economic impact on Community and the time and cost of emergency response; based on the assumption that damage would not occur to structures, the structure loss value due to extreme temperatures was not estimated.

<sup>15</sup> Statistical numbers in this paragraph are from the ACS (2010-2014); see Table 2.1

<b>3) Flooding (local roads)</b> .....	<b>\$0 to \$8,358,861</b>
<b>7) Riverine Flooding (including ice jams)</b> .....	<b>\$0 to \$8,358,861</b>
<b>12) Flooding (dam failure)</b> .....	<b>\$8,358,861 to \$41,794,305</b>

Flooding includes local road flooding, riverine flooding, ice jams and flooding from dam breach.

#### FLOODING LOCAL (ROADS)

Heavy rain, rapid snowmelt and stream flooding often cause culverts to be overwhelmed and roads to wash out. Today, with changes in land use, aging roads, designs that are no longer effective and undersized culverts, the risk of flooding is a serious concern. Inadequate and aging storm water drainage systems create local flooding on many of Berlin's roads.

It is estimated that the City experiences some sort of storm water problem whenever there are two or more inches of rain in a short period of time. Many of the roads in Berlin are long and winding and subject to some of the most severe weather in the State; often these roads have aging or undersized culverts and poor engineering designs. The continuous erosion of roads makes for a daunting task of "up-keep" by the City's Public Works Department. Fortunately, two of the City's major thoroughfares, NH Routes 16 and 110 are the responsibility of the State.

Watson Street and Glen Avenue (near the Irving Gas Station) are two areas that often experience floods, from both heavy rains and at times, riverine flooding. The Industrial Park road also has experienced flooding two to three times in recent years. The City's sanitation system can also experience flooding with rain events of 1-3" a day. Lastly, as noted under Hurricanes & Tropical Storms, the area around Lancaster Street flooded during Tropical Storm Irene due to a poorly maintained culvert.

Mitigation Action Item #17 calls for the development of a storm water maintenance program that will address both ditching and the condition of culverts in the City in order to mitigate flooding issues. In addition, Action Item #34 calls for an improvement to the drainage systems in the area of "Moxie Alley" between Pleasant and Main Streets to mitigate flooding and damage that occurs to some Main Street buildings. This area, near the confluence of the Dead and Androscoggin Rivers, can be problematic during heavy rain events, or more significantly should a major dam failure occur upstream. Other drainage areas and culverts will need replacement and/or improvements in the future.

The cost of road flooding is difficult to calculate and it cannot be based on the assessed value of structures in Berlin. The expected loss value would be primarily on the economic impact on Community, the loss of accessibility and the time and cost of road repair which could be in the millions; however, based on the assumption that damage would not occur to structures, the structure loss value due to road flooding was estimated to be between 0-1% of the total assessed structure value..

## RIVERINE & 100-YEAR FLOODING EVENTS

Flooding is often associated with tropical storms, heavy rains and rapid snowmelt in the spring. Based on the Coos County Floodplain Map, Berlin has a relatively small 100-year floodplain which follows along the banks of the Androscoggin and the Dead Rivers.

Tropical Storm Irene, the remnants of Hurricane Irene, brought heavy rain and local flooding to Berlin. More information on the impact of Tropical Storm Irene is detailed later in this chapter.

Areas known to flood due to ice jams or riverine flooding are Watson Street, Glen Avenue and parts of Main Street near the confluence of the Dead and Androscoggin River. Action Items #14 & #15 provide public outreach for the citizens of Berlin regarding the associated risks from flooding. The last major flooding event took place in 1953 when the Dead River flooded Main Street (see photo to right).

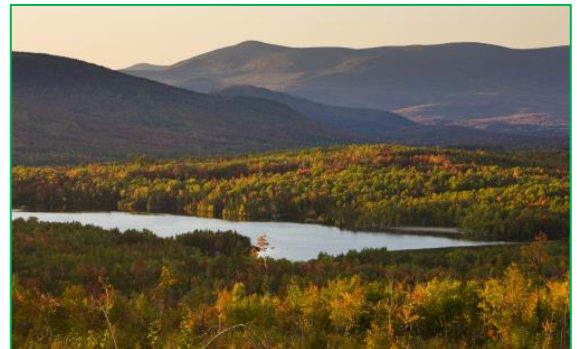


Flooding is a potential problem, but one who's affects would be localized. Based on the localized nature of riverine flooding, the potential loss value was determined to be 0-1% of the total assessed structure value in Berlin.

## FLOODING (DAM FAILURE)

Dams on the Androscoggin River include four dams in Berlin and several upstream including Middle and Lower Dams, Errol Dam and Pontook Dam. But the dam of most concern is the Aziscohos Dam in northern Maine. Failure of the Aziscohos Dam combined with an overburden on dams downstream, could cause a "domino" effect and could put large parts of Berlin underwater.

According to the Aziscohos Dam Plan, waters from a catastrophic failure would reach Berlin in about five days, providing ample warning for evacuations. The resulting flood waters however, would put White Mountains Community College underwater and flood most of Main Street and downtown Berlin at the confluence of the Dead and Androscoggin Rivers. Other areas of the City that are in the 100-year floodplain could also be inundated.



**Jericho Lake & Jericho Lake Dam**

**Photo Credit:** <http://www.nh.life/listing/jericho-mountain-state-park/>

Jericho Lake Dam, a large earthen dam in Jericho State Park is also at some risk for breach, although it has not breached in its history. Depending on the degree of dam failure, flood waters from Jericho Lake could be absorbed by a large floodplain below or, if the breach is significant, some structures could be damaged.



Although historically dam failures have been rare in Berlin, either along the Androscoggin River or at Jericho Lake, the potential does exist. Depending on the location and the amount of breach, the impact could be significant. The potential structure loss value due to dam failure was determined to be between 1% and 5% of the total assessed structure value, based on a full failure of the Azischohos Dam and the potential impact in downtown Berlin and at the College.

**4) Severe Thunder & Lightning Storms ..... \$0 to \$8,358,861**

Severe lightning as a result of summer and mountain storms or as a residual effect from hurricanes and tornados has occurred in Berlin. Many of the City's structures are older buildings and many structures are surrounded by forest. Dry timber on the forest floor and the age of many buildings and out-buildings combined with lightning strikes can pose a significant disaster threat. Lightning could do damage to specific structures or injure or kill an individual, but the direct damage would not be widespread.

As mentioned in Chapter 3, lightning strikes have been fairly common in Berlin. A building was struck on Jericho Road and a home was struck on Washington Street. The Fire Station has also been hit by lightning, resulting in a loss of radio capabilities. St. Anne's Church has also been struck, taking slate shingles off the roof.

The Team noted that it appears that severe thunder and lightning storms are happening more often than in the past; several lightning strikes are documented each year. Lightning is a potential problem, but one who's affects would be localized. Based on the localized nature of lightning strikes, the potential loss value was determined to be 0-1% of the total assessed structure value in Berlin.

**5) Hurricane & Tropical Storms ..... \$0 to \$8,358,861**

Wind damage due to hurricane is a consideration because of the forest and valley floors in Berlin. Like the 1938 hurricane and hurricane Carol in 1954, major forest damage could occur. Although hurricanes could fit into several different categories (wind and flooding), the Team considered hurricanes to be separate events. Hurricanes are rare in New Hampshire, but they should not be ruled out as potential hazards. In most cases, Hurricanes have been down-graded to Tropical Storms by the time they reach northern New Hampshire.

Tropical Storm Irene, the remnants of Hurricane Irene, brought heavy rain and local flooding to Berlin. Several trees were downed as were some power lines, although no roads were closed and no significant power outages occurred. The sanitation collection system flooded and caused some damage to this critical facility, but no significant mechanical damage. The Lancaster Street area flooded during Irene because of an unmaintained culvert which resulted in flood waters reaching several homes in the area. In addition, with the heavy rains of Irene, ground erosion caused some transmission lines to be exposed; the City had to rebuild the shoreline and encase the lines.

For the most part, the City's bridges and roads held up during Tropical Storm Irene, and there was little or no impact from Tropical Storm Sandy except for heavy rains. The City's dams also held up during Irene; although a wing way at Godfrey Dam gave way.

Although Tropical Storms Irene and Sandy had an impact in Berlin, the probability that hurricanes remaining a Category 1 or better in this part of the State is low. Therefore, the potential loss value due to hurricanes was determined to be between 0% and 1% of the total assessed structure value.

**6) Wildfire..... \$8,358,861 to \$41,794,305**

Due to the abundance of slash on the forest floor left by logging operations, blow downs and storms, there is potential for fast burning fuels. Burn permits are required in Berlin, as they are throughout the state, but often burning takes place without the proper permits. The steep terrain and heavily forested areas of Berlin are difficult to monitor, therefore the occasional unauthorized burn will take place. Currently available documentation on fires in Berlin indicates that the majority of fires are human-caused.

The Team noted that no significant wildfires have occurred in Berlin since the completion of the last plan. The largest fire in memory was the Cascade Fire (Gorham) which scorched approximately 100 acres in 2005. The Cascade Fire was thought to have been started by contractors who had started a small fire with either a cutting torch or cigarette; Berlin received the first call for this fire and assisted the town of Gorham and other mutual aid companies with fire suppression.

Other fires that have occurred in Berlin are listed in Chapter 3, Table 3.2. These include a fire on the Kilkenny side of York Pond Road, two 6-7 acre fires on Mt. Jasper (2002 & 2003), and a 3-4 acre fire behind the Androscoggin Valley Hospital in 2003. The Fire Department estimated that there are about 10-20 1-acre fires a year.

The Wildland Urban Interface was determined in collaboration with the NH Division of Forests & Lands and the US Forest Service; the WUI represents the area in which the forest and human habitation intersect. It was defined to be a 1/4 mile buffer located 300 feet off the centerline of Class I-V roads. All structures within the WUI are generally assumed to be at some level of risk and therefore, vulnerable to wildfire (see Map 2). It should be noted that in some communities, Forest Rangers feel that the areas of the community that are heavily forested are all within the WUI. In Berlin, this area of heavily forested land is nearly everywhere, with the exception of downtown.

Large wildfires in northern New Hampshire are uncommon; however, given the right set of conditions (drought, lightning, human interface), the potential for large wildfires is good. Because Berlin is heavily forested, the potential loss value was determined to be between 1% and 5% of the total assessed structure value.

**8) Tornado & Downburst (macro & micro) ..... \$0 to \$8,358,861**

A tornado generally covers a large area, perhaps even several miles. It has winds that blow in a circular fashion leaving behind downed trees that lie in a swirling pattern. Straight-line winds and winds that burst downward are indicative of a microburst; the fallen trees that are left behind lay in roughly the same direction. A microburst must be 2.5 miles in width or less, whereas a macroburst is a similar wind event that is greater than 2.5 miles wide and generally lasts longer than a microburst.

A tornado touched down in Carroll County in July 2008, but it did not reach Coos County or Berlin. A tornado did touch down in Berlin in 2010 causing minor property and tree damage. The high elevations in Berlin, and the surrounding mountains, could deter the occurrence of tornadoes, but can contribute to the formation of downbursts. In the past, Berlin has experienced minor downbursts that resulted in isolated property damage; it was reported that downbursts seem to be more frequent today than in the past, possibly due to climate change.



However, due to the rareness of these events in New Hampshire, the likelihood of a tornado or downburst is low and the affects would be localized. Therefore, the potential loss value was determined to be between 0% and 1% for both downbursts and tornados.

**9) Hailstorms ..... \$0 to \$8,358,861**

Hailstorm events, although not common in Berlin, can occur at any time. In recent years, other communities in northern New Hampshire have experienced hailstones as part of severe thunder and lightning storms, but fortunately, Berlin has not experienced any damage, with the exception of minor property damage and damage to vehicles from a sudden hailstorm during the summer of 2014.

Damage from hail could result in failed crops and structure and vehicular damage, thus creating an economic impact for individual citizens. Overall it was felt that a significant hailstorm event would be unlikely and would cause minimal damage; therefore the potential loss value is estimated at 0% and 1% of the assessed value.

**10) Landslide, Erosion & Mudslide ..... \$0 to \$8,358,861**

Erosion, landslides and mudslides are often associated with heavy rains, steep terrain and the overflow of river banks. Any one of these hazards, or a combination of them, could result in damage in New Hampshire communities.

Although erosion, mudslides and landslides are not of major concern in Berlin, there is potential for a landslide in the Kilkenny Range within the National Forest that could affect Godfrey Dam. In addition, due to the age and steepness of properties in Berlin, old stone retaining walls throughout the City are at risk of collapsing. New trails that have been building for snowmobiling and off-road vehicles are also at risk of eroding and collapsing. Lastly, as clear cuts are done by lumber companies, there is added risk for flooding and erosion to the properties beneath the clear cuts.

Erosion along the Androscoggin River is also worthy of consideration; although riverine erosion is ongoing and possible, no structure damage has resulted from river erosion in the past.

Due to the localized nature of landslide, erosion and mudslide, the potential loss value was determined to be between 0% and 1% of the assessed value of all structures.

**11) Earthquake ..... \$8,358,861 to \$41,794,305**

Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines and are often associated with landslides and flash floods. Four earthquakes occurred in New Hampshire between 1924-1989 having a magnitude of 4.2 or more. Two of these occurred in Ossipee, one west of Laconia and one near the Quebec border. It is well documented that there are fault lines running throughout New Hampshire, but high magnitude earthquakes have not been frequent in New Hampshire history.

The Team reported two earthquakes that occurred near Berlin, one in 1988 and another in 1989 just five kilometers north of Berlin. No damage was reported as a result of either of these earthquakes. In October 2012, an earthquake with its epicenter in Hollis, ME and a magnitude of 4.6 on the Richter scale occurred. The tremor was

felt through most of New England and in Berlin, but no damage was reported.

Although historically earthquakes have been rare in New Hampshire, the potential does exist and depending on the location, the impact could be significant. The potential structure loss value due to earthquakes was determined to be between 1% and 5% of the total assessed structure value.

### 13) Drought ..... Structure loss value was not estimated

An extended period without precipitation could elevate the risk for wildfire and with an extreme drought the water supply and aquifer levels could be threatened. Fortunately, significant droughts rarely occur in New Hampshire or Berlin. According to the NH Department of Environmental Services, five significant droughts have occurred since 1929.<sup>16</sup>

The cost of drought in Berlin is difficult to calculate as any cost would primarily result from an associated fire risk, diminished water supply and economic hardship. Berlin does not have a significant farming community; therefore the impact from drought on farming would be minimal.

Based on the unlikelihood of a serious drought occurring in New Hampshire and because the hardship would be primarily economic, the structure loss value was not estimated.

## ***D. Human-caused Hazards***

The following human-caused hazards were also considered while developing this hazard mitigation plan. Though these hazards are not analyzed in more detail as part of this Plan, they are none-the-less worth mentioning as real and possible hazards that could occur in Berlin.

### **1) Epidemic/Pandemic**

Berlin's unique geography provides hikers, OHRVers and summer and winter recreation enthusiasts many opportunities to visit the City; the City's population shows a modest increase during both summer and winter months. In addition, children from other towns attend school in Berlin and transient visitors arrive to visit not only the high elderly population but the two prisons that are in the City. With four large and one small elderly and/or subsidized housing facilities and the federal (1162 persons) and state prisons (650 persons), visitors, employees and residents are at a greater risk for influenza and other epidemics. Nearly every year, Berlin EMS is overwhelmed by the number of influenza victims that need transport to local and area hospitals.

Because of these factors, the Team determined that an epidemic or pandemic could present a possible threat to Berlin. With the occurrence of world-wide pandemics such as SARS, H1N1 and Avian Flu, Berlin could be susceptible to an epidemic and subsequent quarantine.

### **2) Hazardous Material – Transport**

The possibility of vehicular accidents involving hazardous materials is identified as potentially significant in Berlin. The City's two major roads, NH Routes 16 and 110 see a high volume of vehicular traffic; truck traffic is particular high on these two routes. In addition, rail traffic carries significant amounts of hazardous materials such as liquid petroleum gas, sulfuric acid, hydrochloric acid, anhydrous ammonia and other chemicals. The biomass facility in

<sup>16</sup> NH DES; <http://des.nh.gov/organization/divisions/water/dam/drought/documents/historical.pdf>

downtown Berlin also see deliveries of hazardous materials including fuel oil and hydraulic oil and the Gorham Paper Mill, just over the city line Gorham, is the recipient of piped-in methane gas.

Lastly the flight-path for the Berlin Municipal Airport, located a few miles away in Milan, is over the City of Berlin. The airport is large enough for commercial planes to land and is expected to see increased traffic with the development of the Balsams Resort in nearby Dixville Notch. In fact, the airport is large enough to have welcomed Air Force 2.

Hazardous materials accidents are not common, but when they do occur, the resulting impact is often quite severe. The Team recalled one incident where a 6-wheel propane delivery truck developed a large leak next to the Coos County Nursing Home; a perimeter was set and a shelter-in-place order kept residents and employees at the nursing home safe.

### **3) Hazardous Material - Fixed Location**

Hazardous material in a fixed location is of some concern, particularly due to the natural gas pipeline which travels through parts of Berlin. Although safety precautions are in place, a natural gas leak could occur and not be noticed as natural gas is odor free.

Small leaks in the pipeline have been reported from time to time, but are generally handled by the owners of the pipeline. One event caused by a forklift striking the natural gas line in the Industrial Park, resulted in a Fire Department response and the shutdown of the line by a satellite station. The Industrial Park was shut down for a time and a perimeter was set up.

Many other hazardous materials locations are scattered throughout the City, from small gas stations to the biomass facility which keeps 10,000 gallons of #2 fuel oil onsite.

### **4) Terrorism**

Terrorism is a concern in Berlin and in our nation in general. Terrorism can be a home-grown event or an event with a more international scope.

Berlin has had difficulty with arson in the past; the Fire Department does what it can to not only monitor fire events in the City but to educate its citizens.

A terrorist activity at one of the four hydro dams in Berlin could have a significant impact; a human-caused breach at Smith Hydro could result in major flooding on Main Street. The Berlin public water supply is also at risk although well-head protection plans are in place. Godfrey Dam is monitored by remote video; however a human-caused breach at Godfrey Dam could also cause significant flooding downstream.

### **5) Extended Power Failure**

Extended power failure is a concern, particularly when combined with any of the natural hazards detailed above. Extended power outages of several days have occurred in Berlin, both as a result of local line damage from high winds and storms and problems with the power grid. If a major and/or extended power outage occurs and lasts for more than a week, a significant hardship on individual residents could result, particularly those citizens who are elderly or handicapped.

Tree maintenance by the local utility and by the City has helped to mitigate the potential for power failure. However, it was noted by the Team that the Coos Loop of the electric grid is undersized for the amount of development in Coos County.

Equipped with generators and woodstoves, some residents are self-sufficient. However, the large number of subsidized and elderly housing facilities and the elderly and poor that live in the City make an extended power failure a serious concern.

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## Chapter 6: Current Policies, Plans & Mutual Aid

After researching historic hazards, identifying CIKR and determining potential hazards, the Team determined what is already being done in Berlin to protect its citizens and structures.

Once identified, the Team addressed each current policy or plan to determine its effectiveness and to determine whether or not improvements were needed. This analysis became one of the tools the Team used to identify mitigation action items for this Plan.

If existing policies, plans and mutual from the prior plan were designated as “Improvements Needed”, they were added to *Table 9.1, Mitigation Action Items* as new strategies and reprioritized to meet the City’s needs of today.



With the knowledge of what regulations Berlin currently had in place, creating new action items was less difficult. This process was helpful in identifying current plans and policies that were working well and those that should be addressed as a new “action item” as well as the responsible departments. The table that follows, *Table 6.1, Policies, Plans & Mutual Aid*, shows the analysis that resulted from discussion with the Team.

**TABLE 6.1: CURRENT POLICIES, PLANS & MUTUAL AID**

**KEY TO EFFECTIVENESS:**

**Excellent** ..... The existing program works as intended and is exceeding its goals.

**Good** ..... The existing program works as intended and meets its goals.

**Average** ..... The existing program does not work as intended and/or does not meet its goals.

**Poor** ..... The existing program does not work as intended, often falls short of its goals, and/or may present unintended consequences.

Current Program or Activity	Description	Area of City	Responsible Department	Effectiveness	Improvements Needed or Not Needed
Subdivision Regulations	Includes fire and emergency access, drainage, floodplain and bonding provisions	City-wide	Planning Board	Good	<b>Improvements Needed:</b> Although the Berlin Subdivision Regulations have been in place since 1998, only minor changes have been made; deferred to this Plan to review and update the Subdivision Regulations to insure their effectiveness against natural or human-caused hazards and to align them with state regulations; the Berlin Street Regulations were completely updated six years ago. <b>Action Item #23</b>

Current Program or Activity	Description	Area of City	Responsible Department	Effectiveness	Improvements Needed or Not Needed
Geographic Information System (GIS)	A Geographic Information System (GIS) provides the City with the ability to map and analyze data as it pertains to natural and human-caused hazards and to assist the City with future planning and development modeling.	City-wide	Multi Departmental	Good	<b>Improvements Needed:</b> Although the City has established a Geographic Information System (GIS), this system needs further development, improvements and integration into City departments to insure its best use for understanding and mitigating natural hazards. (also in Table 7.1) <b>Action Item #9</b>
Tree Maintenance Program	Eversource and Brookfield Power have a tree maintenance program to remove trees and tree limbs from around the power lines. In addition, the Berlin DPW, the Fire Department and State DOT have a tree maintenance program to clear trees and hanging limbs from roadways.	City-wide	Berlin DPW, Fire Department & State DOT	Excellent	<b>Improvements Needed:</b> Although the current Tree Maintenance Program is good, this is deferred to this Plan to continue these efforts into the future. <b>Action Item #24</b>
Zoning Ordinance of the City of Berlin	Regulations dealing with land use including rural, residential, agriculture and timber management	City-wide	Planning Director & Zoning Officer	Average	<b>Improvements Needed:</b> Berlin's Zoning Ordinances are reviewed and updated annually or when there is a need; the Zoning Ordinance could use a major update and re-write so that interpretation of the Ordinance is clearer and to align the Ordinance with the Master Plan. <b>Action Item #25</b>
Emergency Back-up Power	Emergency back-up power has been established at the Police Station, Recreation Department, Fire Department, Androscoggin Valley Hospital and the Public Works Garage.	CIKR	Emergency Management Director	Average	<b>Improvements Needed:</b> In order to best maximize the use of critical facilities at the time of an emergency, additional generators should be installed; deferred to this Plan to install permanent generators at City Hall, White Mountains Community College, Berlin High School, Brown Elementary, Berlin Middle School and Hillside Elementary. <b>Action Items #26-31</b>



Current Program or Activity	Description	Area of City	Responsible Department	Effectiveness	Improvements Needed or Not Needed
City Emergency Operations Plan (2013)	This plan offers all members of the emergency management team a better understanding of procedures in case of a disasters	City-wide	Emergency Management Director	Average	<b>Improvements Needed:</b> The Berlin Emergency Operations Plan was updated in 2013 and will not be scheduled for another update until 2018; deferred to this Plan for that update. <b>Action Item #32</b>
City Master Plan (2010)	Includes goals, objectives and expectations for future development of the City	City-wide	Planning Board	Excellent	<b>Improvements Needed:</b> The Berlin Master Plan was created in 2010 and will need a recommended 10-year update in 2020; deferred to this Plan to update the Master Plan and to include a Natural Hazards section. <b>Action Item #33</b>
Incident Command System	Ensure effective command, control, and communications during emergencies.	City-wide	Berlin Fire Chief & Emergency Management Director	Average	<b>Improvements Needed:</b> NIMS & ICS training has been done by most first responders; although this is preparedness, this is deferred to this plan to continue to provide NIMS & ICS training to new first responders and to new City officials as they become elected and/or appointed. (also in Table 7.1) <b>Action Item #2</b>
Mutual Aid Agreements	Offers access to resources appropriate to the scope of the emergency	City-wide	Fire & Police Departments	Excellent	<b>No Improvements Needed:</b> Mutual aid agreements that are in place by the Police Department (Gorham) and by the Fire Department (Milan, Gorham, Shelburne & Stark) work well; the NH State Fire Marshall is also available to assist as needed.
CEMPS Program	Berlin SAU3; Insures preparedness and response for school personnel and city emergency personnel in the instance of a major disaster in the schools	City's Schools	Superintendent of SAU	Excellent	<b>No Improvements Needed:</b> SAU 3's Emergency Response Plans are updated on an annual basis and do what they are intended to do.
Hazardous Materials Plan(s)/Team	The City relies on the Berlin Fire Department and secondarily on the North Country Emergency Response Team (NCERT).	City-wide	Fire Chief	Good	<b>No Improvements Needed:</b> The Berlin Fire Department has trained members for hazmat response and also relies on Northern NH Fire Mutual Aid District and its hazmat team, North Country Emergency Response Team (NCERT).

Current Program or Activity	Description	Area of City	Responsible Department	Effectiveness	Improvements Needed or Not Needed
Wellhead Protection Program	Berlin has identified a wellhead protection area. The purpose is to prevent the contamination of groundwater used for drinking water. The area is the surface and subsurface area surrounding the public water supply where contaminants are likely to reach.	Brown Farm & Jericho Lake	Planning Board	Good	<b>No Improvements Needed:</b> The Berlin Water & Sewer Department has, and continues to address any concerns that are raised by DES; well head protection at the City's wells is excellent.
City Building Code	Continue enforcement of International Code; the City has adopted IBC building code. This code requires new construction to meet the national standards for flood, wind (80mph), earthquake, fire and snow load.	City-wide	Building Inspector	Good	<b>No Improvements Needed:</b> The City has adopted the IBC codes; the Building Inspector enforces the codes. (also in Table 7.1)
NFIP Floodplain Ordinance (1999; updated 2014)	The minimum National Flood Insurance Program (NFIP) requirements have been adopted as part of the City's Zoning Ordinance. This regulates all new and substantially improved structures located in the 100-year floodplain, as identified on the FEMA Flood Insurance Rate Maps.	Floodplain	Planning Board & Building Inspector	Good	<b>No Improvements Needed:</b> The City has been a member of the National Flood Insurance Program (NFIP) since June 15, 1982 and has an established flood ordinance which performs as it is meant to prevent building or substantial improvements in the floodplain.

Current Program or Activity	Description	Area of City	Responsible Department	Effectiveness	Improvements Needed or Not Needed
Class B & C Dam Emergency Action Plans	The four (4) dams in Berlin are class C and have Emergency Action Plans with inundation pathways mapped.	Berlin Dams on Androscoggin	Brookfield Power	Excellent	<b>No Improvements Needed:</b> The City has Emergency Action Plans from Brookfield Power and receives updates to those plans as they are completed; also have EAPs for other high hazard dams up river.
Annual & Segregated CIP Funds	A type of account on a City's balance sheet that is reserved for long-term capital investment projects or any other large and anticipated expense(s) that will be incurred in the future; reserve funds and set aside to ensure adequate funding to at least partially finance future projects, equipment and other expenditures.	City-wide	City Manager	Excellent	<b>No Improvements Needed:</b> The City's Annual & Segregated CIP Funds are funds that are set aside each year at budget time to assist the City's departments with planned purchases of equipment and supplies or in emergency situations; Berlin's Annual & Segregated Funds work well when fully funded.
Burning Index	New Hampshire Forests & Lands (DRED) has a burning index, which measures the risk for wildfires; how likely they are to start on a given day. It also evaluates the potential damages wildfires can create, the number of people that will be needed to fight it and the type of equipment that might be needed as well.	City-wide	Fire Department	Excellent	<b>No Improvements Needed:</b> The Fire Department receives regular notification of the burning index via fax and email from NH Forests & Lands; this notification is made daily during the fire danger season.

Current Program or Activity	Description	Area of City	Responsible Department	Effectiveness	Improvements Needed or Not Needed
State Health Department Public Health Plan	State plan, "Influenza, Pandemic, Public Health Preparedness and Response Plan" written by state health department to be prepared for any public health emergency; the City is part of the North Country Regional Public Health Region	City-wide	North Country Regional Public Health Network	Good	<b>No Improvements Needed:</b> The Public Health Plan does what it is meant to do; the City participates in regional public health meetings whenever possible.
City Capital Improvements Plan	A Capital Improvement Plan is a short-range plan, usually four to ten years, which identifies capital projects and equipment purchases; provides a planning schedule and identifies options for financing the plan; a CIP provides a link between a city and its departments through a comprehensive and strategic plan.	City-wide	City Manager, Planning Board & Council	Excellent	<b>No Improvements Needed:</b> Berlin has a current CIP, work is done on an annual basis and the CIP is an excellent guiding document.
Bridge Design Standards	Standards set by the State of NH for bridge design, repairs and upgrades.	State/DOT Bridges	Public Works Director	Good	<b>No Improvements Needed:</b> Bridge repairs or upgrades are built to state standards.
Local Road Design Standard	Berlin Subdivision and Site Plan Regulations include road design standards that control the amount and retention of storm water runoff.	City-wide	Planning Board & Public Works Department	Good	<b>No Improvements Needed:</b> Road design standards are detailed within the City's planning mechanisms (Subdivision and Site Plan) and adhere to State standards.

Current Program or Activity	Description	Area of City	Responsible Department	Effectiveness	Improvements Needed or Not Needed
State Division of Forest and Lands/Fire Permits	State regulations for open burning and permits	City-wide	Fire Warden	Good	<b>No Improvements Needed:</b> System that is in place with NHFL and the local fire warden works well; public is aware of fire permitting requirements and the ability to get permits online (fee required).
City Housing Code	Continued enforcement of City Chapter 8- Housing Code	City-wide	Housing Inspector	Excellent	<b>No Improvements Needed:</b> The City of Berlin continues to enforce the Chapter 8 Housing code.

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## Chapter 7: Prior Mitigation Plan(s)

### A. Date(s) of Prior Plan(s)

Berlin has participated in the development of a prior Hazard Mitigation Plan, based on the Disaster Mitigation Act (DMA) of 2000, which received Final Approval by FEMA on July 13, 2010. This Plan, the "Berlin Hazard Mitigation Plan Update 2016" is an update to the 2010 Plan.

Below are the action items that were identified in the 2010 Plan. The Team identified the current status of each strategy based on three questions:

- ❖ Has the strategy been completed?
- ❖ Has (or should) the strategy be deleted?
- ❖ Has (or should) the strategy be deferred for consideration in this Plan?

If strategies from the prior plan were "deferred" to this Plan, they were added to *Table 9.1, Mitigation Action Items* as new strategies and reprioritized to meet the City's needs of today.

**TABLE 7.1: ACCOMPLISHMENTS SINCE PRIOR PLAN(S) APPROVAL**

**NOTE:** Items in **red** were extracted word-for-word from the 2010 Hazard Mitigation Plan and do not represent a time frame for this plan.

Priority	Project	Responsibility Oversight	Funding Support	Time Frame	Completed, Deleted, Deferred
<b>Programs &amp; Policies</b>					
	Install a water gauge and monitoring equipment at Jericho Lake and Godfrey Dam that monitors the level of the water (also to be used in conjunction with a Warning System).	Water Department & Recreation Department	FEMA, NHOEM, City Budget	1-2 years 2010-2012	<b>Completed &amp; Deferred:</b> Although the water level is able to be monitored, visual and data trending capabilities are gone at Godfrey Dam; the State now owns Jericho Lake Dam and is responsible for the monitoring water levels and the dam; deferred to this Plan to re-establish visual and data trending capabilities at Godfrey Dam. <b>Action Item #20</b>
	Hire a full-time building inspector and code enforcement officer for more comprehensive and efficient enforcement. Include the update of 1- and 2-family building code to bring up to 2002 standard.	Fire Department	Building Permit Fees; City Budget; Inspections Fees	1-2 years 2010-2011-2012	<b>Completed:</b> A full-time building inspector has been hired; International Residential Code (IRC) and the International Building Codes (IBC) standards adopted in 2009; standards will be updated and adopted again in 2015 by the State; the City has adopted the International Maintenance Code Amendments. (also in Table 6.1)



Priority	Project	Responsibility Oversight	Funding Support	Time Frame	Completed, Deleted, Deferred
	Establish and implement a new comprehensive warning system.	Emergency Management Director (EMD)	City Budget OEM	1 year 2011	<b>Completed &amp; Deferred:</b> The City has the capability to receive warnings through NH Reverse 911; NH Alert 1, Nixle (Police Department) and Call One for the school system are also in place; deferred for continued public education; continue to pursue the funding for obtaining CodeRED. <b>Action Item #21</b>
	Maintain a registry of Materials Safety Data Sheet (MSDS) and provide Fire, Police, EMD and EMS and the AVH.	Fire Department	N/A	2010-2015	<b>Completed:</b> A registry of Materials Safety Data Sheets (MSDS) is maintained and continues to be provided to the Fire and Police Departments and EMS, the Emergency Management Director and Androscoggin Valley Hospital.
	Implement "911" changes necessary for compliance.	City Engineer	N/A	1 year 2011	<b>Completed &amp; Deferred:</b> The Berlin City Planner continues to maintain and request compliance for 911 signage, but full compliance has not been met; deferred to provide ongoing public outreach to be sure that houses are appropriately marked and that homes with long driveways are signed to be visible both day and night. <b>Action Item #1</b>
<b>Training</b>					
	Annual training and exercise for Elected Officials and City Staff regarding Emergency Management, Incident Command System (ICS), Communications, and floodplain requirements. All individuals identified in the City's Emergency Response Plan should be "cross-trained" so as to provide additional staff during a large disaster, as well as to notify them of their responsibilities identified in the response plan.	Emergency Management Director (EMD)	NH OEM	1 year 2011	<b>Completed &amp; Deferred:</b> An ongoing program has been devised by the Emergency Management Director to insure "cross-training" for the City's Elected Officials and Staff on the Incident Command System (ICS); deferred to continue to encourage all new hires and newly elected officials to take ICS 100, 200 & NIMS 700. (also in Table 6.1) <b>Action Item #2</b>

Priority	Project	Responsibility Oversight	Funding Support	Time Frame	Completed, Deleted, Deferred
	Collapsed building training for Fire, Police, EMS, Building Department and Public Works.	EMD / Fire Department	FEMA, NH OEM	1-3 years 2010-2013	<b>Completed &amp; Deferred:</b> Although some in house collapsed building training has been done at the Fire Department, additional training should be done with the Police Department, EMS and Public Works; although this is preparedness, it is deferred to this Plan as a reminder to continue. <b>Action Item #3</b>
	Hazardous material Training for the Fire Department, Police and EMS.	EMD / Fire Department	FEMA, NH OEM	1-3 years 2010-2013	<b>Completed &amp; Deferred:</b> Although some in house hazardous materials training has been done at the Fire Department and the Police Department, additional training should be done with EMS and Public Works; although this is preparedness, it is deferred to this Plan as a reminder to continue. <b>Action Item #4</b>
	Water rescue and evacuation training for Fire, Police and EMS.	EMD / Fire Department	FEMA, NH OEM	1-3 years 2010-2013	<b>Completed &amp; Deferred:</b> Although some water rescue training has been done at the Fire Department, additional training should be done with the Police Department and EMS; although this is preparedness, it is deferred to this Plan as a reminder to continue. <b>Action Item #5</b>
	Heavy equipment rescue training for Fire Department and EMS.	EMD / Fire Department	FEMA, NH OEM	1-3 years 2010-2013	<b>Completed &amp; Deferred:</b> Although some heavy equipment rescue training has been done at the Fire Department, additional training should be done with the Police Department and EMS; although this is preparedness, it is deferred to this Plan as a reminder to continue. <b>Action Item #6</b>
<b>Public Education</b>					
	Educate public on the to be established "comprehensive warning system" (as identified in Programs/Policies above). Including the addition of one or more warning whistles - if deemed appropriate with the "new" comprehensive system.	EMD, City of Berlin, Local Radio		1-3 years 2010-2013	<b>Deferred:</b> Public education on the current warning systems has not been done; deferred to provide public education via several means including but not limited to local radio, community meetings, Public TV, newspapers, the website and social media pages; emergency messages can be sent through E-911 via text (can put in medical conditions, cell, phone updates). <b>Action Item #7</b>

Priority	Project	Responsibility Oversight	Funding Support	Time Frame	Completed, Deleted, Deferred
	Educate public, landlords and renters on incompatible materials in the water and sewer system; floor drains in the basement and potential for oil spills.	Public Works Director	N/A	1-2 years 2010-2012	<b>Completed &amp; Deferred:</b> Some public education has been provided to advise the public, landlords and renters on incompatible materials in the water and sewer system but more can be done; deferred to continue public education on items such as, but not limited to, floor drains and potential for oil spills. <b>Action Item #8</b>
	Investigate the possibility of a student compiling a public information pamphlet and/or develop and distribute an "emergency card" to the public (include the type of response required of the public depending on the event).	EMD	City Department , NHCTC, Berlin High School	1-2 years 2010-2012	<b>Deferred:</b> The City has not yet devised a method of tracking the functional needs population to determine what types of response would be necessary at the time of an emergency; deferred to establish a method to gather this information on a voluntary basis and to devise a system to maintain and protect this sensitive information according to the Health Insurance Portability and Accountability Act (HIPAA) regulations; send form via mail and other methods. <b>Action Item #16</b>
	Ensure appropriate copies of all regulations/building codes in all places required by RSAs.	City Planner	City Budget	1 year 2011	<b>Completed:</b> The City keeps citizens of the community informed of all regulations, building codes and ordinances by posting them on the City's website and providing hard copies at the Public Library.
<b>Structural &amp; Engineering</b>					
	Moxie Alley: evaluation of existing studies with a recommendation to reduce flooding in cooperation with the economic development committee.	AVER, Berlin City Planner	Private investor, AVER, City	2 years 2010-2012	<b>Partially Completed &amp; Deferred:</b> Dead River flooding still exists although some progress has been made; deferred to continue to improve the drainage systems in the area of Moxie Alley between Pleasant and Main Street to mitigate flooding. <b>Action Item #34</b>
	Comprehensive drainage study for entire City, including: Charron Ave area and Hillside Ave Bridge (need to determine ownership).	Public Works Director	City Budget / Grants	1-2 years	<b>Deferred:</b> The City of Berlin has not yet developed a comprehensive drainage system study for the entire community; deferred to this Plan to develop a complete Storm Water Maintenance Plan. <b>Action Item #17</b>

Priority	Project	Responsibility Oversight	Funding Support	Time Frame	Completed, Deleted, Deferred
	Evaluate city owned buildings for structural integrity and determine what long-term improvements are needed. Also an evaluation of the possible risk to health and the working environment at all	City owned; City Manager, City Council Building & Health Departments	City Budget & Grants	-	<b>Completed:</b> Ongoing assessments are done and improvements are made as changes in code and building needs change.
<b>GIS Projects</b>					
	Need a comprehensive GIS system, including public utilities and floodplains.	City Planner & Public Works	FEMA, NHCTC, Berlin High School	2 years 2010- 2012	<b>Partially Completed &amp; Deferred:</b> Ongoing GIS work has been done to map the City's public utilities; deferred to this Plan to continue to improve and update the GIS mapping of both the floodplain (available from Granit) and the City's utilities and water systems. <b>Action Item #9</b>
	Investigate possibility of working with the NHCTC to implement the program.	City Planner & Public Works	FEMA, NHCTC, Berlin High School	2 years 2010- 2012	<b>Partially Completed &amp; Deleted:</b> The City completed one impervious surface project with a student from White Mountains Community College (formerly NHCTC) and did some training at the college, but has chosen to do GIS with in-house staff at this time.
<b>Equipment</b>					
	Confined space and heights rescue equipment	Fire Chief	Grants & Capital Improvement Program	2-3 years 2010- 2013	<b>Completed:</b> With USDA grants, EMPG funding and company donations confined space and heights rescue equipment has been obtained.
	New Police Building	Police Chief	Grants & City Budget	2-5 years 2010- 2015	<b>Deferred:</b> A new Police Building has not been built due to lack of financial resources; deferred to this Plan to replace this key resource. <b>Action Item #22</b>
	Updated salt and sand de-icing facility.	Public Works Director	City Budget	1-2 years 2010- 2011	<b>Deferred:</b> An update of the salt and sand de-icing facility has not been done due to lack of financial resources; deferred to this Plan to update the facility. <b>Action Item #18</b>
	Purchase 6500 watt generator for EMS	EMS Director		2-3 years 2010- 2013	<b>Deleted:</b> The City has not purchased a 6500 watt generator for the EMS building due to lack of financial resources; however, the EMS department has decided that due to the nature of the department, a generator is not needed.

Priority	Project	Responsibility Oversight	Funding Support	Time Frame	Completed, Deleted, Deferred
	Security monitoring equipment at Godfrey Reservoir	Water Works Department	Grants	1 year 2011	<b>Completed &amp; Deferred:</b> Although security monitoring equipment at Godfrey Reservoir Dam has been established, this strategy is deferred to this Plan to provide visual and data capabilities. <b>Action Item #20</b>
	Flood warning system at Jericho Dam with visual & audio alert.	Police & EMD	Grants	2-3 years 2010-2013	<b>Deleted:</b> The State of NH, as the owner of Jericho Dam, is responsible for flood warning, not the City.
	Community warning audible alert device	Public Health	City Budget	1-2 years 2010-2012	<b>Completed &amp; Deferred:</b> A siren has been established in downtown that can be heard throughout the more populated parts of Berlin; deferred to complete an actual warning system plan based on coded blasts and to provide public education. <b>Action Item #19</b>

## Chapter 8: New Mitigation Strategies & STAPLEE

### A. Mitigation Strategies by Type

The following list of mitigation categories and possible mitigation strategy ideas was compiled from a number of sources including the USFS, FEMA, other Planners and past hazard mitigation plans. This list was used during a brainstorming session to discuss what issues there may be in City. Team involvement and brainstorming sessions proved helpful in bringing new ideas, better relationships and a more in-depth knowledge of the Community.

#### Prevention

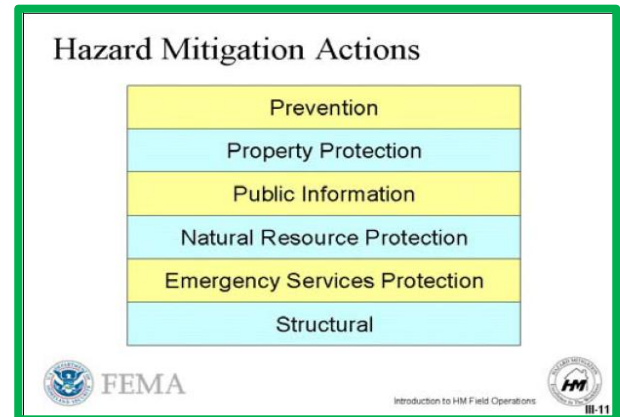
- Forest fire fuel reduction programs
- Special management regulations
- Fire Protection Codes NFPA 1
- Firewise landscaping
- Culvert and hydrant maintenance
- Planning and zoning regulations
- Building Codes
- Density controls
- Driveway standards
- Slope development regulations
- Master Plan
- Capital improvement program
- Rural Fire Water Resource Plan
- NFIP compliance

#### Public Education & Awareness

- Hazard information centers
- Public education and outreach programs
- Emergency website creation
- “Firewise” training
- NFIP awareness
- Public hazard notification
- Defensible space brochures

#### Emergency Service Protection

- Critical facilities protection
- Critical infrastructure protection
- Emergency training for city officials
- Ongoing training for first responders



#### Property Protection

- Current use or other conservation measures
- Transfer of development rights
- Firewise landscaping
- Water drafting facilities
- High risk notification for homeowners
- Structure elevation
- Real estate disclosures
- Flood proofing
- Building codes
- Development regulations

#### Natural Resource Protection

- Best management practices within the forest
- Forest and vegetation management
- Forestry and landscape management
- Wetlands development regulations
- Watershed management
- Erosion control
- Soil stabilization
- Open space preservation initiatives

#### Structural Projects

- Structure acquisition and demolition
- Structure acquisition and relocation
- Bridge replacement
- Dam removal
- Culvert up-size and/or realignment

## B. Potential Mitigation Strategies by Hazard

In order to further promote the concept of mitigation, the City was provided with a handout that was developed by Mapping and Planning Solutions and used to determine what additional mitigation action items might be appropriate for the City. The mitigation action items from that handout are listed on the following two pages; each item from this comprehensive list of possible mitigation action items was considered by the Planning Team to determine if any of these action items could be put in place for Berlin with special emphasis on new and existing buildings and infrastructure.

### Strategies that may apply to more than one hazard

### Type of Project

- *Community Outreach and Education* .....Public Awareness
- *Changes to Zoning Regulations* .....Prevention
- *Changes to Subdivision Regulations* .....Prevention
- *Steep Slopes Ordinance* .....Prevention
- *Density Controls* .....Prevention
- *Driveway Standards* .....Prevention
- *Emergency Website Creation* .....Public Awareness
- *Critical Infrastructure & Key Resources* .....Emergency Service Protection
- *Emergency Training for City Officials* .....Emergency Service Protection
- *High Risk Notification to Homeowners* .....Property Protection
- *Master Plan Update or Development* .....Prevention
- *Capital Improvement Plan* .....Prevention

### Flood Mitigation Ideas

### Type of Project

- *Storm Water Management Ordinances* .....Prevention
- *Floodplain Ordinances* .....Prevention
- *Updated Floodplain Mapping* .....Prevention
- *Watershed Management* .....Natural Resource Protection
- *Drainage Easements* .....Prevention
- *Purchase of Easements* .....Prevention
- *Wetland Protection* .....Natural Resource Protection
- *Structural Flood Control Measures* .....Prevention
- *Bridge Replacement* .....Structural Project
- *Dam Removal* .....Structural Project
- *NFIP Compliance* .....Prevention
- *Acquisition, Demolition & Relocation* .....Structural Project
- *Structure Elevation* .....Structural Project
- *Flood Proofing* .....Property Protection
- *Erosion Control* .....Natural Resource Protection
- *Floodplain/Coastal Zone Management* .....Prevention
- *Building Codes Adoption or Amendments* .....Prevention
- *Culvert & Hydrant Maintenance* .....Prevention
- *Culvert & Drainage Improvements* .....Structural Protection
- *Transfer of Development Rights* .....Property Protection



## **Natural Hazard Mitigation Ideas**

## **Type of Project**

### **Landslide**

- Slide-Prone Area Ordinance..... Prevention
- Drainage Control Regulations..... Prevention
- Grading Ordinances..... Prevention
- Hillside Development Ordinances..... Prevention
- Open Space Initiatives..... Prevention
- Acquisition, Demolition & Relocation..... Structural Project
- Vegetation Placement and Management..... Natural Resource Protection
- Soil Stabilization..... Natural Resource Protection

### **Thunderstorms & Lightning**

- Building construction..... Property Protection

### **Tornado & Severe Wind**

- Construction Standards and Techniques..... Property Protection
- Safe Rooms..... Prevention
- Manufactured Home Tie Downs..... Property Protection
- Building Codes..... Property Protection

### **Wildfire**

- Building Codes..... Property Protection
- Defensible Space..... Prevention
- Forest Fire Fuel Reduction..... Prevention
- Burning Restriction..... Property Protection
- Water Resource Plan..... Prevention
- Firewise Training & Brochures..... Public Awareness
- Woods Roads Mapping..... Prevention

### **Extreme Temperatures**

- Warming & Cooling Stations..... Prevention

### **Winter Weather Snowstorms**

- Snow Load Design Standards..... Property Protection

### **Subsidence**

- Open Space..... Natural Resource Protection
- Acquisition, Demolition & Relocation..... Structural Project

### **Earthquake**

- Construction Standards and Techniques..... Property Protection
- Building Codes..... Property Protection
- Bridge Strengthening..... Structural Project
- Infrastructure Hardening..... Structural Project

### **Drought**

- Water Use Ordinances..... Prevention

### C. STAPLEE Methodology

Table 8.1, *Potential Mitigation Items & the STAPLEE*, reflects the newly identified potential hazard and wildfire mitigation action items as well as the results of the STAPLEE evaluation as explained below. It should also be noted that although some areas are identified as “All Hazards”, many of these would apply indirectly to wildfire response and capabilities. Many of these potential mitigation action items overlap.

The goal of each proposed mitigation action item is “to reduce or eliminate the long-term risk to human life and property from hazards”. To determine the effectiveness of each mitigation action item in accomplishing this goal, a set of criteria that was developed by FEMA, the STAPLEE method, was applied to each proposed action item.

The STAPLEE method analyzes the Social, Technical, Addministrative, 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 action items discussed in Table 8.1.

**Social:** ..... Is the proposed action item socially acceptable to the Community? Is there an equity issue involved that would result in one segment of the Community being treated unfairly?

**Technical:** ..... Will the proposed action item work? Will it create more problems than it solves?

**Administrative:** ..... Can the Community implement the action item? Is there someone to coordinate and lead the effort?

**Political:** ..... Is the action item politically acceptable? Is there public support both to implement and to maintain the project?

**Legal:** ..... Is the Community authorized to implement the proposed action item? Is there a clear legal basis or precedent for this activity?

**Economic:** ..... What are the costs and benefits of this action item? Does the cost seem reasonable for the size of the problem and the likely benefits?

**Environmental:** ..... How will the action item impact the environment? Will it need environmental regulatory approvals?

Each proposed mitigation action item was then evaluated and assigned a score based on the above criteria. Each of the STAPLEE categories was discussed and was awarded one of the following scores:

3 - Good ..... 2 - Average ..... 1 - Poor

An evaluation chart with total scores for each new action item is shown in Table 8.1.

The “Type” of Action Item was also considered to be (see section A of this chapter) for more reference):

- **Prevention**
- **Public Education & Awareness**
- **Emergency Service Protection**
- **Property Protection**
- **Natural Resource Protection**
- **Structural Projects**

#### ***D. Team’s Understanding of Hazard Mitigation Action Items***

The Team determined that any strategy designed to reduce personal injury or damage to property that could be done prior to an actual disaster would be listed as a potential mitigation strategy. This decision was made even though not all projects listed in Table 8.1 and Table 9.1, *The Mitigation Action Plan*, are fundable under FEMA pre-mitigation guidelines. The Team determined that this Plan was in large part a management document designed to assist the City Council and other city officials in all aspects of managing and tracking potential emergency planning action items. For instance, the Team was aware that some of these action items are more properly identified as preparedness or readiness issues. As there are no other established planning mechanisms that recognize some of these issues, the Team did not want to “lose” any of the ideas discussed during these planning sessions and thought this method was the best way to achieve that objective.

Also, it should be noted that the City understands that the “Mitigation Action Items” for a town of 200 are not the same as the “Mitigation Action Items” for a town of 30,000. In addition, the “Mitigation Action Items” for a city in the middle of predominantly hardwood forests, are not the same as the “Mitigation Action Items” for a town on the Jersey Shore. Therefore the City of Berlin has accepted the “Mitigation Action Items” in Tables 8.1 and 9.1 as the complete list of “Mitigation Action Items” for this City and only this City and hereby indicates that having carefully considered a comprehensive list of other possible mitigation action items (see sections A & B of this chapter) for this Plan, there are no additional “Mitigation Action Items” to add at this time.

#### **TABLE 8.1: POTENTIAL MITIGATION ACTION ITEMS & THE STAPLEE**

- Potential mitigation action items in Table 8.1 on the following page are listed in numerical order and indicate if they were derived from prior tables in this Plan, i.e., (Table 7.1).
- Items in green such as (MU14) represent mitigation action items taken from Mitigation Ideas, A Resource for Reducing Risk to Natural Hazards, FEMA, January 2013; see *Appendix E: Potential Mitigation Ideas*, for more information.

Action Items are listed in numerical order.

Potential Mitigation Action Item	Affected Location	Type of Activity	Total	S	T	A	P	L	E	E
<p><b>Problem Statement:</b> Full compliance for 911 signage has not been met; this is problematic for emergency responders when attempting to locate homes during emergency situations.</p> <p><b>Action Item #1:</b> Consider ways to improve standard 911 signage compliance so that emergency responders can better assist the public at the time of need; perhaps through public outreach. <b>(Table 7.1)</b></p>	City Wide	Public Education & Awareness	20	3	3	3	2	3	3	3
				<b>Political:</b> Some people and businesses may not want signs on their properties						
<p><b>Problem Statement:</b> Although police officers, EMTs and firefighters have received NIMS &amp; ICS trainings, not all of Berlin's city officials have.</p> <p><b>Action Item #2:</b> The Emergency Management Director will encourage all City officials and new hires who are integral to emergency response to take NIMS 700 and ICS 100 and 200. <b>(Tables 6.1 &amp; 7.1)</b></p>	City Wide	Emergency Service Protection	21	3	3	3	3	3	3	3
				<b>No significant issues with this strategy</b>						
<p><b>Problem Statement:</b> Although some in-house collapsed building training has been done at the Fire Department, additional training should be done with the Police Department, EMS and Public Works.</p> <p><b>Action Item #3:</b> Extend collapsed building training to include all new Firefighters and to Police Officers, EMTs and Public Works staff. <b>(Table 7.1)</b></p>	City Wide	Emergency Service Protection	21	3	3	3	3	3	3	3
				<b>No significant issues with this strategy</b>						
<p><b>Problem Statement:</b> Although some in-house hazardous materials training has been done at the Fire Department and Police Department, additional training should be done with EMS and Public Works.</p> <p><b>Action Item #4:</b> Extend hazardous materials training to include all new Firefighters, Police Officers and to EMTs and Public Works staff. <b>(Table 7.1)</b></p>	City Wide	Emergency Service Protection	21	3	3	3	3	3	3	3
				<b>No significant issues with this strategy</b>						
<p><b>Problem Statement:</b> Although some water rescue training has been done at the Fire Department, additional training should be done with the Police Department and EMS.</p> <p><b>Action Item #5:</b> Extend water rescue training to include all new Firefighters and to Police Officers and EMTs. <b>(Table 7.1)</b></p>	City Wide	Emergency Service Protection	21	3	3	3	3	3	3	3
				<b>No significant issues with this strategy</b>						

Potential Mitigation Action Item	Affected Location	Type of Activity	Total	S	T	A	P	L	E	E
<p><b>Problem Statement:</b> Although some heavy equipment rescue training has been done at the Fire Department, additional training should be done with the Police Department, Public Works and EMS.</p> <p><b>Action Item #6:</b> Extend heavy equipment rescue training to include all new Firefighters and to Police Officers, Public Works and EMTs. <b>(Table 7.1)</b></p>	City Wide	Emergency Service Protection	21	3	3	3	3	3	3	3
<b>No significant issues with this strategy</b>										
<p><b>Problem Statement:</b> Public education on the current warning systems has not been done.</p> <p><b>Action Item #7:</b> Provide public education on current warning systems via several means including but not limited to local radio, community meetings, Public Access TV, newspapers, the website and social media pages <b>(MU14) (Table 7.1)</b></p>	City Wide	Public Education & Awareness	21	3	3	3	3	3	3	3
<b>No significant issues with this strategy</b>										
<p><b>Problem Statement:</b> Some public education has been provided to advise the public, landlords and renters on incompatible materials in the water and sewer system but more can be done.</p> <p><b>Action Item #8:</b> Continue public education on incompatible materials in the water and sewer system including items such as, but not limited to wipes, drugs, oils, fats/grease and other materials that could be flushed into toilets or dumped into floor drains. <b>(Table 7.1)</b></p>	City Wide	Public Education & Awareness	20	3	3	3	2	3	3	3
<b>Political:</b> Public support for implementation may be difficult										
<p><b>Problem Statement:</b> Although the City has established a Geographic Information System (GIS), this system needs further development, improvements and integration into all City departments to insure its best use for monitoring, understanding and mitigating natural hazards.</p> <p><b>Action Item #9:</b> Continue to develop, improve and update the GIS mapping of the floodplain (available from Granit) and the City's utilities and water systems as well as other hazards that affect the Community. <b>(F7, WF1, EQ3, ER1, LS1, SW3, &amp; MU2) (Tables 6.1 &amp; 7.1)</b></p>	City Wide	Prevention	20	3	3	2	3	3	3	3
<b>Administrative:</b> Time and personnel may become overwhelmed in the attempts to get the GIS up-to-date, maintained and functional										

Potential Mitigation Action Item	Affected Location	Type of Activity	Total	S	T	A	P	L	E	E
<p><b>Problem Statement:</b> NCRC&amp;D prepared a Rural Fire Water Resource Plan with recommendations for the installation of water resources (i.e., dry hydrants, fire ponds, cisterns); maintenance needs to continue on all of the City's water resources</p> <p><b>Action Item #10:</b> Routinely inspect the functionality of fire hydrants and continue the maintenance of all hydrants and other water resources in Berlin. (WF8)</p>	Fire Hydrants City-Wide	Prevention	21	3	3	3	3	3	3	3
							No significant issues with this strategy			
<p><b>Problem Statement:</b> Information on lightning safety has been distributed however additional public outreach should be done.</p> <p><b>Action Item #11:</b> Increase public outreach regarding the dangers of lightning by including links and other lightning information on the City's website and/or the Emergency Management Facebook page. (L2)</p>	City Wide	Public Education & Awareness	21	3	3	3	3	3	3	3
							No significant issues with this strategy			
<p><b>Problem Statement:</b> Residents are not aware of emergency procedures or preventative techniques that can be done to protect their lives and property; it is sometimes difficult to convey these messages and to provide Public Outreach via mail or personal contact.</p> <p><b>Action Item #12:</b> Establish a webpage for educating the public on hazard mitigation and preparedness measures (MU14) by adding to the City's Emergency Management Services a webpage that will include such information as emergency contacts, shelter locations, evacuation routes (SW7, WF11 &amp; T3), methods of emergency alerting, 911 compliance, water saving techniques (D9), earthquake risk and mitigation activities that can be taken in residents' homes (EQ7), steps homeowners can take to protect themselves and their properties when extreme temperatures occur (ET1 &amp; ET4), safety measures that can be taken during hail (HA3), high winds (SW7) and lightning storms (L2), mitigation techniques for property protection and links to available sources; educate homeowners regarding the risks of building in hazard zones and encourage homeowners to install carbon monoxide monitors and alarms (WW5).</p>	City Wide	Public Education & Awareness	20	3	3	2	3	3	3	3
							Administrative: Time and personnel may become overwhelmed in the attempts to keep web information updated			

Potential Mitigation Action Item	Affected Location	Type of Activity	Total	S	T	A	P	L	E	E
<p><b>Problem Statement:</b> Residents may not be aware of the steps they can take to reduce the risk of fire at their homes.</p> <p><b>Action Item #13:</b> Obtain and have available "Firewise" brochures to educate homeowners on methods to reduce fire risk around their homes (WF10); provide "Firewise" brochures to those residents seeking burn permits; advise residents of the importance of maintaining defensible space, the safe disposal of yard and household waste and the removal of dead or dry leaves, needles, twigs, and combustible materials from roofs, decks, eaves, porches and yards. (WF12)</p>	City Wide	Public Education & Awareness	21	3	3	3	3	3	3	3
							No significant issues with this strategy			
<p><b>Problem Statement:</b> Residents and Builders may not be aware of flood regulations &amp; the availability of flood insurance through the NFIP.</p> <p><b>Action Item #14:</b> Advise the public about the local flood hazard, flood insurance and flood protection measures (F10) by obtaining and keeping on hand a supply of NFIP brochures to have available in the City Offices; give NFIP materials to homeowners and builders when proposing new development or substantial improvements; encourage property owners to purchase flood insurance (F22), whether or not they are in the flood zone and provide appropriate links to the NFIP and Ready.gov on the Emergency Management Services webpage.</p>	City Wide	Public Education & Awareness	21	3	3	3	3	3	3	3
							No significant issues with this strategy			
<p><b>Problem Statement:</b> Residents may not be aware of the risk of building in the floodplain and the steps they can take to reduce flooding.</p> <p><b>Action Item #15:</b> Through Public Outreach and the City's website, educate homeowners regarding the risks of building in the flood zone and measures that can be taken to reduce the chance of flooding, such as securing debris, propane tanks, yard items or stored objects that may otherwise be swept away, damaged, or pose a hazard if picked up and washed away by floodwaters; add links and info to website. (F23)</p>	City Wide	Public Education & Awareness	21	3	3	3	3	3	3	3
							No significant issues with this strategy			



Potential Mitigation Action Item	Affected Location	Type of Activity	Total	S	T	A	P	L	E	E
<p><b>Problem Statement:</b> The City has not yet devised a method of tracking the functional needs population to determine what types of response would be necessary at the time of an emergency.</p> <p><b>Action Item #16:</b> Investigate legalities and methods used by other communities to create a database to track those individuals at high risk of death, such as the elderly, homeless, etc.; perhaps by developing a survey of the functional needs population and a method of maintaining the data. (ET3 &amp; WW6) (Table 7.1)</p>	City Wide	Emergency Service Protection	18	3	3	2	3	1	3	3
							<p><b>Administrative:</b> Finding the people who can coordinate the efforts  <b>Legal:</b> HIPPA laws need to be respected</p>			
<p><b>Problem Statement:</b> The City of Berlin has not yet developed a comprehensive drainage system study for the entire community.</p> <p><b>Action Item #17:</b> Develop a written storm water operation and maintenance plan in order to insure more efficient storm water management; create a manual for the storm water collection system and integrate it with the City's GIS system; establish a culvert replacement schedule. (F5) (Table 7.1)</p>	City Wide	Prevention	20	3	3	2	3	3	3	3
							<p><b>Administrative:</b> Finding time and people to work on the Plan</p>			
<p><b>Problem Statement:</b> The salt and sand de-icing facility is in need of an update.</p> <p><b>Action Item #18:</b> Obtain funding to update and improve the salt and de-icing facility so that it can better serve the community during severe winter storm events. (WW4) (Table 7.1)</p>	Public Works Department	Emergency Service Protection	19	3	3	3	2	3	2	3
							<p><b>Political:</b> May not receive first priority  <b>Economic:</b> Budget Constraints</p>			
<p><b>Problem Statement:</b> Although a siren can be heard in the more populated areas of Berlin, there is no actual warning system based on code blasts.</p> <p><b>Action Item #19:</b> Establish a system of coded siren "blasts" that will better notify citizens of impending hazards; educate the public on the "blast" system to educate the public on hazard mitigation and preparedness measures. (MU14) (Table 7.1)</p>	Siren @ Brookfield Hydro	Public Education & Awareness	21	3	3	3	3	3	3	3
							<p><b>No significant issues with this strategy</b></p>			

Potential Mitigation Action Item	Affected Location	Type of Activity	Total	S	T	A	P	L	E	E
<p><b>Problem Statement:</b> The City monitors water levels at Godfrey Dam but at the current time does not have visual and data-trending capabilities.</p> <p><b>Action Item #20:</b> Re-establish visual and data-trending capabilities at Godfrey Dam to better monitor and understand flooding potential. (Table 7.1)</p>	Godfrey Dam	Prevention	20	3	2	3	3	3	3	3
<p><b>Technical:</b> The City needs a tower in order to make this strategy a reality</p>										
<p><b>Problem Statement:</b> Although some reverse 911 capabilities have been established in the City, public education on these systems and the development of CodeRED would enhance these capabilities.</p> <p><b>Action Item #21:</b> Obtain funding to establish CodeRED and provide public outreach to encourage all residents to contact CodeRED to add cell numbers, unlisted numbers and to verify information; use the website, a possible brochure or a sign up at City Hall. (MU14) (Table 7.1)</p>	City Wide	Public Education & Awareness	19	3	3	3	2	3	2	3
<p><b>Political:</b> Some people may not understand the system and not want to spend the money  <b>Economic:</b> Budget Constraints</p>										
<p><b>Problem Statement:</b> The City is in need of a new, better equipped and up-to-date Police Station; the current Station is too small, has limited document storage and impound space and the building is old; the Fire Station and EMS also need improvements, including structural improvements in the near future.</p> <p><b>Action Item #22:</b> Obtain funding to improve this Critical Facility with a new and improved Public Safety Building (Fire, Police &amp; EMS). (CIKR) (MU13). (Table 7.1)</p>	Police Station	Emergency Service Protection	16	3	2	3	1	3	1	3
<p><b>Technical:</b> Finding an ideal location based on risk-benefit analysis would be necessary  <b>Political:</b> All three departments would have to agree on issues such as budget, building plans, etc.; some people will not think a new Public Safety Building is necessary  <b>Economic:</b> Budget Constraints</p>										
<p><b>Problem Statement:</b> Although the Berlin Subdivision Regulations have been in place since 1998, only minor changes have been made; deferred to this Plan to review and update the Subdivision Regulations to insure their effectiveness against natural or human-caused hazards and to align them with state regulations.</p> <p><b>Action Item #23:</b> Review and update the Subdivision Regulations to insure their effectiveness against natural hazards for future planning. (WF2, MU3) (Table 6.1)</p>	City-wide & areas of new subdivisions	Prevention	21	3	3	3	3	3	3	3
<p><b>No significant issues with this strategy</b></p>										

Potential Mitigation Action Item	Affected Location	Type of Activity	Total	S	T	A	P	L	E	E
<p><b>Problem Statement:</b> Although the current Tree Maintenance Program is good, this is deferred to this Plan to continue these efforts into the future.</p> <p><b>Action Item #24:</b> Continue tree maintenance program to protect structures, utilities and roads from damage due to high winds, fallen trees and downed power lines. <b>(SW4) (Table 6.1)</b></p>	City Wide	Property Protection	21	3	3	3	3	3	3	3
<b>No significant issues with this strategy</b>										
<p><b>Problem Statement:</b> Berlin's Zoning Ordinances are reviewed and updated annually or when there is a need; the Zoning Ordinances could use a major update and re-write so that interpretation of the Ordinance is clearer and to align the Ordinance with the Master Plan and with possible hazardous events.</p> <p><b>Action Item #25:</b> Review and update the City's Zoning Ordinances; consider possible hazardous events and align Ordinance with the Master Plan. <b>(MU6) (Table 6.1)</b></p>	City Wide	Prevention	19	3	3	3	1	3	3	3
<b>Political:</b> Proposal to change zones may produce disagreement in the Community on what should be done										
<p><b>Problem Statement:</b> In order to best maximize the use of critical facilities at the time of an emergency, a generator should be installed at City Hall.</p> <p><b>Action Item #26:</b> Install power connections to receive a portable generator at City Hall (CIKR/City Government) to protect this critical facility and to insure its functions at the time of an emergency. <b>(MU13) (Table 6.1)</b></p>	City Hall	Emergency Service Protection	19	3	2	3	3	3	2	3
<b>Technical:</b> Size and location as well as mobility must be determined; fuel, support and capabilities with this 100 year old building could be a concern <b>Economic:</b> Budget Constraints										
<p><b>Problem Statement:</b> In order to best maximize the use of critical facilities at the time of an emergency, a generator should be installed at White Mountains Community College.</p> <p><b>Action Item #27:</b> Install a permanent generator at White Mountains Community College (potential shelter/feeding location and Alternative Care Site) to protect this critical facility and to insure its functions at the time of an emergency. <b>(MU13) (Table 6.1)</b></p>	White Mountains Community College	Emergency Service Protection	17	3	3	3	2	2	1	3
<b>Political:</b> Shared expenses would be necessary between the College and the City <b>Legal:</b> The College would have to fully participate in the process from a legal standpoint <b>Economic:</b> Budget Constraints										

Potential Mitigation Action Item	Affected Location	Type of Activity	Total	S	T	A	P	L	E	E
<p><b>Problem Statement:</b> In order to best maximize the use of critical facilities at the time of an emergency, a generator should be installed at Berlin High School.</p> <p><b>Action Item #28:</b> Install a permanent generator at Berlin High School (primary shelter and possible Alternative Care Site) to protect this critical facility and to insure its functions at the time of an emergency. (MU13) (Table 6.1)</p>	Berlin High School	Emergency Service Protection	19	3	3	3	3	3	1	3
<b>Economic:</b> Budget Constraints										
<p><b>Problem Statement:</b> In order to best maximize the use of critical facilities at the time of an emergency, a generator should be installed at Brown Elementary School.</p> <p><b>Action Item #29:</b> Install a permanent generator at Brown Elementary School (potential shelter) to protect this critical facility and to insure its functions at the time of an emergency. (MU13) (Table 6.1)</p>	Brown Elementary School	Emergency Service Protection	18	3	2	3	3	3	1	3
<b>Technical:</b> Location of the generator would have to be determined and may be difficult to find; may need to have a mobile unit <b>Economic:</b> Budget Constraints										
<p><b>Problem Statement:</b> In order to best maximize the use of critical facilities at the time of an emergency, a generator should be installed at Berlin Middle School.</p> <p><b>Action Item #30:</b> Install a permanent generator at Berlin Middle School (potential shelter) to protect this critical facility and to insure its functions at the time of an emergency. (MU13) (Table 6.1)</p>	Berlin Middle School	Emergency Service Protection	19	3	3	3	3	3	1	3
<b>Economic:</b> Budget Constraints										
<p><b>Problem Statement:</b> In order to best maximize the use of critical facilities at the time of an emergency, a generator should be installed at Hillside Elementary.</p> <p><b>Action Item #31:</b> Install a permanent generator at Hillside Elementary (potential shelter) to protect this critical facility and to insure its functions at the time of an emergency. (MU13) (Table 6.1)</p>	Hillside Elementary	Emergency Service Protection	19	3	3	3	3	3	1	3
<b>Economic:</b> Budget Constraints										
<p><b>Problem Statement:</b> The Berlin Emergency Operations Plan was updated in 2013 and will not be scheduled for another update until 2018; deferred to this Plan for that update.</p> <p><b>Action Item #32:</b> Update the Berlin Emergency Operations Plan to align with the current State Emergency Operations Plan. (Table 6.1)</p>	City Wide	Emergency Service Protection	21	3	3	3	3	3	3	3
<b>No significant issues with this strategy</b>										

Potential Mitigation Action Item	Affected Location	Type of Activity	Total	S	T	A	P	L	E	E
<p><b>Problem Statement:</b> The Berlin Master Plan was created in 2010 and will need a recommended 10-year update in 2020; deferred to this Plan to update the Master Plan and to include a Natural Hazards section.</p> <p><b>Action Item #33:</b> Update the Berlin Master Plan and include a Natural Hazards section. <b>(MU6) (Table 6.1)</b></p>	City Wide	Prevention	21	3	3	3	3	3	3	3
No significant issues with this strategy										
<p><b>Problem Statement:</b> Dead River flooding still exists although some progress has been made; deferred to continue to improve the drainage systems in the area of Moxie Alley between Pleasant and Main Street to mitigate flooding.</p> <p><b>Action Item #34:</b> Improve the drainage systems in the area of Moxie Alley between Pleasant and Main Street to mitigate flooding and to improve storm water flow. <b>(F5) (Table 7.1)</b></p>	Moxie Alley	Property Protection	11	3	1	2	2	1	1	1
<p><b>Technical:</b> Engineering studies will need to be done  <b>Administrative:</b> This will require a lot of people to make this happen  <b>Political:</b> People who do not live in this area may not understand the need  <b>Legal:</b> Work will require legal acceptance by the property owners in the area  <b>Economic:</b> Budget Constraints  <b>Environmental:</b> Will need permits from several state agencies and the Army Corp of Engineers to make this strategy a reality</p>										

## Chapter 9: Implementation Schedule for Prioritized Action Items

### A. Priority Methodology

After reviewing the finalized STAPLEE numerical ratings, the Team prepared to develop *Table 9.1, The Mitigation Action Plan*. To do this, team members created four categories into which they would place the potential mitigation action items.

- **Category 0** was to include those items which are being done and will continue to be done in the future.
- **Category 1** was to include those items under the direct control of city officials, within the financial capability of the City using only city funding, those already being done or planned or those that could generally be completed within one year (0 – 12 months).
- **Category 2** was to include those items that the City did not have sole authority to act upon, those for which funding might be beyond the City's capability or those that would generally take between two to three years to complete (13 – 36 months).
- **Category 3** was to include those items that would take a major funding effort, those that the City had little control over the final decision or those that would take four to five years to complete (37 – 60 months).

Each potential mitigation action item was placed in one of these four categories and then those action items were prioritized within each category according to cost-benefit, time frame and capability. Actual cost estimates were unavailable during the planning process, although using the STAPLEE process along with the methodology detailed above and a Low-High estimate (see following page) the Team was able to come up with a general consensus on cost-benefit for each proposed action item.

The Team also considered the following criteria while ranking and prioritizing each action item:

- Does the action reduce damage?
- Does the action contribute to community objectives?
- Does the action meet existing regulations?
- Does the action protect historic structures?
- Does the action keep in mind future development?
- Can the action be implemented quickly?

The prioritization exercise helped the committee seriously evaluate the new hazard mitigation action items that they had brainstormed throughout the hazard mitigation planning process. While all actions would help improve the City's hazard and wildfire responsiveness capability, funding availability will be a driving factor in determining what and when new mitigation action items are implemented.

## B. Who, When, How?

Once this was completed, the Team developed an action plan that outlined who is responsible for implementing each action item, as well as when and how the actions will be implemented. The following questions were asked in order to develop a schedule for the identified mitigation action items.

**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?

In addition to the prioritized mitigation action items, *Table 9.1, The Mitigation Action Plan*, includes the responsible party (WHO), how the project will be supported (HOW) and what the time frame is for implementation of the project (WHEN).

Once the Plan is approved, the Community will begin working on the action items listed in *Table 9.1, The Mitigation Action Plan* (see below). An estimation of completion for each action item is noted in the "Time Frame" column of Table 9.1.

Some projects, including most training and education of residents on emergency and evacuation procedures, could be tied into the emergency operation plan and implemented through that planning effort.

### TABLE 9.1: THE MITIGATION ACTION PLAN

*Table 9.1, The Mitigation Action Plan*, located on the next page, includes Problem Statements that were expressed by the Planning Team. These action items are listed in order of priority and indicate if they were derived from prior tables in this Plan.

The estimated cost was determined using the following criteria:

- **Low** (\$0 - \$1,000 or staff time only)
- **Medium** (\$1,000 - \$10,000)
- **High** (\$10,000 or more)

The time frame was determined using the following criteria:

- **Short Term**, ongoing for the life of the Plan
- **Short Term**, 1 year (0-12 months)
- **Medium Term**, 1-3 years (13-36 months)
- **Long Term**, 4-5 years (37-60 months)



Items in green such as (MU14) represent mitigation action items taken from **Mitigation Ideas, A Resource for Reducing Risk to Natural Hazards**, FEMA, January 2013; see *Appendix E: Potential Mitigation Ideas*, for more information



Mitigation Action Items are listed in order of priority.

Final Priority	Problem Statement Mitigation Action Item	Hazard Addressed	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
0-1	<p><b>Problem Statement:</b> Although police officers, EMTs and firefighters have received NIMS &amp; ICS trainings, not all of Berlin's city officials have.</p> <p><b>Action Item #2:</b> The Emergency Management Director will encourage all City officials and new hires who are integral to emergency response to take NIMS 700 and ICS 100 and 200. (Tables 6.1 &amp; 7.1)</p>	All Hazards	Emergency Management Director & Department Managers	Local	<b>Short Term</b> Ongoing for the life of the Plan	<b>Low Cost</b> <\$1,000	21
0-2	<p><b>Problem Statement:</b> Full compliance for 911 signage has not been met; this is problematic for emergency responders when attempting to locate homes during emergency situations.</p> <p><b>Action Item #1:</b> Consider ways to improve standard 911 signage compliance so that emergency responders can better assist the public at the time of need; perhaps through public outreach. (Table 7.1)</p>	All Hazards	Code Enforcement Officer & Fire Department	Local	<b>Short Term</b> Ongoing for the life of the Plan	<b>Low Cost</b> <\$1,000	20
0-3	<p><b>Problem Statement:</b> Although the City has established a Geographic Information System (GIS), this system needs further development, improvements and integration into all City departments to insure its best use for monitoring, understanding and mitigating natural hazards.</p> <p><b>Action Item #9:</b> Continue to develop, improve and update the GIS mapping of the floodplain (available from Granit) and the City's utilities and water systems as well as other hazards that affect the Community. (F7, WF1, EQ3, ER1, LS1, SW3, &amp; MU2 ) (Tables 6.1 &amp; 7.1)</p>	Flooding, Wildfires, Earthquake, Erosion, Landslide, Severe Wind & All Hazards	Community Development Director	Local	<b>Short Term</b> Ongoing for the life of the Plan	<b>High Cost</b> >\$10,000	20

Final Priority	Problem Statement Mitigation Action Item	Hazard Addressed	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
0-4	<p><b>Problem Statement:</b> <i>Some public education has been provided to advise the public, landlords and renters on incompatible materials in the water and sewer system but more can be done.</i></p> <p><b>Action Item #8:</b> Continue public education on incompatible materials in the water and sewer system including items such as, but not limited to wipes, drugs, oils, fats/grease and other materials that could be flushed into toilets or dumped into floor drains. <b>(Table 7.1)</b></p>	Hazardous Materials Fixed & Flooding	Public Works	Local	<b>Short Term</b> Ongoing for the life of the Plan	<b>Low Cost</b> <\$1,000	20
0-5	<p><b>Problem Statement:</b> <i>NCRC&amp;D prepared a Rural Fire Water Resource Plan with recommendations for the installation of water resources (i.e., dry hydrants, fire ponds, cisterns); maintenance needs to continue on all of the City's water resources</i></p> <p><b>Action Item #10:</b> Routinely inspect the functionality of fire hydrants and continue the maintenance of all hydrants and other water resources in Berlin. <b>(WF8)</b></p>	Wildfire & Urban Fire	Water works & Fire Department	Local	<b>Short Term</b> Ongoing for the life of the Plan	<b>Medium Cost</b> \$1,000 to \$10,000	21
0-6	<p><b>Problem Statement:</b> <i>Although the current Tree Maintenance Program is good, this is deferred to this Plan to continue these efforts into the future.</i></p> <p><b>Action Item #24:</b> Continue tree maintenance program to protect structures, utilities and roads from damage due to high winds, fallen trees and downed power lines. <b>(SW4) (Table 6.1)</b></p>	Severe Wind	Berlin Public Works (BPW)	Local	<b>Short Term</b> Ongoing for the life of the Plan	Low Cost <\$1,000	21
0-7	<p><b>Problem Statement:</b> <i>Public education on the current warning systems has not been done.</i></p> <p><b>Action Item #7:</b> Provide public education on current warning systems via several means including but not limited to local radio, community meetings, Public Access TV, newspapers, the website and social media pages <b>(MU14) (Table 7.1)</b></p>	All Hazards	Emergency Management Director	local	<b>Short Term</b> Ongoing for the life of the Plan	<b>Low Cost</b> <\$1,000	21

Final Priority	Problem Statement Mitigation Action Item	Hazard Addressed	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
0-8	<p><b>Problem Statement:</b> Although some in-house collapsed building training has been done at the Fire Department, additional training should be done with the Police Department, EMS and Public Works.</p> <p><b>Action Item #3:</b> Extend collapsed building training to include all new Firefighters and to Police Officers, EMTs and Public Works staff. <b>(Table 7.1)</b></p>	Wildfire & Urban Fire	Fire Department, Police, Code Enforcement, EMS, Public Works	Local	<b>Short Term</b> Ongoing for the life of the Plan	<b>High Cost</b> >\$10,000	21
0-9	<p><b>Problem Statement:</b> Although some in-house hazardous materials training has been done at the Fire Department and the Police Department, additional training should be done with EMS and Public Works.</p> <p><b>Action Item #4:</b> Extend hazardous materials training to include all new Firefighters, Police Officers and to EMTs and Public Works staff. <b>(Table 7.1)</b></p>	Hazardous Materials Transport & Fixed	Fire Department, Police, Code Enforcement, EMS, Public Works	Local	<b>Short Term</b> Ongoing for the life of the Plan	<b>High Cost</b> >\$10,000	21
0-10	<p><b>Problem Statement:</b> Although some water rescue training has been done at the Fire Department, additional training should be done with the Police Department and EMS.</p> <p><b>Action Item #5:</b> Extend water rescue training to include all new Firefighters and to Police Officers and EMTs. <b>(Table 7.1)</b></p>	Flooding	Fire Department, Police, Code Enforcement, EMS	Local	<b>Short Term</b> Ongoing for the life of the Plan	<b>High Cost</b> >\$10,000	21
0-11	<p><b>Problem Statement:</b> Although some heavy equipment rescue training has been done at the Fire Department, additional training should be done with the Police Department, Public Works and EMS.</p> <p><b>Action Item #6:</b> Extend heavy equipment rescue training to include all new Firefighters and to Police Officers, Public Works and EMTs. <b>(Table 7.1)</b></p>	Wildfire & Urban Fire	Fire Department, Police, Code Enforcement, EMS, Public Works	Local	<b>Short Term</b> Ongoing for the life of the Plan	<b>High Cost</b> >\$10,000	21

Final Priority	Problem Statement Mitigation Action Item	Hazard Addressed	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
0-12	<p><i><b>Problem Statement:</b> Information on lightning safety has been distributed however additional public outreach should be done.</i></p> <p><b>Action Item #11:</b> Increase public outreach regarding the dangers of lightning by including links and other lightning information on the City's website and/or the Emergency Management Facebook page. (L2)</p>	Lightning	City Manager & Community Development Director & Emergency Management Director	Local	<b>Short Term</b> Ongoing for the life of the Plan	<b>Medium Cost</b> \$1,000 to \$10,000	20
0-13	<p><i><b>Problem Statement:</b> Residents are not aware of emergency procedures or preventative techniques that can be done to protect their lives and property; it is sometimes difficult to convey these messages and to provide Public Outreach via mail or personal contact.</i></p> <p><b>Action Item #12:</b> Establish an webpage for educating the public on hazard mitigation and preparedness measures (MU14) by adding to the City's Emergency Management Services a webpage that will include such information as emergency contacts, shelter locations, evacuation routes (SW7, WF11 &amp; T3), methods of emergency alerting, 911 compliance, water saving techniques (D9), earthquake risk and mitigation activities that can be taken in residents' homes (EQ7), steps homeowners can take to protect themselves and their properties when extreme temperatures occur (ET1 &amp; ET4), safety measures that can be taken during hail (HA3), high winds (SW7) and lightning storms (L2), mitigation techniques for property protection and links to available sources; educate homeowners regarding the risks of building in hazard zones and encourage homeowners to install carbon monoxide monitors and alarms (WW5).</p>	All Hazards including: Severe Wind, Drought, Earthquake, Extreme Temperatures, Hail, High Winds, Lightning, Severe Winter Weather, Tornado & Wildfire	City Manager, Community Development Director & Emergency Management Director	Local	<b>Short Term</b> Ongoing for the life of the Plan	<b>Medium Cost</b> \$1,000 to \$10,000	21

Final Priority	Problem Statement Mitigation Action Item	Hazard Addressed	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
1-1	<p><b>Problem Statement:</b> <i>In order to best maximize the use of critical facilities at the time of an emergency, a generator should be installed at Berlin High School.</i></p> <p><b>Action Item #28:</b> Install a permanent generator at Berlin High School (primary shelter and possible Alternative Care Site) to protect this critical facility and to insure its functions at the time of an emergency. <b>(MU13) (Table 6.1)</b></p>	All Hazards	Emergency Management Director	Local & Grants	<b>Short Term</b> 1 year or less	High Cost >\$10,000	19
1-2	<p><b>Problem Statement:</b> <i>The City of Berlin has not yet developed a comprehensive drainage system study for the entire community.</i></p> <p><b>Action Item #17:</b> Develop a written storm water operation and maintenance plan in order to insure more efficient storm water management; create a manual for the storm water collection system and integrate it with the City's GIS system; establish a culvert replacement schedule. <b>(F5) (Table 7.1)</b></p>	Flooding	Berlin Public Works (BPW)	Local	<b>Short Term</b> 1 year or less	<b>Medium Cost</b> \$1,000 to \$10,000	20
1-3	<p><b>Problem Statement:</b> <i>Although a siren can be heard in the more populated areas of Berlin, there is no actual warning system based on code blasts.</i></p> <p><b>Action Item #19:</b> Establish a system of coded siren "blasts" that will better notify citizens of impending hazards; educate the public on the "blast" system. <b>(MU14) (Table 7.1)</b></p>	All Hazards	Emergency Management Director & Fire Department	Local	<b>Short Term</b> 1 year or less	<b>Low Cost</b> <\$1,000	21

Final Priority	Problem Statement Mitigation Action Item	Hazard Addressed	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
1-4	<p><i><b>Problem Statement:</b> The City has not yet devised a method of tracking the functional needs population to determine what types of response would be necessary at the time of an emergency.</i></p> <p><b>Action Item #16:</b> Investigate legalities and methods used by other communities to create a database to track those individuals at high risk of death, such as the elderly, homeless, etc.; perhaps by developing a survey of the functional needs population and a method of maintaining the data. (ET3 &amp; WW6) (Table 7.1)</p>	Extreme Temperatures, Severe Winter Weather & All Hazards	City Manager	Local	<u>Short Term</u> 1 year or less	<u>Medium Cost</u> \$1,000 to \$10,000	18
1-5	<p><i><b>Problem Statement:</b> Residents may not be aware of the steps they can take to reduce the risk of fire at their homes.</i></p> <p><b>Action Item #13:</b> Obtain and have available "Firewise" brochures to educate homeowners on methods to reduce fire risk around their homes (WF10); provide "Firewise" brochures to those residents seeking burn permits; advise residents of the importance of maintaining defensible space, the safe disposal of yard and household waste and the removal of dead or dry leaves, needles, twigs, and combustible materials from roofs, decks, eaves, porches and yards. (WF12)</p>	Wildfire & Urban Fire	Fire Department	Local	<u>Short Term</u> 1 year or less	<u>Low Cost</u> <\$1,000	21

Final Priority	Problem Statement Mitigation Action Item	Hazard Addressed	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
1-6	<p><b>Problem Statement:</b> Residents and Builders may not be aware of flood regulations &amp; the availability of flood insurance through the NFIP.</p> <p><b>Action Item #14:</b> Advise the public about the local flood hazard, flood insurance and flood protection measures (F10) by obtaining and keeping on hand a supply of NFIP brochures to have available in the City Offices; give NFIP materials to homeowners and builders when proposing new development or substantial improvements; encourage property owners to purchase flood insurance (F22), whether or not they are in the flood zone and provide appropriate links to the NFIP and Ready.gov on the Emergency Management Services webpage.</p>	Flooding	Community Development Director	Local	<b>Short Term</b> 1 year or less	<b>Low Cost</b> <\$1,000	21
1-7	<p><b>Problem Statement:</b> Residents may not be aware of the risk of building in the floodplain and the steps they can take to reduce flooding.</p> <p><b>Action Item #15:</b> Through Public Outreach and the City's website, educate homeowners regarding the risks of building in flood zone and measures that can be taken to reduce the chance of flooding, such as securing debris, propane tanks, yard items or stored objects that may otherwise be swept away, damaged, or pose a hazard if picked up and washed away by floodwaters; add links and info to website. (F23)</p>	Flooding	Community Development Director	Local	<b>Short Term</b> 1 year or less	<b>Low Cost</b> <\$1,000	21
1-8	<p><b>Problem Statement:</b> In order to best maximize the use of critical facilities at the time of an emergency, a generator should be installed at Brown Elementary School.</p> <p><b>Action Item #29:</b> Install a permanent generator at Brown Elementary School (potential shelter) to protect this critical facility and to insure its functions at the time of an emergency. (MU13) (Table 6.1)</p>	All Hazards	Emergency Management Director	Local & Grants	<b>Short Term</b> 1 year or less	High Cost >\$10,000	18



Final Priority	Problem Statement Mitigation Action Item	Hazard Addressed	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
2-1	<p><b>Problem Statement:</b> <i>Although some reverse 911 capabilities have been established in the City, public education on these systems and the development of CodeRED would enhance these capabilities.</i></p> <p><b>Action Item #21:</b> Obtain funding to establish CodeRED and provide public outreach to encourage all residents to contact CodeRED to add cell numbers, unlisted numbers and to verify information; use the website, a possible brochure or a sign up at City Hall. <b>(MU14) (Table 7.1)</b></p>	All Hazards	Emergency Management Director	Local	<b>Medium Term</b> 1-3 years	<b>Medium Cost</b> \$1,000 to \$10,000	19
2-2	<p><b>Problem Statement:</b> <i>The salt and sand de-icing facility is in need of an update.</i></p> <p><b>Action Item #18:</b> Obtain funding to update and improve the salt and de-icing facility so that it can better serve the community during severe winter storm events. <b>(WW4) (Table 7.1)</b></p>	Severe Winter Weather	Berlin Public Works (BPW)	Local	<b>Medium Term</b> 1-3 years	<b>High Cost</b> >\$10,000	19
2-3	<p><b>Problem Statement:</b> <i>In order to best maximize the use of critical facilities at the time of an emergency, a generator should be installed at White Mountains Community College.</i></p> <p><b>Action Item #27:</b> Install a permanent generator at White Mountains Community College (potential shelter/feeding location and Alternative Care Site) to protect this critical facility and to insure its functions at the time of an emergency. <b>(MU13) (Table 6.1)</b></p>	All Hazards	Emergency Management	Local & Grants	<b>Medium Term</b> 1-3 years	High Cost >\$10,000	17
2-4	<p><b>Problem Statement:</b> <i>The City monitors water levels at Godfrey Dam but at the current time does not have visual and data-trending capabilities.</i></p> <p><b>Action Item #20:</b> Re-establish visual and data-trending capabilities at Godfrey Dam to better monitor and understand flooding potential. <b>(Table 7.1)</b></p>	Flooding	Berlin Waterworks (BWW)	Local & Grants	<b>Medium Term</b> 1-3 years	<b>High Cost</b> >\$10,000	20

Final Priority	Problem Statement Mitigation Action Item	Hazard Addressed	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
2-5	<p><b>Problem Statement:</b> <i>In order to best maximize the use of critical facilities at the time of an emergency, a generator should be installed at Hillside Elementary.</i></p> <p><b>Action Item #31:</b> Install a permanent generator at Hillside Elementary (potential shelter) to protect this critical facility and to insure its functions at the time of an emergency. <b>(MU13) (Table 6.1)</b></p>	All Hazards	Emergency Management Director	Local & Grants	<b>Medium Term</b> 1-3 years	High Cost >\$10,000	19
2-6	<p><b>Problem Statement:</b> <i>The City is in need of a new, better equipped and up-to-date Police Station; the current Station is too small, has limited document storage and impound space and the building is old; the Fire Station and EMS also need improvements, including structural improvements in the near future.</i></p> <p><b>Action Item #22:</b> Obtain funding to improve this Critical Facility with a new and improved Public Safety Building (Fire, Police &amp; EMS). (CIKR) <b>(MU13). (Table 7.1)</b></p>	All Hazards	City Manager & Police Department	Local & Grants	<b>Medium Term</b> 1-3 years	<b>High Cost</b> >\$10,000	16
2-7	<p><b>Problem Statement:</b> <i>Berlin's Zoning Ordinances are reviewed and updated annually or when there is a need; the Zoning Ordinances could use a major update and re-write so that interpretation of the Ordinance is clearer and to align the Ordinance with the Master Plan and with possible hazardous events.</i></p> <p><b>Action Item #25:</b> Review and update the City's Zoning Ordinances; consider possible hazardous events and align Ordinance with the Master Plan. <b>(MU6) (Table 6.1)</b></p>	All Hazards	Planning Board	Local	<b>Medium Term</b> 1-3 years	Low Cost <\$1,000	19

Final Priority	Problem Statement Mitigation Action Item	Hazard Addressed	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
2-8	<p><b>Problem Statement:</b> Although the Berlin Subdivision Regulations have been in place since 1998, only minor changes have been made; deferred to this Plan to review and update the Subdivision Regulations to insure their effectiveness against natural or human-caused hazards and to align them with state regulations.</p> <p><b>Action Item #23:</b> Review and update the Subdivision Regulations to insure their effectiveness against natural hazards for future planning. (WF2, MU3) (Table 6.1)</p>	Wildfire & Urban Fire & All Hazards	Planning Board	Local	<u>Medium Term</u> 1-3 years	<u>Low Cost</u> <\$1,000	21
3-1	<p><b>Problem Statement:</b> The Berlin Emergency Operations Plan was updated in 2013 and will not be scheduled for another update until 2018; deferred to this Plan for that update.</p> <p><b>Action Item #32:</b> Update the Berlin Emergency Operations Plan to align with the current State Emergency Operations Plan. (Table 6.1)</p>	All Hazards	Emergency Management Director	Local & Grants	<u>Long Term</u> 4-5 years	<u>Low Cost</u> <\$1,000	21
3-2	<p><b>Problem Statement:</b> In order to best maximize the use of critical facilities at the time of an emergency, a generator should be installed at Berlin Middle School.</p> <p><b>Action Item #30:</b> Install a permanent generator at Berlin Middle School (potential shelter) to protect this critical facility and to insure its functions at the time of an emergency. (MU13) (Table 6.1)</p>	All Hazards	Emergency Management Director	Local & Grants	<u>Long Term</u> 4-5 years	High Cost >\$10,000	19

Final Priority	Problem Statement Mitigation Action Item	Hazard Addressed	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
3-3	<p><b>Problem Statement:</b> The Berlin Master Plan was created in 2010 and will need a recommended 10-year update in 2020; deferred to this Plan to update the Master Plan and to include a Natural Hazards section.</p> <p><b>Action Item #33:</b> Update the Berlin Master Plan and include a Natural Hazards section. <b>(MU6) (Table 6.1)</b></p>	All Hazards	Planning Board & City Council	Local	<u>Long Term</u> 4-5 years	<u>High Cost</u> >\$10,000	21
3-4	<p><b>Problem Statement:</b> In order to best maximize the use of critical facilities at the time of an emergency, a generator should be installed at City Hall.</p> <p><b>Action Item #26:</b> Install power connections to receive a portable generator at City Hall (CIKR/City Government) to protect this critical facility and to insure its functions at the time of an emergency. <b>(MU13) (Table 6.1)</b></p>	All Hazards	Emergency Management	Local & Grants	<u>Long Term</u> 4-5 years	High Cost >\$10,000	19
3-5	<p><b>Problem Statement:</b> Dead River flooding still exists although some progress has been made; deferred to continue to improve the drainage systems in the area of Moxie Alley between Pleasant and Main Street to mitigate the flooding and erosion of some Main Street buildings.</p> <p><b>Action Item #34:</b> Improve the drainage systems in the area of Moxie Alley between Pleasant and Main Street to mitigate flooding and to improve storm water flow; study the possibility of a channeling project on the Dead River to eliminate the flooding and erosion that exists and causes damage to some Main Street buildings. <b>(F5) (Table 7.1)</b></p>	Flooding	City Council & Property Owners in the area; Army Corp of Engineers	Local & Grants	<u>Long Term</u> 4-5 years	<u>High Cost</u> >\$10,000	11

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## Chapter 10: Adopting, Monitoring, Evaluating and Updating the Plan

### ***A. Hazard Mitigation Plan Monitoring, Evaluation and Updates***

A good mitigation plan must allow for updates where and when necessary, particularly since communities may suffer budget cuts or experience personnel turnover during both the planning and implementation stages. A good plan will incorporate periodic monitoring and evaluation mechanisms to allow for review of successes and failures or even just simple updates. The Emergency Management Director is responsible for initiating Plan reviews and will consult with members of the hazard mitigation planning team identified in this Plan.

The Berlin Hazard Mitigation Plan Update 2016 is considered a work in progress. There are three situations which will prompt revisiting this Plan:

- First, as a minimum, it will be reviewed annually or after any emergency event to assess whether the existing and suggested mitigation action items were successful. This review will focus on the assessment of the Plan's effectiveness, accuracy and completeness in monitoring of the implementation action item. The review will also address recommended improvements to the Plan as contained in the FEMA plan review checklist and address any weaknesses the City identified that the Plan did not adequately address.
- Second, the Plan will be thoroughly updated every five years.
- Third, if the City adopts any major modifications to its land use planning documents, the jurisdiction will conduct a Plan review and make changes as applicable.

In keeping with the process of adopting this hazard mitigation plan, the public and stakeholders will have the opportunity for future involvement as they will be invited to participate in any and all future reviews or updates of this Plan. Public notice before any review or update will be given by such means as: press releases in local papers, posting meeting information on the City website and at City Hall, sending letters to federal, state and local organizations impacted by the Plan and posting notices in public places in the City. This will ensure that all comments and revisions from the public and stakeholders will be considered. The Emergency Management Director insures that these actions will be done.

Concurrence forms to be used for post-hazard or annual reviews are available in Chapter 11 of this Plan. The City is encouraged to use these forms to document any changes and accomplishments since the development of this Plan. Forms are available for years 1-4, with expectation that the five-year annual update will be in process during the fifth year.

### ***B. Integration with Other Plans***

This Plan will only enhance mitigation if balanced with all other City plans. Berlin completed its last hazard mitigation plan in 2010 and has completed some of projects from that Plan. The City was able to integrate these actions into other city activities, plans and mechanisms. Several examples of this integration can be seen in Table 7.1 including the inclusion of Dead River flooding mitigation (although this is continued to this Plan), some GIS mapping and the establishment of a reverse 911 calling system. Berlin will continue to take the necessary steps to incorporate the mitigation action items and other information contained in this Plan with other city activities, plans and mechanisms, when appropriate. The City will incorporate elements from this Plan into the following documents:

**Berlin Master Plan:**

Traditionally, Master Plans are updated every 5 to 10 years and detail the use of capital reserves funds and capital improvements within the City. Berlin's Master Plan was created in 2010 and will need a recommended update in 2020. Updating the Master Plan was discussed during meetings with the Hazard Mitigation Planning Team and it was suggested that an update be done in 2020. Future updates of the Master Plan will integrate concepts and ideas from this Hazard Mitigation Plan. **(Action Item #33)**

**Berlin Emergency Operations Plan 2013 (EOP):**

The EOP is designed to allow the City to respond more effectively to disasters as well as mitigate the risk to people and property; EOPs are generally reviewed after each hazardous event and updated on a five-year basis. The Berlin EOP is currently up-to-date, but will need an update again in 2018. The new EOP will include elements from this hazard mitigation plan. **(Action Item #32)**

**Capital Improvement Plan & Capital Reserve Funds:**

The City of Berlin has a Capital Improvement Plan and it is an excellent guiding document. The CIP is updated and worked on annually; Capital Reserve Funds also assist City departments with long-term planning.

**Ordinances & Subdivision Regulations:**

As time goes by and the needs of the City change, these ordinances will be reviewed and updated. In coordination with these actions, the Planning Board will review this Hazard Mitigation Plan and the Rural Water Fire Resource Plan and incorporate any changes that help mitigate the susceptibility of the Community and its citizens to the dangers of natural or human-caused disasters. The Ordinances are reviewed annually; however a major re-write would make the ordinances clearer and more aligned with the Master Plan. An example of this integration can be seen in this Plan's mitigation action items. **(Action Items #23 & 25)**

The local governments will modify other plans and actions as necessary to incorporate hazard and/or wildfire issues; the City Council ensures this process will be followed in the future. In addition, the City will review and make note of instances when this has been done and include it as part of their annual review of the Plan.



**Partially Completed & Deferred:** Dead River flooding still exists although some progress has been made; deferred to continue to improve the drainage systems in the area of Moxie Alley between Pleasant and Main Street to mitigate flooding. **Action Item #34**

### ***C. Plan Approval & Adoption***

The Plan was presented to the This Plan was completed in a series of open meetings beginning on April 8, 2015. The Plan was presented to the City for review, submitted to FEMA for Conditional Approval (*APA, Approved Pending Adoption*), formally adopted by the City Council and resubmitted to FEMA for Final Approval. Once Final Approval from FEMA was met, copies of the Plan were distributed to the City, HESM, FEMA, DRED and the USDA-FS; the Plan was then distributed as these entities saw fit. Copies of the Plan remain on file at Mapping and Planning Solutions (MAPS) in both digital and paper format.

Adoption by the local governing body demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in the Plan. Adoption legitimizes the Plan and authorizes responsible agencies to execute their responsibilities. The Plan shall include documentation of the resolution adopting the Plan as per requirement §201.6(c)(5).

*(Note: for the purposes of clarity, the above paragraph was written in future tense, noting that these actions have not yet transpired – this box will be deleted when final hard copy is distributed)*



***Berlin Fire Station***

***Photo Credit: [https://commons.wikimedia.org/wiki/File:Berlin\\_NH\\_Fire\\_Station.JPG](https://commons.wikimedia.org/wiki/File:Berlin_NH_Fire_Station.JPG)***

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## Chapter 11: Signed Community Documents and Approval Letters

### A. Planning Scope of Work & Agreement

#### PLANNING SCOPE OF WORK & AGREEMENT

#### HAZARD MITIGATION PLAN



#### PARTIES TO THE AGREEMENT

Mapping and Planning Solutions  
City of Berlin, NH

Current Plan Expiration: August 16, 2015  
PDM13 Grant Expiration: January 9, 2016

This Agreement between the City of Berlin (the City) or its official designee and Mapping and Planning Solutions (MAPS) outlines the City's desire to engage the services of MAPS to assist in planning and technical services in order to produce the 2015 Hazard Mitigation Plan Update (the Plan).

#### Agreement

This Agreement outlines the responsibilities that will ensure that the Plan is developed in a manner that involves city members and local, federal and state emergency responders and organizations. The Agreement identifies the work to be done by detailing the specific tasks, schedules and finished products that are the result of the planning process.

The goal of this Agreement is that the Plan and planning process be consistent with city policies and that it accurately reflects the values and individuality of the City. This is accomplished by forming a working relationship between the City's citizens, the Planning Team and MAPS.

The Plan created as a result of this Agreement will be presented to the City for adoption once conditional approval is received from FEMA. When adopted, the Plan provides guidance to the City, commissions, and departments; adopted plans serve as a guide and do not include any financial commitments by the City. Additionally, all adopted plans should address mitigation strategies for reducing the risk of natural, man-made, and wildfire disasters on life and property and written so that they may be integrated within other City planning initiatives.

#### Scope of Work

#### MAPS - Responsibilities include, but are not limited to, the following:

- MAPS will collect data that is necessary to complete the Plan and meet the requirements of the FEMA Plan Review Tool by working with the Planning Team (the Team) and taking public input from community members.
- With the assistance of the Team, MAPS will coordinate and facilitate meetings and provide any materials, handouts and maps necessary to provide a full understanding of each step in the planning process.
- MAPS will assist the Team in the development of goals, objectives and implementation strategies and clearly define the processes needed for future plan monitoring, educating the public and integrating the Plan with other City plans and activities.
- MAPS will coordinate and collaborate with other federal, state and local agencies throughout the process.
- MAPS will explain and delineate the City's Wildland Urban Interface (WUI) and working with the Team, will establish a list of potential hazards and analyze the risk severity of each.

- MAPS will author, edit and prepare the Plan for review by the Team prior to submitting the Plan to FEMA for conditional approval. Upon conditional approval by FEMA, MAPS will assist the planning team as needed with presentation of the Plan to the City Council and/or Planning Board and continue to work with the City until final approval and distribution of the Plan is complete, unless extraordinary circumstances prevail.
- MAPS shall provide, at its office, all supplies and space necessary to complete the Berlin Hazard Mitigation Plan.
- After final approval is received from FEMA, MAPS will provide the City with a two copies of the Plan containing all signed documents, approvals and GIS maps along with CDs containing these same documents in digital form, for distribution by the City as it sees fit. Additional CDs may be requested at no additional cost. Copies of the Plan will be distributed by MAPS to collaborating agencies including, but not limited to, NH Homeland Security (HSEM) and FEMA.
- MAPS will provide Plan maintenance reminders and assistance on an annual basis leading up to the next five-year plan update at no cost to the City, if requested by the City.

**The City - Responsibilities include but are not limited to the following:**

- The City shall insure that the Planning Team includes members who are able to support the planning process by identifying available City resources including people who will have access to and can provide pertinent data. The planning team should include, but not be limited to, such City members as the local Emergency Management Director, the Fire and Police Chiefs, representatives from the relative federal and state organizations, other local officials, property owners, and relevant businesses or organizations.
- The City shall determine a lead contact to work with Mapping and Planning Solutions. This contact shall assist with recruiting participants for planning meetings, including the development of mailing lists when and if necessary, distribution of flyers, and placement of meeting announcements. In addition, this contact shall assist Mapping and Planning Solutions with organizing public meetings to develop the Plan and offer assistance to Mapping and Planning Solutions in developing the work program which will produce the Plan.
- The City shall gain the support of stakeholders for the recommendations found within the Plan.
- The City shall provide public access for all meetings and provide public notice at the start of the planning process and at the time of adoption, as required by FEMA.
- The proposed Plan shall be submitted to the City Council and/or Planning Board for consideration and adoption.
- After adoption and final approval from FEMA is received, the City will:
  - *Distribute copies of the Plan as it sees fit throughout the local community.*
  - *Develop a team to monitor and work toward plan implementation.*
  - *Publicize the Plan to the Community and insure citizen awareness.*
  - *Urge the Planning Board to incorporate priority projects into the City's Capital Improvement Plan (if available).*
  - *Integrate mitigation strategies and priorities from the Plan into other City planning documents.*

**Terms**

- **Payment Procedures:** The payment procedure is as follows:
  - MAPS will invoice the City
  - The City will pay MAPS
  - The City will forward the MAPS invoice along with an invoice from the City on letterhead to HSEM
  - HSEM will reimburse the City for the monies paid to MAPS

All payments to MAPS are fully reimbursable to the City by Homeland Security & Emergency Management.

**Fees & Payment Schedule:** The contract price is limited to \$7,500; an invoice will be sent to the City for each payment as outlined below.

- 1. Initial payment upon signing of this contract and receipt of first invoice ..... \$3,650
- 2. Second payment upon Plan submittal to FEMA for Conditional Approval ..... \$3,650
- 3. Final payment upon project completion and receipt of final Plan copy..... \$200
- Total Fees..... \$7,500

- **Required Matching Funds:** The City of Berlin will be responsible to provide and document any and all resources to be used to meet the FEMA required matching funds in the amount of \$2,500. Matching funds are the responsibility of the City of Berlin, not MAPS. Mapping and Planning Solutions will however assist the City with attendance tracking by asking meeting attendees to “sign in” at all meetings and to “log” any time spent outside of the meetings working on this project. MAPS will provide the City with final attendance records in spreadsheet form at project’s end for the City to use in its match fulfillment.
- **Project Period:** This project shall begin upon signing this Agreement by both parties and continue through January 16, 2015 or whenever the planning process is complete. The project period may be extended by mutual written Agreement between the City, MAPS and Homeland Security if required. The actual project end date is dependent upon timely adoptions and approvals which may be outside of the control of MAPS and the City. It is anticipated that five or six two-hour meetings will be required to gather the necessary information to create the updated the Plan.
- **Ownership of Material:** All maps, reports, documents and other materials produced during the project period shall be owned by the City; each party may keep file copies of any generated work. MAPS shall have the right to use work products collected during the planning process; however, MAPS shall not use any data in such a way as to reveal personal or public information about individuals or groups which could reasonably be considered confidential.
- **Termination:** This Agreement may be terminated if both parties agree in writing. In the event of termination, MAPS shall forward all information prepared to date to the City. MAPS shall be entitled to recover its costs for any work that was completed.
- **Limit of Liability:** MAPS agrees to perform all work in a diligent and efficient manner according to the terms of this Agreement. MAPS' responsibilities under this Agreement depend upon the cooperation of the City of Berlin. MAPS and its employees, if any, shall not be liable for opinions rendered, advice, or errors resulting from the quality of data that is supplied. Adoption of the Plan by the City and final approval of the Plan by FEMA, relieve MAPS of content liability. Mapping and Planning Solutions carries annual general liability insurance.
- **Amendments:** Changes, alterations or additions to this Agreement may be made if agreed to in writing between both the City of Berlin and Mapping and Planning Solutions.
- **Contacts:**

**For Mapping & Planning Solutions**

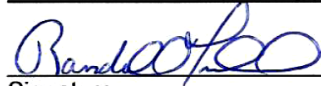
June Garneau  
P.O. Box 283, 91 Cherry Mountain Place  
Twin Mountain, NH 03595  
jgarneau@mappingandplanning.com  
(603) 846-5720; (603) 991-9664 (cell)

**For the City**

Randall Trull, Fire Chief & EMD  
Berlin Fire Department  
263 Main Street  
Berlin, NH 03570  
Fire\_chief@berlinnh.gov  
(603) 752-3135; (603) 723-0079 (cell)

**Signature below indicates acceptance of and Agreement to details outlined in this Agreement**

**FOR THE CITY OF BERLIN, NH**

  
\_\_\_\_\_  
Signature

Randall Trull Fire Chief, EMD  
Printed Name/Title

4/14/2015  
\_\_\_\_\_  
Date

**FOR MAPPING AND PLANNING SOLUTIONS**

  
\_\_\_\_\_  
Signature

June Garneau, Owner  
April 7, 2015

**Signature is a scanned facsimile; original signatures are on file.**

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**B. Conditional Approval Letter from FEMA****Berlin, NH Approvable pending Adoption**

Surette, Melissa &lt;Melissa.Surette@fema.dhs.gov&gt;

- ③ This message has been replied to or forwarded.  
This message was sent with High importance.

Sent: Tue 7/5/2016 2:24 PM

To: jwheeler@berlinnh.org

Cc: Hilliard, Marilyn; Neiderbach, Josiah; Lavallee, Denise; Welch, Whitney; Leigh Cheney (Leigh.Cheney@dos.nh.gov); jgarneau@mappingandplanning.com; NH MIT Plans

Congratulations!

FEMA Region I has completed its review of the Berlin, NH Hazard Mitigation Plan and found it approvable pending adoption. With this approval, the jurisdiction meets the local mitigation planning requirements under 44 CFR 201 **pending FEMA's receipt of electronic copies of the adoption documentation and the final plan.**

These items should be provided to your State's mitigation planning point of contact who will ensure they are forwarded to FEMA. Acceptable electronic formats include Word or PDF files and must be submitted to us via email at [fema-r1-mitigationplans@fema.dhs.gov](mailto:fema-r1-mitigationplans@fema.dhs.gov). Upon FEMA's receipt of these documents, a formal letter of approval will be issued, along with the final FEMA Checklist and Assessment.

The FEMA letter of formal approval will confirm the jurisdiction's eligibility to apply for Mitigation grants administered by FEMA and identify related issues affecting eligibility, if any. If the plan is not adopted within one calendar year of FEMA's Approval Pending Adoption, the jurisdiction must update the entire plan and resubmit it for FEMA review. If you have questions or wish to discuss this determination further, please contact me at [Melissa.Surette@fema.dhs.gov](mailto:Melissa.Surette@fema.dhs.gov) or 617-956-7559.

Thank you for submitting the Berlin, NH Hazard Mitigation Plan and congratulations again on your successful community planning efforts.

Sincerely,

Melissa A. Surette  
Senior Planner, Risk Analysis Branch

FEMA Region I  
99 High Street  
Boston, MA 02110

Email: [Melissa.Surette@fema.dhs.gov](mailto:Melissa.Surette@fema.dhs.gov)  
Office: 617.956.7559  
Cellular: 617.794.0292

*Signature is a scanned facsimile; original signatures are on file*



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***C. Signed Certificate of Adoption***

**CERTIFICATE OF ADOPTION**

**BERLIN, NH**

**CITY COUNCIL**

**A RESOLUTION ADOPTING THE CITY OF BERLIN, HAZARD MITIGATION PLAN UPDATE 2016**

WHEREAS, the City of Berlin has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of those natural hazards profiled in this plan, resulting in loss of property and life, economic hardship and threats to public health and safety; and

WHEREAS, the City of Berlin has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan Update 2016 under the requirements of 44 CFR 201.6; and

WHEREAS, public and committee meetings were held between April 8, 2015 and August 5, 2015 regarding the development and review of the Hazard Mitigation Plan Update 2016 and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the City of Berlin; and

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

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

RESOLVED by the City Council:

1. The Plan is hereby adopted as an official plan of the City of Berlin;
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;

**Berlin, Hazard Mitigation Plan Update Certificate of Adoption, page two**

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;
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the City Council by the Emergency Management Director.

Adopted this day, the \_\_\_\_\_ of \_\_\_\_\_, 2016

**City Manager**  
**(on behalf of the City Council)**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name

**Emergency Management Director**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name

**IN WITNESS WHEREOF**, the undersigned has affixed his/her signature and the corporate seal of the City of Berlin on this day, \_\_\_\_\_, 2016

\_\_\_\_\_  
Notary

\_\_\_\_\_  
Expiration

\_\_\_\_\_  
Date

***Signatures are scanned facsimile; original signatures are on file.***

***D. Final Approval Letter from FEMA***

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INSERTION OF FINAL APPROVAL LETTER FROM  
FEMA WHEN RECEIVED.

PAGE LEFT INTENTIONALLY BLANK FOR  
INSERTION OF FINAL APPROVAL LETTER  
(PAGE 2) FROM FEMA WHEN RECEIVED.

*Signatures are scanned facsimile; original signatures are on file*

***E. CWPP Approval Letter from DRED***

**Berlin, NH  
A Resolution Approving the  
Berlin Hazard Mitigation Plan Update 2016  
As a Community Wildfire Protection Plan**

Several public meetings and committee meetings were held between April 8, 2015 and August 5, 2015 regarding the development and review of the Berlin Hazard Mitigation Plan Update 2016. The Berlin Hazard Mitigation Plan Update 2016 contains potential future projects to mitigate hazard and wildfire damage in the City of Berlin.

The Fire Chief/EMD along with the City Council desire that this Plan and be accepted by the Department of Resources and Economic Development (DRED) as a Community Wildfire Protection Plan, having adhered to the requirements of said Plan.

The City Council and the Berlin Fire Chief/EMD approve the Berlin Hazard Mitigation Plan Update 2016 and understand that with approval by DRED, this Plan will also serve as a Community Wildfire Protection Plan.

**For the City of Berlin**

APPROVED and SIGNED this day, \_\_\_\_\_, 2016.

\_\_\_\_\_  
City Manager (on behalf of the City Council)

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Randall Trull – EMD/Fire Chief

\_\_\_\_\_  
Printed Name

**For the Department of Resources and Economic Development**

APPROVED and SIGNED this day, \_\_\_\_\_, 2016.

\_\_\_\_\_  
Forest Ranger – NH Division of Forest and Lands, DRED

APPROVED and SIGNED this day, \_\_\_\_\_, 2016.

\_\_\_\_\_  
Director – NH Division of Forest and Lands, DRED

***Signature is a scanned facsimile; original signatures are on file***

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## F. Annual Review or Post Hazard Concurrence Forms

### YEAR ONE

Check all that apply

- ☐ Annual Review & Concurrence - **Year One**: \_\_\_\_\_ (Date)
- ☐ Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)
- ☐ Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)

The City of Berlin, NH shall execute this page annually by the members of the City's governing body and the City's designated Emergency Management Director after inviting the public to attend any and all hearings that pertain to this annual and/or post hazard review and/or update by means such as press releases in local papers, posting meeting information on the City website and at City Hall, sending letters to federal, state local organizations impacted by the Plan posting notices in public places in the City.

Berlin, NH  
Hazard Mitigation Plan Update

REVIEWED AND APPROVED

DATE: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

Emergency Management Director

CONCURRENCE OF APPROVAL

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

City Manager (on behalf of the City Council)

Changes and notes regarding the 2016 Hazard Mitigation Plan Update

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**Please use reverse side for additional notes** 

### Additional Notes – Year One:

[illegible]

**YEAR TWO**

Check all that apply

- ☐ Annual Review & Concurrence - **Year Two**: \_\_\_\_\_ (Date)
- ☐ Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)
- ☐ Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)

The City of Berlin, NH shall execute this page annually by the members of the City's governing body and the City's designated Emergency Management Director after inviting the public to attend any and all hearings that pertain to this annual and/or post hazard review and/or update by means such as press releases in local papers, posting meeting information on the City website and at City Hall, sending letters to federal, state local organizations impacted by the Plan posting notices in public places in the City.

Berlin, NH  
Hazard Mitigation Plan Update

REVIEWED AND APPROVED

DATE: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

Emergency Management Director

CONCURRENCE OF APPROVAL

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

City Manager (on behalf of the City Council)

Changes and notes regarding the 2016 Hazard Mitigation Plan Update

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**Please use reverse side for additional notes** 

### Additional Notes – Year Two:

[illegible]

**YEAR THREE**

Check all that apply

- ☐ Annual Review & Concurrence - **Year Three:** \_\_\_\_\_ (Date)
- ☐ Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)
- ☐ Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)

The City of Berlin, NH shall execute this page annually by the members of the City's governing body and the City's designated Emergency Management Director after inviting the public to attend any and all hearings that pertain to this annual and/or post hazard review and/or update by means such as press releases in local papers, posting meeting information on the City website and at City Hall, sending letters to federal, state local organizations impacted by the Plan posting notices in public places in the City.

Berlin, NH  
Hazard Mitigation Plan Update

REVIEWED AND APPROVED

DATE: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

Emergency Management Director

CONCURRENCE OF APPROVAL

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

City Manager (on behalf of the City Council)

Changes and notes regarding the 2016 Hazard Mitigation Plan Update

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**Please use reverse side for additional notes** 

**Additional Notes – Year Three:**

[illegible]

**YEAR FOUR**

Check all that apply

☐ Annual Review & Concurrence - **Year Four**: \_\_\_\_\_ (Date)

☐ Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)

☐ Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)

The City of Berlin, NH shall execute this page annually by the members of the City's governing body and the City's designated Emergency Management Director after inviting the public to attend any and all hearings that pertain to this annual and/or post hazard review and/or update by means such as press releases in local papers, posting meeting information on the City website and at City Hall, sending letters to federal, state local organizations impacted by the Plan posting notices in public places in the City.

Berlin, NH  
Hazard Mitigation Plan Update

REVIEWED AND APPROVED

DATE: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

Emergency Management Director

CONCURRENCE OF APPROVAL

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

City Manager (on behalf of the City Council)

Changes and notes regarding the 2016 Hazard Mitigation Plan Update

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**Please use reverse side for additional notes** 

### Additional Notes – Year Four:

[illegible]



## Chapter 12: Appendices

- APPENDIX A: BIBLIOGRAPHY
- APPENDIX B: TECHNICAL AND FINANCIAL ASSISTANCE FOR HAZARD MITIGATION
  - *Hazard Mitigation Grant Program (HMGP)*
  - *Pre-Disaster Mitigation (PDM)*
  - *Flood Mitigation Assistance (FMA)*
  - *Repetitive Flood Claims (RFC)*
  - *Severe Repetitive Loss (SRL)*
- APPENDIX C: THE EXTENT OF HAZARDS
- APPENDIX D: PRESIDENTIAL DISASTER & EMERGENCY DECLARATIONS
- APPENDIX E: POTENTIAL MITIGATION IDEAS
- APPENDIX F: ACRONYMS
- APPENDIX G: MAP DOCUMENTS
  - *Map 1 – Base Risk Analysis*
  - *Map 2 – Historic Fires & the Wildland Urban Interface (WUI)*
  - *Map 3 – Past & Potential Areas of Concern*
  - *Map 4 – Critical Infrastructure & Key Resources*
  - *Map 5 – Downtown Berlin Critical Infrastructure & Key Resources*

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## Appendix A: Bibliography

### Documents

- **Local Hazard Mitigation Planning Review Guide**, FEMA, October 2011
- **Local Hazard Mitigation Planning Handbook**, FEMA, March 2013
- **Mitigation Ideas, A Resource for Reducing Risk to Natural Hazards**, FEMA, January 2013
- **Hazard Mitigation Unified Guidance**, FEMA, July 12, 2013
- **Hazard Mitigation Assistance Guidance**, FEMA, February 27, 2015
- **Berlin Annual Report, Year Ending December 31, 2014**
- **Hazards Mitigation Plans**
  - Berlin Hazard Mitigation Plan, 2010
  - Randolph Hazard Mitigation Plan, 2014
  - Carroll Hazard Mitigation Plan, 2015
  - Gorham Hazard Mitigation Plan, 2016
- **NH State Multi-Hazard Mitigation Plan**, 2013
  - <http://www.nh.gov/safety/divisions/hsem/HazardMitigation/documents/hazard-mitigation-plan.pdf>
- **NH Division of Forests and Lands Quarterly Update**
  - <http://www.nhdfil.org/fire-control-and-law-enforcement/fire-statistics.aspx>
- **Disaster Mitigation Act (DMA) of 2000**, Section 101, b1 & b2 and Section 322a
  - <http://www.fema.gov/library/viewRecord.do?id=1935>
- **Economic & Labor Market Information Bureau**, NH Employment Security, January 2016.; Community Response for Berlin, Received, 6/26/15, Census 2000 and Revenue Information derived from this site; <http://www.nhes.nh.gov/elmi/products/cp/profiles-htm/Berlin.htm>
- **Photos**: Photos taken by MAPS unless otherwise noted.

### Additional Websites

- US Forest Service; <http://www.fs.fed.us>
- US Fire Administration; <http://www.usfa.dhs.gov/>
- US Department of Agriculture Wildfire Programs: <http://www.wildfireprograms.usda.gov/>
- Firewise; <http://www.firewise.org/>
- NH Homeland Security & Emergency Management; <http://www.nh.gov/safety/divisions/hsem/>
- US Geological Society; <http://water.usgs.gov/ogw/subsidence.html>
- Department Environmental Services; <http://des.nh.gov/organization/divisions/water/dam/drought/documents/historical.pdf>
- The Disaster Center (NH); <http://www.disastercenter.com/newhamp/tornado.html>
- Floodsmart, about the NFIP; [http://www.floodsmart.gov/floodsmart/pages/about/nfip\\_overview.jsp](http://www.floodsmart.gov/floodsmart/pages/about/nfip_overview.jsp)
- NOAA, National Weather Service; <http://www.nws.noaa.gov/glossary/index.php?letter=w>
- NOAA, Storm Prediction Center; <http://www.spc.noaa.gov/faq/tornado/beaufort.html>
- NOAA, Index/Heat Disorders; <http://www.srh.noaa.gov/ssd/html/heatwv.htm>
- National Weather Service; <http://www.nws.noaa.gov/om/windchill/>
- Center for Disease Control; <http://www.bt.cdc.gov/disasters/winter/guide.asp>
- FEMA; <http://www.fema.gov/hazard/hazmat/index.shtm>
- Slate; <http://www.slate.com/id/2092969/>
- Home Pro Inspections; How Radon Enters a House; [www.homeprocanada.ca/radon/HP\\_radon.htm](http://www.homeprocanada.ca/radon/HP_radon.htm)
- NH Office of Energy and Planning; <http://www.nh.gov/oep/planning/programs/fmp/join-nfip.htm>
- Code of Federal Regulations; Title 14, Aeronautics and Space; Part 1, Definitions and Abbreviations; <http://ecfr.gpoaccess.gov>
- Federal Aviation Administration; <http://faa.custhelp.com>
- US Legal, Inc.; <http://definitions.uslegal.com/v/violent-crimes/>

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## Appendix B: Technical & Financial Assistance for Hazard Mitigation

FEMA's Hazard Mitigation Assistance (HMA) grant programs provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages. Currently, FEMA administers the following HMA grant programs<sup>17</sup>:

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)
- Repetitive Flood Claims (RFC)
- Severe Repetitive Loss (SRL)

FEMA's HMA grants are provided to eligible Applicants (States/Tribes/Territories) that, in turn, provide sub-grants to local governments and communities. The Applicant selects and prioritizes subapplications developed and submitted to them by subapplicants. These subapplications are submitted to FEMA for consideration of funding.

Prospective subapplicants should consult the office designated as their Applicant for further information regarding specific program and application requirements. Contact information for the FEMA Regional Offices and State Hazard Mitigation Officers is available on the FEMA website, [www.fema.gov](http://www.fema.gov).

### HMA Grant Programs

The HMA grant programs provide funding opportunities for pre- and post-disaster mitigation. While the statutory origins of the programs differ, all share the common goal of reducing the risk of loss of life and property due to Natural Hazards. Brief descriptions of the HMA grant programs can be found below.

#### A. Hazard Mitigation Grant Program (HMGP)

HMGP assists in implementing long-term hazard mitigation measures following Presidential disaster declarations. Funding is available to implement projects in accordance with State, Tribal and local priorities.

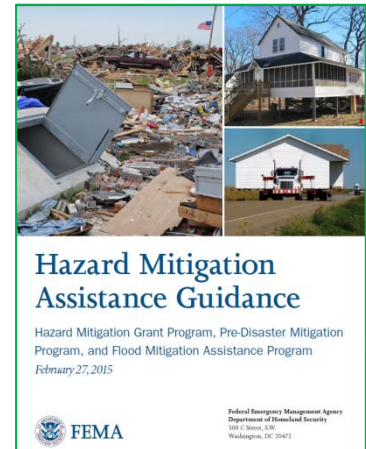


Table 3: Eligible Activities by Program

Eligible Activities	HMGP	PDM	FMA
<b>1. Mitigation Projects</b>	✓	✓	✓
Property Acquisition and Structure Demolition	✓	✓	✓
Property Acquisition and Structure Relocation	✓	✓	✓
Structure Elevation	✓	✓	✓
Mitigation Reconstruction	✓	✓	✓
Dry Floodproofing of Historic Residential Structures	✓	✓	✓
Dry Floodproofing of Non-residential Structures	✓	✓	✓
Generators	✓	✓	
Localized Flood Risk Reduction Projects	✓	✓	✓
Non-localized Flood Risk Reduction Projects	✓	✓	
Structural Retrofitting of Existing Buildings	✓	✓	✓
Non-structural Retrofitting of Existing Buildings and Facilities	✓	✓	✓
Safe Room Construction	✓	✓	
Wind Retrofit for One- and Two-Family Residences	✓	✓	
Infrastructure Retrofit	✓	✓	✓
Soil Stabilization	✓	✓	✓
Wildfire Mitigation	✓	✓	
Post-Disaster Code Enforcement	✓		
Advance Assistance	✓		
5 Percent Initiative Projects	✓		
Miscellaneous/Other <sup>(1)</sup>	✓	✓	✓
<b>2. Hazard Mitigation Planning</b>	✓	✓	✓
Planning Related Activities	✓		
<b>3. Technical Assistance</b>			✓
<b>4. Management Cost</b>	✓	✓	✓

<sup>(1)</sup> Miscellaneous/Other indicates that any proposed action will be evaluated on its own merit against program requirements. Eligible projects will be approved provided funding is available.

Eligibility Chart taken from Hazard Mitigation Assistance Guidance, February 27, 2015

<sup>17</sup> Information in Appendix B is taken from the following website and links to specific programs unless otherwise noted  
[http://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0bd4ea8a161e8bb7b79553/HMA\\_Guidance\\_022715\\_508.pdf](http://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0bd4ea8a161e8bb7b79553/HMA_Guidance_022715_508.pdf)

### What is the 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. Authorized under Section 404 of the Stafford Act and administered by FEMA, HMGP was created to reduce the loss of life and property due to natural disasters. The program enables mitigation measures to be implemented during the immediate recovery from a disaster.

### Who is eligible to apply?

Hazard Mitigation Grant Program funding is only available to applicants that reside within a presidentially declared disaster area. Eligible applicants are

- State and local governments
- Indian tribes or other tribal organizations
- Certain non-profit organizations

Individual homeowners and businesses may not apply directly to the program; however a community may apply on their behalf.

### How are potential projects selected and identified?

The State's administrative plan governs how projects are selected for funding. However, proposed projects must meet certain minimum criteria. These criteria are designed to ensure that the most cost-effective and appropriate projects are selected for funding. Both the law and the regulations require that the projects are part of an overall mitigation strategy for the disaster area.

The State prioritizes and selects project applications developed and submitted by local jurisdictions. The State forwards applications consistent with State mitigation planning objectives to FEMA for eligibility review. Funding for this grant program is limited and States and local communities must make difficult decisions as to the most effective use of grant funds.

## ***B. Pre-Disaster Mitigation (PDM)***

PDM provides funds on an annual basis for hazard mitigation planning and the implementation of mitigation projects prior to a disaster. The goal of the PDM program is to reduce overall risk to the population and structures, while at the same time, also reducing reliance on Federal funding from actual disaster declarations.

### Program Overview

The Pre-Disaster Mitigation (PDM) program provides funds to states, territories, Indian 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.

### **C. Flood Mitigation Assistance (FMA)**

FMA provides funds on an annual basis so that measures can be taken to reduce or eliminate risk of flood damage to buildings insured under the National Flood Insurance Program.

#### Program Overview

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

FEMA provides FMA funds to assist States and communities implement 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.

#### Types of FMA Grants

Three types of FMA grants are available to States and communities:

**Planning Grants** to prepare Flood Mitigation Plans. Only NFIP-participating communities with approved Flood Mitigation Plans can apply for FMA Project grants.

**Project Grants** to implement measures to reduce flood losses, such as elevation, acquisition, or relocation of NFIP-insured structures. States are encouraged to prioritize FMA funds for applications that include repetitive loss properties; these include structures with 2 or more losses each with a claim of at least \$1,000 within any ten-year period since 1978.

**Technical Assistance Grants** for the State to help administer the FMA program and activities. Up to ten percent (10%) of Project grants may be awarded to States for Technical Assistance Grants

#### Repetitive Flood Claims (RFC)

RFC provides funds on an annual basis to reduce the risk of flood damage to individual properties insured under the NFIP that have had one or more claim payments for flood damages. RFC provides up to 100% federal funding for projects in communities that meet the reduced capacity requirements.

#### Program Overview

The Repetitive Flood Claims (RFC) grant program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (P.L. 108–264), which amended the National Flood Insurance Act (NFIA) of 1968 (42 U.S.C. 4001, et al).

Up to \$10 million is available annually for FEMA to provide RFC funds to assist States and communities reduce flood damages to insured properties that have had one or more claims to the National Flood Insurance Program (NFIP).

#### Federal / Non-Federal Cost Share

FEMA may contribute up to 100 percent of the total amount approved under the RFC grant award to implement approved activities, if the Applicant has demonstrated that the proposed activities cannot be funded under the Flood Mitigation Assistance (FMA) program.

### Severe Repetitive Loss (SRL)

SRL provides funds on an annual basis to reduce the risk of flood damage to residential structures insured under the NFIP that are qualified as severe repetitive loss structures. SRL provides up to 90% federal funding for eligible projects.

#### Program Overview

The Severe Repetitive Loss (SRL) grant program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, which amended the National Flood Insurance Act of 1968 to provide funding to reduce or eliminate the long-term risk of flood damage to severe repetitive loss (SRL) structures insured under the National Flood Insurance Program (NFIP).

#### Definition

The definition of severe repetitive loss as applied to this program was established in section 1361A of the National Flood Insurance Act, as amended (NFIA), 42 U.S.C. 4102a. An SRL property is defined as a **residential property** that is covered under an NFIP flood insurance policy and:

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

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

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

#### Purpose

To reduce or eliminate claims under the NFIP through project activities that will result in the greatest savings to the National Flood Insurance Fund (NFIF).

#### Federal / Non-Federal cost share

75/25%; up to 90% Federal cost-share funding for projects approved in States, Territories and Federally-recognized Indian tribes with FEMA-approved Standard or Enhanced Mitigation Plans or Indian tribal plans that include a strategy for mitigating existing and future SRL properties.

**For further information all of these programs, please refer to the  
new FEMA Hazard Mitigation Assistance Guidance:**

***[http://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0bd4ea8a161e8bb7b79553/HMA\\_Guidance\\_022715\\_508.pdf](http://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0bd4ea8a161e8bb7b79553/HMA_Guidance_022715_508.pdf)***



## Appendix C: The Extent of Hazards

Hazards indicated with an asterisk \* are included in this Plan.

### DAM FAILURE

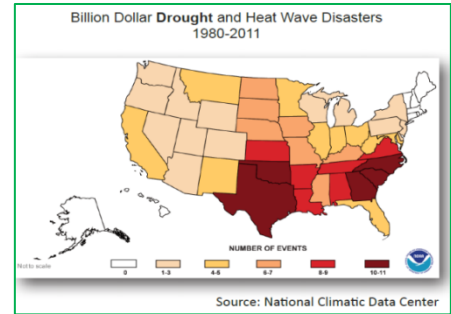
A “Dam” means any artificial barrier, including appurtenant works, which impounds or diverts water, and which has a height of 4 feet or more, or a storage capacity of 2 acre-feet or more, or is located at the outlet of a great pond<sup>18</sup>. A dam failure occurs when water overtops the dam, or there is structural failure of the dam which causes there to be a breach and an unintentional release of water. Dams are classified in the following manner<sup>18</sup>:

Classification	Description	Inspection Intervals
<b>Non-Menace</b>	A dam that is not a menace because it is in a location and of a size that failure or misoperation of the dam would not result in probable loss of life or loss to property. The dam must be less than six feet in height if the storage capacity is greater than 50 acre-feet or less than 25 feet in height if it has a storage capacity of 15-50 acre-feet.	Every 6 years
<b>Low Hazard</b>	A dam that has a low hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in no possible loss of life, low economic loss to structures or property, structural damage to a town or city road or private road accessing property other than the dam owner's that could render the road impassable or otherwise interrupt public safety services, the release of liquid industrial, agricultural, or commercial wastes, septage, or contained sediment if the storage capacity is less two-acre-feet and is located more than 250 feet from a water body or water course, and/or reversible environmental losses to environmentally-sensitive sites.	Every 6 years
<b>Significant Hazard</b>	A dam that has a significant hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in no probable loss of lives; however, there would be major economic loss to structures or property, Structural damage to a Class I or Class II road that could render the road impassable or otherwise interrupt public safety services, major environmental or public health losses including one or more of the following: Damages to a public water system (RSA 485:1-a, XV) which will take longer than 48 hours to repair, the release of liquid industrial, agricultural, or commercial wastes, septage, sewage, or contaminated sediments if the storage capacity is 2 acre-feet or more; or damage to an environmentally-sensitive site that does not meet the definition of reversible environmental losses.	Every 4 years
<b>High Hazard</b>	A dam that has a high hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in probable loss of human life as well as a result of; water levels and velocities causing the structural failure of a foundation of a habitable residential structure or commercial or industrial structure which is occupied under normal conditions; water levels rising above the first floor elevation of a habitable residential structure or a commercial or industrial structure, which is occupied under normal conditions when the rise due to a dam failure is greater than one foot; structural damage to an interstate highway, which could render the roadway impassable or otherwise interrupt public safety services; the release of a quantity and concentration of material, which qualify as “hazardous waste” as defined by RSA 147-A:2 VII; or any other circumstance that would more likely than not cause one or more deaths.	Every 2 years

<sup>18</sup> <http://des.nh.gov/organization/commissioner/pip/factsheets/db/documents/db-15.pdf>

## \*DROUGHT

A drought is defined as a long period of abnormally low precipitation, especially one that adversely affects the growing season or living conditions of plants and animals. Droughts are rare in New Hampshire. They generally are not as damaging and disruptive as floods and are more difficult to define. The effect of drought is indicated through measurements of soil moisture, groundwater levels and stream flow.



However, not all of these indicators will be minimal during a drought. For example, frequent minor rainstorms can replenish the soil moisture without raising groundwater levels or increasing stream flow. Low stream flow also correlates with low groundwater levels because groundwater discharge to streams and rivers maintains stream flow during extended dry periods. Low stream flow and low groundwater levels commonly cause diminished water supply.

### NEW HAMPSHIRE DROUGHT HISTORY

Dates	Area Affected	Recurrence Interval Yrs	Remarks
1929-1936	Statewide	10 to > 25	Regional
1939-1944	Statewide	10 to > 25	Severe in southeast and moderate elsewhere
1947-1950	Statewide	10 to 25	Moderate
1960-1969	Statewide	> 25	Regional longest recorded continuous spell of less than normal precipitation
2001-2002	Statewide	Not yet determined	Third worst drought on record, exceeded only by the drought of 1956-1966 and 1941-1942

NH DES; <http://des.nh.gov/organization/divisions/water/dam/drought/documents/historical.pdf>

## \*EARTHQUAKE

An earthquake is a rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines and often cause landslides, flash floods, fires and avalanches. Larger earthquakes usually begin with slight tremors but rapidly take the form of one or more violent shocks and end in vibrations of gradually diminishing force called aftershocks. The underground point of origin of an earthquake is called its focus; the point on the surface directly above the focus is the epicenter. The magnitude and intensity of an earthquake is widely determined by the use of two scales, the more commonly used Richter Scale (measures strength or magnitude) and the Mercalli Scale (measures intensity or severity). The chart to the right shows the two scales relative to one another. The Richter Scale measures earthquakes starting at 1 as the lowest with each successive unit being about 10 times stronger and more severe than the previous one.<sup>19</sup>

Four earthquakes occurred in New Hampshire between 1924-1989 having a magnitude of 4.2 or more. Two of these occurred in Ossipee, one west of Laconia and one near the Quebec border. It is well documented that there are fault lines running throughout New Hampshire, but high magnitude earthquakes have not been frequent in New Hampshire history.

Modified Mercalli Scale		Richter Magnitude Scale
I	Detected only by sensitive instruments	1.5
II	Felt by few persons at rest, especially on upper floors; delicately suspended objects may swing	2
III	Felt noticeably indoors, but not always recognized as earthquake; standing autos rock slightly, vibration like passing truck	2.5
IV	Felt indoors by many, outdoors by few, at night some may awaken; dishes, windows, doors disturbed; autos rock noticeably	3
V	Felt by most people; some breakage of dishes, windows, and plaster; disturbance of tall objects	3.5
VI	Felt by all, many frightened and run outdoors; falling plaster and chimneys, damage small	4
VII	Everybody runs outdoors; damage to buildings varies depending on quality of construction; noticed by drivers of autos	4.5
VIII	Panel walls thrown out of frames; fall of walls, monuments, chimneys; sand and mud ejected; drivers of autos disturbed	5
IX	Buildings shifted off foundations, cracked, thrown out of plumb; ground cracked; underground pipes broken	5.5
X	Most masonry and frame structures destroyed; ground cracked, rails bent, landslides	6
XI	Few structures remain standing; bridges destroyed, fissures in ground, pipes broken, landslides, rails bent	6.5
XII	Damage total; waves seen on ground surface, lines of sight and level distorted, objects thrown up in air	7

<sup>19</sup> Modified Mercalli Scale/Richter Scale Chart; MO DNR, [http://www.dnr.mo.gov/geology/geosrv/geores/richt\\_mercalli\\_relation.htm](http://www.dnr.mo.gov/geology/geosrv/geores/richt_mercalli_relation.htm)

## \*EROSION, MUDSLIDE & LANDSLIDE

Erosion is the wearing away of land, such as loss of riverbank, beach, shoreline or dune material. It is measured as the rate of change in the position or displacement of a riverbank or shoreline over a period of time. Short-term erosion typically results from periodic natural events, such as flooding, hurricanes, storm surge and windstorms but may be intensified by human activities. Long-term erosion is a result of multi-year impacts such as repetitive flooding, wave action, sea level rise, sediment loss, subsidence and climate change. Death and injury are not typically associated with erosion; however, it can destroy buildings and infrastructure.<sup>20</sup>

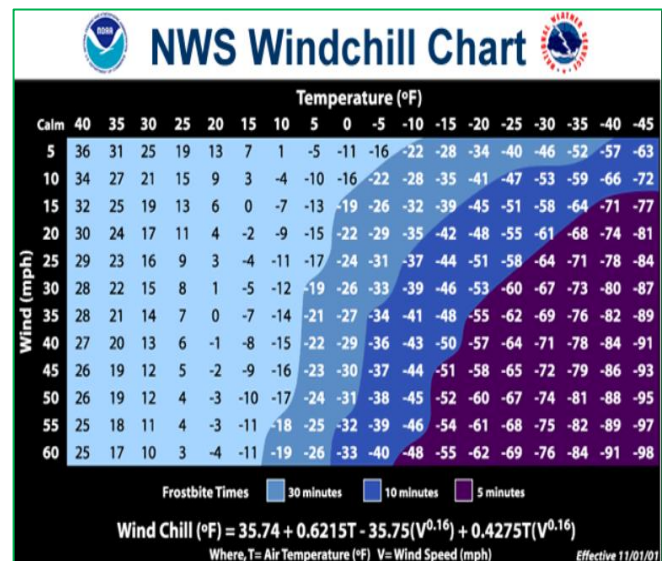
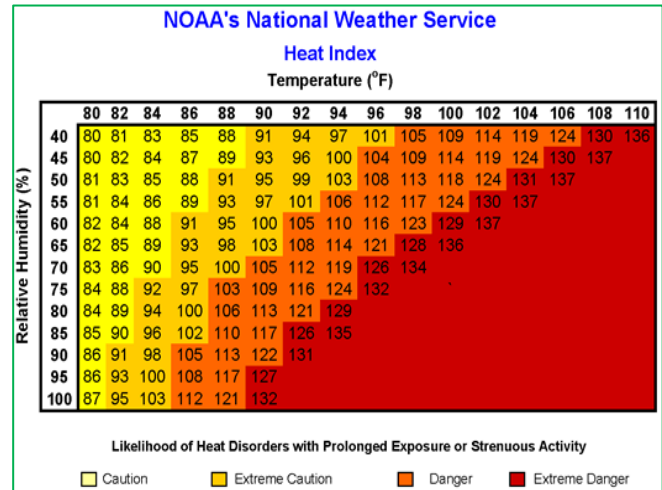
## \*EXTREME TEMPERATURES

### EXTREME HEAT

A Heat Wave is a "Prolonged period of excessive heat, often combined with excessive humidity." Heat kills by pushing the human body beyond its limits. In extreme heat and high humidity, evaporation is slowed and the body must work extra hard to maintain a normal temperature.

Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children and those who are sick or overweight are more likely to succumb to extreme heat.

Conditions that can induce heat-related illnesses include stagnant atmospheric conditions and poor air quality. Consequently, people living in urban areas may be at greater risk from the effects of a prolonged heat wave than those living in rural areas. Also, asphalt and concrete store heat longer and gradually release heat at night, which can produce higher nighttime temperatures known as the "urban heat island effect."<sup>21</sup> The chart above explains the likelihood of heat disorders that may result from high heat.<sup>22</sup>



<sup>20</sup>Mitigation Ideas, A Resource for Reducing Risk to Natural Hazards, FEMA, January 2013

<sup>21</sup> NOAA, Index/Heat Disorders; <http://www.srh.noaa.gov/ssd/html/heatwv.htm>

<sup>22</sup> NOAA; <http://www.nws.noaa.gov/os/heat/index.shtml>

### EXTREME COLD

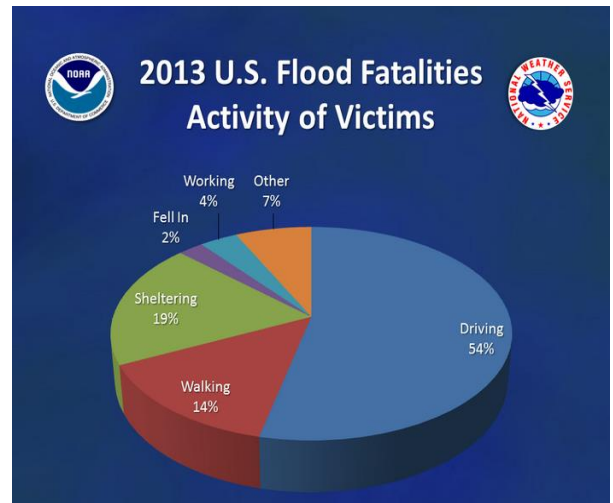
What constitutes extreme cold and its effects can vary across different areas of the country. In regions relatively unaccustomed to winter weather, near freezing temperatures are considered “extreme cold.” Whenever temperatures drop decidedly below normal and as wind speed increases, heat can leave your body more rapidly; these weather related conditions may lead to serious health problems. Extreme cold is a dangerous situation that can bring on health emergencies in susceptible people without shelter or who are stranded, or who live in a home that is poorly insulated or without heat.<sup>23</sup> The National Weather Service Chart (previous page) shows windchill as a result of wind and temperature.<sup>24</sup>

### **\*FLOODING**

#### GENERAL FLOODING CONDITIONS

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; warm temperatures and heavy rains cause rapid snowmelt producing prime conditions for flooding. In addition, rising waters in early spring often breaks ice into chunks that float downstream and pile up, causing flooding behind them. Small rivers and streams pose special flooding risks because they are easily blocked by jams. Ice in riverbeds and against structures presents a significant flooding threat to bridges, roads and the surrounding lands.



#### FLOODING (LOCAL, ROAD EROSION)

Heavy rain, rapid snowmelt and stream flooding often cause culverts to be overwhelmed and roads to wash out. Today, with changes in land use, aging roads, designs that are no longer effective and undersized culverts, the risk of flooding is a serious concern. Inadequate and aging storm water drainage systems create local flooding on both asphalt and gravel roads.

#### FLOODING (RIVERINE)

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. Flooding is often associated with hurricanes, heavy rains, ice jams and rapid snowmelt in the spring.

<sup>23</sup> CDC; <http://www.bt.cdc.gov/disasters/winter/guide.asp> f

<sup>24</sup> National Weather Service; <http://www.nws.noaa.gov/om/windchill/>



## FLOODING (DAM FAILURE)

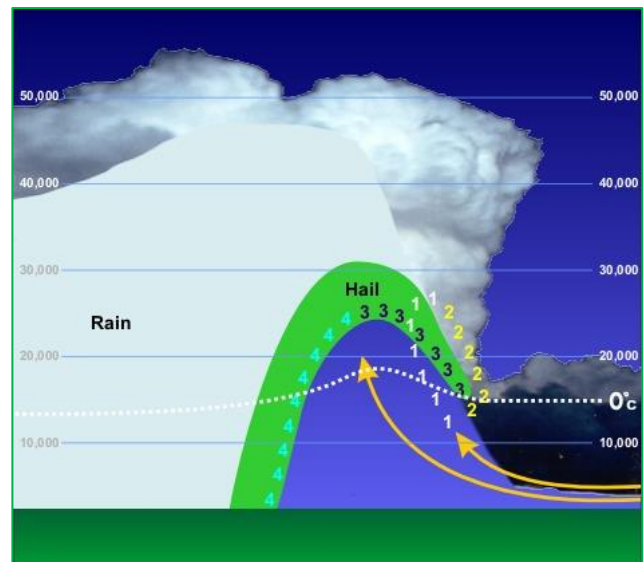
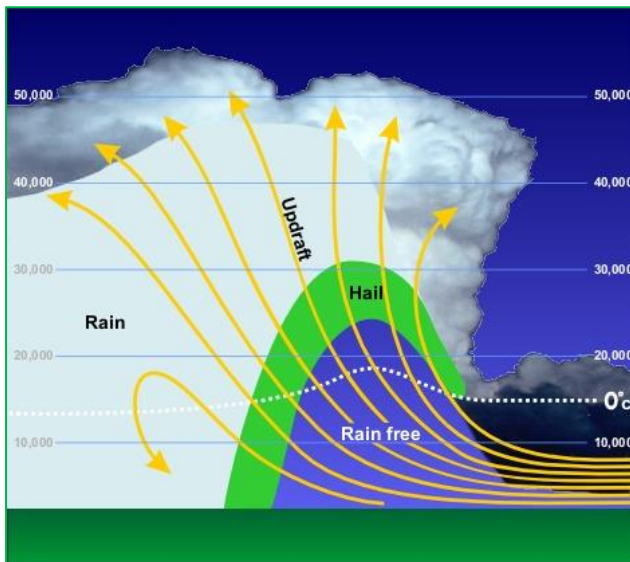
Flooding as a result of dam failure can be small enough to only affect the immediate area of the dam, or large enough to cause catastrophic results to cities, towns and human life that is below the dam. The extent of flooding depends largely on the size of the dam, the amount of water that is being held by the dam, the size of the breach, the amount of water flow from the dam and the amount of human habitation that is downstream.

## \*HAILSTORM

Hailstones are balls of ice that grow as they're held up by winds, known as updrafts that blow upwards in thunderstorms. The updrafts carry droplets of supercooled water, water at a below-freezing temperature that is not yet ice. The supercooled water droplets freeze into balls of ice and grow to become hailstones. The faster the updraft, the bigger the stones can grow. Most hailstones are smaller in diameter than a dime, but stones weighing more than a pound have been recorded. "The largest hailstone recovered in the US fell in Vivian, SD on June 23, 2010 with a diameter of 8 inches and a circumference of 18.62 inches. It weighed 1 lb. 15 oz."<sup>25</sup>

<b>Dime/Penny</b>	<b>0.75</b>	
<b>Nickel</b>	<b>0.88</b>	
<b>Quarter</b>	<b>1.00</b>	
<b>Half Dollar</b>	<b>1.25</b>	
<b>Ping Pong</b>	<b>1.50</b>	
<b>Golf Ball</b>	<b>1.75</b>	
<b>Hen Egg</b>	<b>2.00</b>	
<b>Tennis Ball</b>	<b>2.50</b>	
<b>Baseball</b>	<b>2.75</b>	
<b>Tea Cup</b>	<b>3.00</b>	
<b>Grapefruit</b>	<b>4.00</b>	
<b>Softball</b>	<b>4.50</b>	

Details of how hailstones grow are complicated, but the results are irregular balls of ice that can be as large as baseballs. The chart above shows the relative size differences and a common way to "measure" the size of hail based on diameter.<sup>26</sup> The charts below show how hail is formed.<sup>27</sup>



<sup>25</sup> NOAA National Severe Storms Laboratory; <https://www.nssl.noaa.gov/education/svrwx101/hail/>

<sup>26</sup> <http://www.pinterest.com/pin/126171227030590678/>

<sup>27</sup> <http://oceanservice.noaa.gov/education/yos/resource/JetStream/tstorms/hail.htm#hail>

## HIGH WIND (WINDSTORM)

As stated by NOAA (National Oceanic & Atmospheric Administration), wind is defined as “The horizontal motion of the air past a given point. Winds begin with differences in air pressures. Those pressures which are higher at one place than another place set up a force pushing from the high pressure toward the low pressure; the greater the difference in pressures, the stronger the force. The distance between the area of high pressure and the area of low pressure also determines how fast the moving air is accelerated. Meteorologists refer to the force that starts the wind flowing as the “pressure gradient force.” High and low pressures are relative. There's no set number that divides high and low pressure. Wind is used to describe the prevailing direction from which the wind is blowing with the speed given usually in miles per hour or knots.” In addition, NOAA’s issuance of a Wind Advisory takes place when sustained winds reach 25 to 39 mph and/or gusts to 57 mph.<sup>28</sup>

Below is the Beaufort Wind Scale, showing expected damage based on wind (knots), developed in 1805 by Sir Francis Beaufort of England and posted on NOAA’s Storm Prediction Center website.<sup>29</sup>

Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects	
			On the Water	On Land
0	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes bring to move
3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 ft. taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 ft., whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Sea heaps up, waves 13-20 ft., white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (13-20 ft.) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Whole trees in motion, resistance felt walking against wind
9	41-47	Strong Gale	High waves (20 ft.), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Very high waves (20-30 ft.) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, “considerable structural damage”
11	56-63	Violent Storm	Exceptionally high(30-45 ft.) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 ft., sea completely white with driving spray, visibility greatly reduced	

<sup>28</sup> NOAA; <http://www.nws.noaa.gov/glossary/index.php?letter=w>

<sup>29</sup> NOAA, Storm Prediction Center, <http://www.spc.noaa.gov/faq/tornado/beaufort.html>

## \*HURRICANE & TROPICAL STORM

### HURRICANES

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 the storm may extend over 400 miles. High winds are a primary cause of hurricane-inflicted loss of life and property damage.

"The Saffir-Simpson Hurricane Wind Scale" (to the right<sup>30</sup>) is a 1 to 5 rating 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, however and require preventative measures. In the western North Pacific, the term "super typhoon" is used for tropical cyclones with sustained winds exceeding 150 mph.<sup>31</sup>

Flooding is often caused from the coastal storm surge of the ocean and torrential rains, both of which may accompany a hurricane; these floods can result in loss of lives and property.

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	<b>Very dangerous winds will produce some damage:</b> Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	<b>Extremely dangerous winds will cause extensive damage:</b> Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	<b>Devastating damage will occur:</b> Well-built frame homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	<b>Catastrophic damage will occur:</b> Well-built frame homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157-182 mph 136-158 kt 271-332 km/h	<b>Catastrophic damage will occur:</b> A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

### TROPICAL STORMS

A tropical depression becomes a tropical storm when its maximum sustained winds are between 39-73 mph. Although tropical storms have winds of less than 74 miles per hour, like hurricanes, they can do significant damage. The damage most felt by tropical storms is from the torrential rains they produce which cause rivers and streams to flood and overflow their banks.

Rainfall from tropical storms has been reported at rates of up to 6 inches per hour; 43 inches of rain in a 24 hour period was reported in Alvin, TX as a result of Tropical Storm Claudette.<sup>32</sup>

<sup>30</sup> National Hurricane Center; <http://www.nhc.noaa.gov/aboutsshws.php>

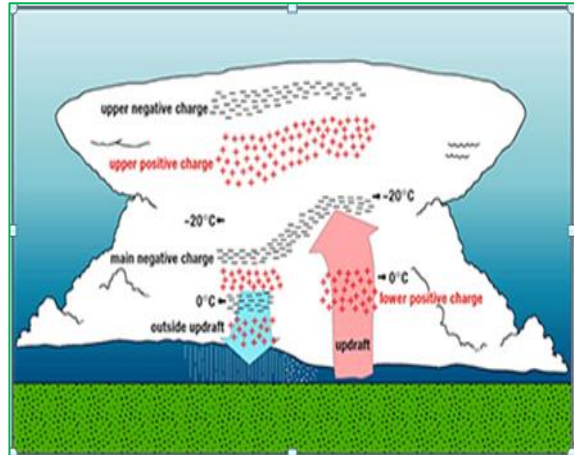
<sup>31</sup> National Hurricane Center, NOAA; <http://www.nhc.noaa.gov/aboutsshws.php>

<sup>32</sup> [http://www.wpc.ncep.noaa.gov/research/mcs\\_web\\_test\\_test\\_files/Page1637.htm](http://www.wpc.ncep.noaa.gov/research/mcs_web_test_test_files/Page1637.htm)

### \*SEVERE THUNDER & LIGHTNING STORM

As stated by the NOAA National Severe Storms Laboratory (NSSL) "Lightning is a giant spark of electricity in the atmosphere between clouds, the air, or the ground. In the early stages of development, air acts as an insulator between the positive and negative charges in the cloud and between the cloud and the ground. When the opposite charges build up enough, this insulating capacity of the air breaks down and there is a rapid discharge of electricity that we know as lightning. The flash of lightning temporarily equalizes the charged regions in the atmosphere until the opposite charges build up again."<sup>33</sup>

Thunder, a result of lightning, is created when the "lightning channel heats the air to around 18,000 degrees Fahrenheit..."<sup>34</sup> thus causing the rapid expansion of the air and the sounds we hear as thunder. Although thunder that is heard during a storm cannot hurt you, the lightning that is associated with the thunder can not only strike people but also strike homes, out-buildings, grass and trees sparking disaster. Wildfires and structure loss are at a high risk during severe lightning events.



*"A conceptual model shows the electrical charge distribution inside deep convection (thunderstorms), developed by NSSL and university scientists. In the main updraft (in and above the red arrow), there are four main charge regions. In the convective region but outside the out draft (in and above the blue arrow), there are more than four charge regions."- NOAA*

Although thunderstorms and their associated lightning can occur any time of year, in New England they are most likely to occur in the summer months and during the late afternoon or early evening hours and may even occur during a winter snowstorm. Trees, tall buildings and mountains are often the targets of lightning because their tops are closer to the cloud; however, lightning is unpredictable and does not always strike the tallest thing in the area.

"Lightning strikes the ground somewhere in the U.S. nearly every day of the year. Thunderstorms and lightning occur most commonly in moist warm climates. Data from the National Lightning Detection Network shows that over the continental U.S. an average of 20,000,000 cloud-to-ground flashes occur every year. Around the world, lightning strikes the ground about 100 times each second, or 8 million times a day.

In general, lightning decreases across the U.S. mainland toward the northwest. Over the entire year, the highest frequency of cloud-to-ground lightning is in Florida between Tampa and Orlando. This is due to the presence, on many days during the year, of a large moisture content in the atmosphere at low levels (below 5,000 feet), as well as high surface temperatures that produce strong sea breezes along the Florida coasts. The western mountains of the U.S. also produce strong upward motions and contribute to frequent cloud-to-ground lightning. There are also high frequencies along the Gulf of Mexico coast, the Atlantic coast and in the southeast United States. US Regions along the Pacific west coast have the least cloud-to-ground lightning."<sup>35</sup>

<sup>33</sup> NOAA National Severe Storms Laboratory, <https://www.nssl.noaa.gov/education/svrwx101/lightning>

<sup>34</sup> Ibid

<sup>35</sup> Ibid



### \*SEVERE WINTER SNOW & ICE STORM

Ice and snow events typically occur during the winter months and can cause loss of life, property damage and tree damage.

#### SNOW STORMS

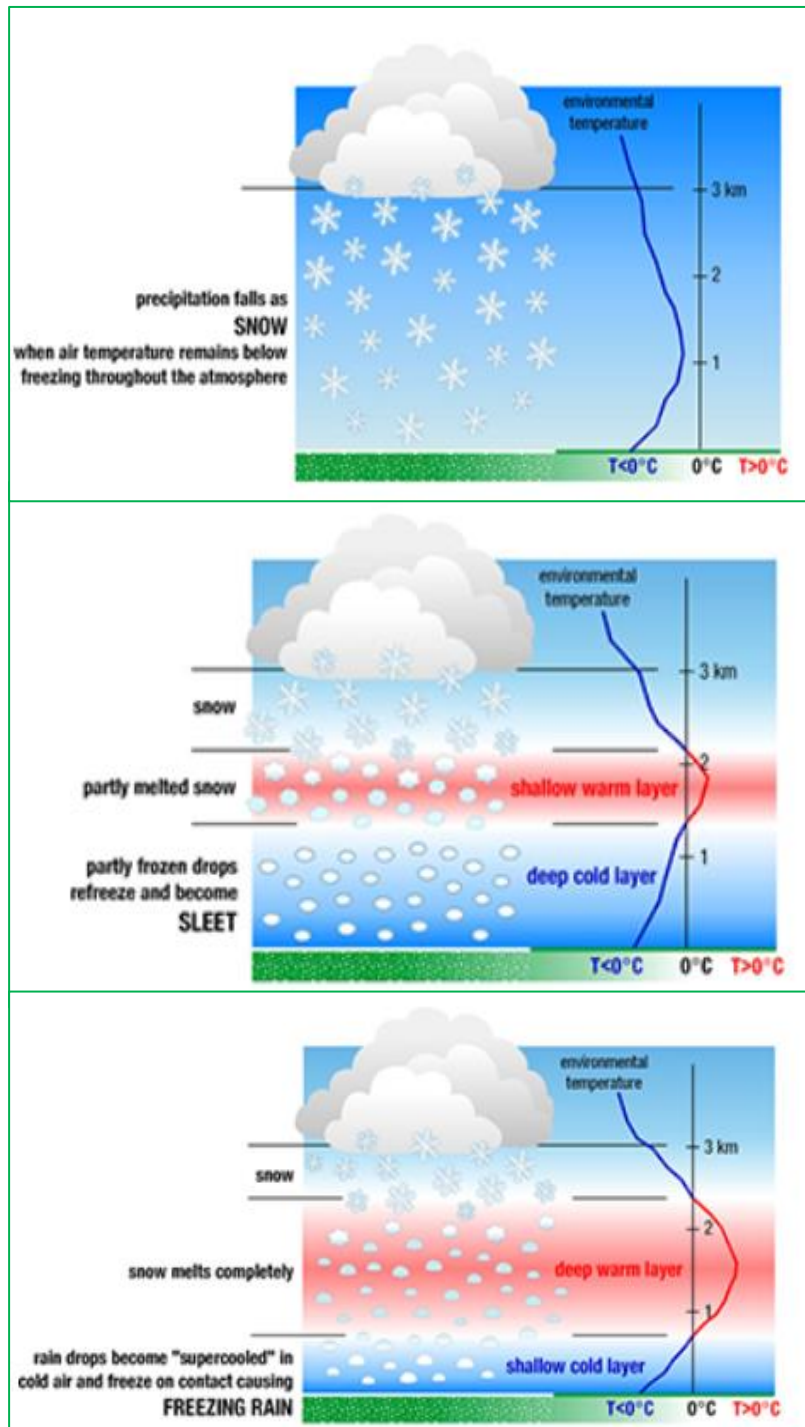
A winter storm can range from moderate snow to blizzard conditions. Blizzard conditions are considered blinding wind-driven snow over 35 mph that lasts several days. A severe winter storm deposits four or more inches of snow during a 12-hour period or six inches of snow during a 24-hour period.

#### SLEET

Snowflakes melt as they fall through a small band of warm air and later refreeze when passing through a wider band of cold air. These frozen rain drops then fall to the ground as “sleet”.

#### FREEZING RAIN & ICE STORMS

Snowflakes melt completely as they fall through a warm band of air then fall through a shallow band of cold air close to the ground to become “supercooled”. These supercooled raindrops instantly freeze upon contact with the ground and anything else that is below 32 degrees Fahrenheit. This freezing creates accumulations of ice on roads, trees, utility lines and other objects resulting in what we think of as an “Ice Storm”. “Ice coating at least one-fourth inch in thickness is heavy enough to damage trees, overhead wires and similar objects.”<sup>36</sup>



*Types of Severe Winter Weather*  
NOAA – National Severe Storms Laboratory

<sup>36</sup> NOAA, National Severe Storms Laboratory, <https://www.nssl.noaa.gov/education/svrwx101/winter/types/>

The Sperry-Piltz Ice Accumulation Index (SPIA) (below) is designed to help utility companies better prepare for predicated ice storms.<sup>37</sup>

**The Sperry-Piltz Ice Accumulation Index, or "SPIA Index" – Copyright, February, 2009**

ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) <small>* Revised-October, 2011</small>	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
<b>0</b>	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
<b>1</b>	0.10 – 0.25	15 – 25	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
	0.25 – 0.50	> 15	
<b>2</b>	0.10 – 0.25	25 – 35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
	0.25 – 0.50	15 – 25	
	0.50 – 0.75	< 15	
<b>3</b>	0.10 – 0.25	> = 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
	0.25 – 0.50	25 – 35	
	0.50 – 0.75	15 – 25	
	0.75 – 1.00	< 15	
<b>4</b>	0.25 – 0.50	> = 35	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
	0.50 – 0.75	25 – 35	
	0.75 – 1.00	15 – 25	
	1.00 – 1.50	< 15	
<b>5</b>	0.50 – 0.75	> = 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	> = 25	
	1.00 – 1.50	> = 15	
	> 1.50	Any	

(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

## SNOW AVALANCHE

According to the National Snow & Ice Data Center “An avalanche is a rapid flow of snow down a hill or mountainside. Although avalanches can occur on any slope given the right conditions, certain times of the year and certain locations are naturally more dangerous than others. Wintertime, particularly from December to April, is when most avalanches tend to happen. However, avalanche fatalities have been recorded for every month of the year.”<sup>38</sup>



“All that is necessary for an avalanche is a mass of snow and a slope for it to slide down...A large avalanche in North America might release 230,000 cubic meters (300,000 cubic yards) of snow. That is the equivalent of 20 football fields filled 3 meters (10 feet) deep with snow. However, such large avalanches are often naturally released, when the snowpack becomes unstable and layers of snow begin to fail. Skiers and recreationalists usually trigger smaller, but often more deadly avalanches.”

There are three main parts to an avalanche (see image above). The first and most unstable is the “starting zone”, where the snow can “fracture” and slide. “Typical starting zones are higher up on slopes. However, given the right conditions, snow can fracture at any point on the slope.”<sup>39</sup>

<sup>37</sup> The Weather Channel, <http://www.weather.com/news/weather-winter/rating-ice-storms-damage-sperry-piltz-20131202>

<sup>38</sup> Copyright Richard Armstrong, NSIDC, <http://nsidc.org/cryosphere/snow/science/avalanches.html>






<sup>39</sup> NSIDC, <http://nsidc.org/cryosphere/snow/science/avalanches.html>; image credit: Betsy Armstrong

The second part is the “avalanche track”, or the downhill path that the avalanche follows. The avalanche is evident where large swaths of trees are missing or where there are large pile-ups of rock, snow, trees and debris at the bottom of an incline.

The third part of an avalanche is the “runout zone”. The runout zone is where the avalanche has come to a stop and left the largest and highest pile of snow and debris.

“Several factors may affect the likelihood of an avalanche, including weather, temperature, slope steepness, slope orientation (whether the slope is facing north or south), wind direction, terrain, vegetation and general snowpack conditions. Different combinations of these factors can create low, moderate, or extreme avalanche conditions. Some of these conditions, such as temperature and snowpack, can change on a daily or hourly basis.”<sup>40</sup>

When the possibility of an avalanche is evident, an “avalanche advisory” is issued. This preliminary notification warns hikers, skiers, snowmobilers and responders that conditions may be favorable for the development of avalanches. The chart below shows avalanche danger as determined by likelihood, size & distribution.<sup>41</sup>

North American Public Avalanche Danger Scale				
Avalanche danger is determined by the likelihood, size and distribution of avalanches.				
Danger Level		Travel Advice	Likelihood of Avalanches	Avalanche Size and Distribution
5 Extreme		Avoid all avalanche terrain.	Natural and human-triggered avalanches certain.	Large to very large avalanches in many areas.
4 High		Very dangerous avalanche conditions. Travel in avalanche terrain <u>not</u> recommended.	Natural avalanches likely; human-triggered avalanches very likely.	Large avalanches in many areas; or very large avalanches in specific areas.
3 Considerable		Dangerous avalanche conditions. Careful snowpack evaluation, cautious route-finding and conservative decision-making essential.	Natural avalanches possible; human-triggered avalanches likely.	Small avalanches in many areas; or large avalanches in specific areas; or very large avalanches in isolated areas.
2 Moderate		Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully; identify features of concern.	Natural avalanches unlikely; human-triggered avalanches possible.	Small avalanches in specific areas; or large avalanches in isolated areas.
1 Low		Generally safe avalanche conditions. Watch for unstable snow on isolated terrain features.	Natural and human-triggered avalanches unlikely.	Small avalanches in isolated areas or extreme terrain.
Safe backcountry travel requires training and experience. You control your own risk by choosing where, when and how you travel.				

<sup>40</sup> Copyright Richard Armstrong, NSIDC, <http://nsidc.org/cryosphere/snow/science/avalanches.html>

<sup>41</sup> <http://www.avalanche.ca/cac/bulletins/danger-scale>

## \*TORNADO & DOWNBURST

### TORNADO

A tornado is a violent windstorm characterized by a twisting, funnel shaped cloud. Tornadoes develop when cool air overrides a layer of warm air, causing the warm air to rise rapidly. The atmospheric conditions required for the formation of a tornado include great thermal instability, high humidity and the convergence of warm, moist air at low levels with cooler, drier air aloft. Most tornadoes remain suspended in the atmosphere, but if they touch down they become a force of destruction.

Tornadoes produce the most violent winds on earth, at speeds of 280 mph or more. In addition, tornadoes can travel at a forward speed of up to 70 mph. Damage paths can be in excess of one mile wide and 50 miles long. Violent winds and debris slamming into buildings cause the most structural damage.

The Fujita Scale is the standard scale for rating the severity of a tornado as measured by the damage it causes. A tornado is usually accompanied by thunder, lightning, heavy rain and a loud "freight train" noise. In comparison to a hurricane, a tornado covers a much smaller area but can be more violent and destructive.

"Dr. T. Theodore Fujita developed the Fujita Tornado Damage Scale (F-Scale) to provide estimates of tornado strength based on damage surveys. Since it's practically impossible to make direct measurements of tornado winds, an estimate of the winds based on damage is the best way to classify a tornado. The new Enhanced Fujita Scale (EF-Scale) addresses some of the limitations identified by meteorologists and engineers since the introduction of the Fujita Scale in 1971. The new scale identifies 28 different free standing structures most affected by tornadoes taking into account construction quality and maintenance. The range of tornado intensities remains as before, zero to five, with 'EF-0' being the weakest, associated with very little damage and 'EF-5' representing complete destruction, which was the case in Greensburg, Kansas on May 4th, 2007, the first tornado classified as 'EF-5'. The EF scale was adopted on February 1, 2007."<sup>42</sup> The chart (above), adapted from wunderground.com, shows a comparison of the Fujita Scale to the Enhanced Fujita Scale.

Tornadoes are relatively uncommon natural hazards in New Hampshire; on average, about six tornadoes touch down each year. Damage largely depends on where the tornado strikes. If it were to strike an inhabited area, the impact could be severe.

EF SCALE	OLD F-SCALE	TYPICAL DAMAGE
<b>EF-0</b> (65-85mph)	<b>F0</b> (65-73 mph)	<b>Light damage.</b> Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
<b>EF-1</b> (86-110 mph)	<b>F1</b> (74-112 mph)	<b>Moderate damage.</b> Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
<b>EF-2</b> (111-135 mph)	<b>F2</b> (113-157 mph)	<b>Considerable damage.</b> Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off
<b>EF-3</b> (136-165 mph)	<b>F3</b> (158-206 mph)	<b>Severe damage.</b> Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
<b>EF-4</b> (166-200 mph)	<b>F4</b> (207-260 mph)	<b>Devastating damage.</b> Well-constructed houses and whole frame houses completely leveled; cars through and small missiles generated.
<b>EF-5</b> (> 200 mph)	<b>F5</b> (261-318 mph)	<b>Incredible damage.</b> Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (109 yards); high-rise buildings have significant structural deformation; incredible phenomena will occur.
EF No rating	<b>F6-F12</b> (319 mph to speed of sound)	<b>Inconceivable damage.</b> Should a tornado with the maximum wind speed in excess of EF5 occur, the extent and types of damage may not be conceived. A number of missiles such as iceboxes, water heaters, storage tanks, automobiles, etc. will create serious secondary damage on structures.

<sup>42</sup> Enhance Fujita Scale, [http://www.wunderground.com/resources/severe/fujita\\_scale.asp](http://www.wunderground.com/resources/severe/fujita_scale.asp)



**DOWNBURST**

A downburst is a strong downdraft which causes damaging winds on or near the ground according to NOAA. Not to be confused with downburst, the term "microburst" describes the size of the downburst. A comparison of a microburst and the larger macroburst shows that both can cause extreme winds.

A microburst is a downburst with winds extending 2 ½ miles or less, lasting 5 to 15 minutes and causing damaging winds as high as 168 MPH. A macroburst is a downburst with winds extending more than 2 ½ miles lasting 5 to 30 minutes. Damaging winds, causing widespread, tornado-like damage, could be as high as 134 MPH.<sup>43</sup>

**\*WILDFIRE**

As stated by the National Wildfire Coordinating Group (NWCG), wildfires are designated in seven categories as seen in the top chart to the right:<sup>44</sup> For the purpose of statistical analysis, the US Forest Service recognizes the cause of fires according to the bottom chart to the right:<sup>45</sup>

The definition according to the International Wildland-Urban Interface Code of wildfire is "an uncontrolled fire spreading through vegetative fuels exposing and possibly consuming structures". In addition, the IWUIC goes on to define the wildland urban interface area as "that geographical area where structures and other human development meets or intermingles with wildland or vegetative fuels."<sup>46</sup>

There are two main potential losses with a wildfire: the forest itself and the threat to the built-up human environment (the structures within the WUI). In many cases, the only time it is feasible for a community to control a wildfire is when it threatens the built-up human environment. Therefore, the loss to the forest itself will not be a factor in our loss calculation analysis.

Class	Acres Burned
Class A	0 to .25 acres
Class B	.26 to 9 acres
Class C	10 to 99 acres
Class D	100 to 299 acres
Class E	300 to 999 acres
Class F	1,000 to 4,999 acres
Class G	5,000 acres or more
Code	Statistical Cause
1	Lightning
2	Equipment Use
3	Smoking
4	Campfire
5	Debris Burning
6	Railroad
7	Arson
8	Children
9	Miscellaneous

<sup>43</sup> NOAA - <http://www.erh.noaa.gov/cae/svrwx/downburst.htm>

<sup>44</sup> <http://www.nwcg.gov/pms/pubs/glossary/s.htm>

<sup>45</sup> <http://www.fs.fed.us/im/directives/fsh/5109.14/5109.14.20.txt>

<sup>46</sup> International Wildland-Urban Interface Code, 2012, International Code Council, Inc.

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## Appendix D: NH Presidential Disaster & Emergency Declarations

### NH Presidential Disaster Declarations (DR) since 1953

Number	Description	Date of Event	Counties	Description
DR-4209	Severe Winter Storm and Snowstorm	January 26-28, 2015	Hillsborough, Rockingham & Stafford	<b>Presidential Emergency Declaration DR-4206:</b> Severe winter storm and snowstorm in Hillsborough, Rockingham and Strafford Counties; disaster aid to supplement state and local recovery efforts.
DR-4139	Severe Storms, Flooding	July 9-10, 2013	Cheshire, Sullivan & Grafton	<b>Presidential Emergency Declaration DR-4139:</b> Severe storms, flooding and landslides during the period of June 26 to July 3, 2013 in Cheshire, Sullivan and southern Grafton Counties.
DR-4105	Severe Winter Storm	February 8, 2013	All Ten NH Counties	<b>Presidential Emergency Declaration DR-4105:</b> Nemo; heavy snow in February 2013.
DR-4095	Hurricane Sandy	October 26-November 8, 2012	Belknap, Carroll, Coos, Grafton & Sullivan	<b>Presidential Disaster Declaration DR-4095:</b> The declaration covers damage to property from the storm that spawned heavy rains, high winds, high tides and flooding over the period of October 26-November 8, 2012.
DR-4065	Severe Storm & Flooding	May 29-31, 2012	Cheshire	<b>Presidential Disaster Declaration DR-4065:</b> Severe Storm and Flood Event May 29-31, 2012 Cheshire County.
DR-4049	Severe Storm & Snowstorm	October 29-30, 2011	Hillsborough & Rockingham	<b>Presidential Disaster Declaration DR-4049:</b> Severe Storm and Snowstorm Event October 29-30, 2011 Hillsborough and Rockingham Counties.
DR-4026	Tropical Storm Irene	August 26-September 6, 2011	Carroll, Coos, Grafton, Merrimack, Belknap, Strafford, & Sullivan	<b>Presidential Disaster Declaration DR-4026:</b> Tropical Storm Irene Aug 26th- Sept 6, 2011 Carroll, Coos, Grafton, Merrimack, Belknap, Strafford, & Sullivan Counties.
DR-4006	Severe Storms & Flooding	May 26-30, 2011	Coos & Grafton County	<b>Presidential Disaster Declaration DR-4006:</b> May Flooding Event, May 26th-30th 2011 Coos & Grafton County. (aka: Memorial Day Weekend Storm)
DR-1913	Severe Storms & Flooding	March 14-31, 2010	Hillsborough & Rockingham	<b>Presidential Disaster Declaration DR-1913:</b> Flooding to two NH counties including Hillsborough and Rockingham counties.
DR-1892	Severe Winter Storm, Rain & Flooding	February 23 - March 3, 2010	Grafton, Hillsborough, Merrimack, Rockingham, Strafford & Sullivan	<b>Presidential Disaster Declaration: DR-1892:</b> Flood and wind damage to most of southern NH including six counties; 330,000 homes without power; more than \$2 million obligated by June 2010.
DR-1812	Severe Winter Storm & Ice Storm	December 11-23, 2008	All Ten NH Counties	<b>Presidential Declaration DR-1812:</b> Damaging ice storms to entire state including all ten NH counties; fallen trees and large scale power outages; five months after December's ice storm pummeled the region, nearly \$15 million in federal aid had been obligated by May 2009.
DR-1799	Severe Storms & Flooding	September 6-7, 2008	Hillsborough	<b>Presidential Declaration: DR-1799:</b> Severe storms and flooding beginning on September 6-7, 2008.
DR-1787	Severe Storms & Flooding	July 24-August 14, 2008	Belknap, Carroll & Grafton & Coos	<b>Presidential Declaration DR-1787:</b> Severe storms, tornado and flooding on July 24, 2008.

### NH Presidential Disaster Declarations (DR) since 1953

<b>DR-1782</b>	Severe Storms, Tornado, & Flooding	July 24, 2008	Belknap, Carroll, Merrimack, Strafford & Rockingham	<b>Presidential Declaration DR-1782:</b> Tornado damage to several NH counties.
<b>DR-1695</b>	Nor'easter, Severe Storms & Flooding	April 15-23, 2007	All Ten NH Counties	<b>Presidential Disaster Declaration DR-1695:</b> Flood damages; FEMA & SBA obligated more than \$27.9 million in disaster aid following the April nor'easter. (aka: Tax Day Storm)
<b>DR-1643</b>	Severe Storms & Flooding	May 12-23, 2006	Belknap, Carroll, Grafton, Hillsborough, Merrimack, Rockingham & Strafford	<b>Presidential Disaster Declaration DR-1643:</b> Flooding in most of southern NH, May 12-23, 2006. (aka: Mother's Day Storm)
<b>DR-1610</b>	Severe Storms & Flooding	October 7-18, 2005	Belknap, Cheshire, Grafton, Hillsborough, Merrimack & Sullivan	<b>Presidential Disaster Declaration DR-1610:</b> To date, state and federal disaster assistance has reached more than \$3 million to help residents and business owners in New Hampshire recover from losses resulting from the severe storms and flooding in October.
<b>DR-1489</b>	Severe Storms & Flooding	July 21-August 18, 2003	Cheshire & Sullivan	<b>Presidential Disaster Declaration DR-1489:</b> Floods stemming from persistent rainfall and severe storms that caused damage to public property occurring over the period of July 21 through August 18, 2003.
<b>DR-1305</b>	Tropical Storm Floyd	September 16-18, 1999	Belknap, Cheshire & Grafton	<b>Presidential Disaster Declaration DR-1305:</b> The declaration covers damage to public property from the storm that spawned heavy rains, high winds and flooding over the period of September 16-18.
<b>DR-1231</b>	Severe Storms & Flooding	June 12-July 2, 1998	NA	<b>Presidential Disaster Declaration DR-1231:</b>
<b>DR-1199</b>	Ice Storms	January 7-25, 1998	NA	<b>Presidential Disaster Declaration DR-1199:</b>
<b>DR-1144</b>	Severe Storms/Flooding	October 20-23, 1996	NA	<b>Presidential Disaster Declaration DR-1144:</b>
<b>DR-1077</b>	Storms/Floods	October 20-November 15, 1995	NA	<b>Presidential Disaster Declaration DR-1077:</b>
<b>DR-923</b>	Severe Coastal Storm	October 30-31, 1991	NA	<b>Presidential Disaster Declaration DR-923:</b>
<b>DR-917</b>	Hurricane Bob, Severe Storm	August 18-20, 1991	NA	<b>Presidential Disaster Declaration DR-917:</b>
<b>DR-876</b>	Flooding, Severe Storm	August 7-11, 1990	NA	<b>Presidential Disaster Declaration DR-876:</b>
<b>DR-789</b>	Severe Storms & Flooding	March 30-April 11, 1987	NA	<b>Presidential Disaster Declaration DR-789</b>
<b>DR-771</b>	Severe Storms & Flooding	July 29-August 10, 1986	NA	<b>Presidential Disaster Declaration DR-771:</b>
<b>DR-549</b>	High Winds, Tidal Surge, Coastal Flooding & Snow	February 16, 1978	NA	<b>Presidential Disaster Declaration DR-549:</b> Blizzard of 1978
<b>DR-411</b>	Heavy Rains, Flooding	January 21, 1974	NA	<b>Presidential Disaster Declaration DR-411:</b>



### NH Presidential Disaster Declarations (DR) since 1953

<b>DR-399</b>	Severe Storms & Flooding	July 11, 1973	NA	<b>Presidential Disaster Declaration DR-399:</b>
<b>DR-327</b>	Coastal Storms	March 18, 1972	NA	<b>Presidential Disaster Declaration DR-327:</b>
<b>DR-11</b>	Wildfire	July 2, 1953	NA	<b>Presidential Disaster Declaration DR-11:</b>

### Emergency Declarations (EM) since 1953

Number	Description	Date of Event	Counties	Description
<b>EM-3360</b>	Hurricane Sandy	October 26-31, 2012	All Ten	<b>Presidential Emergency Declaration EM-3360:</b> Hurricane Sandy came ashore in NJ and brought high winds, power outages and heavy rain to NH; all ten counties in the State of New Hampshire.
<b>EM-3344</b>	Severe Snow Storm	October 29-30, 2011	All Ten	<b>Presidential Emergency Declaration EM-3344:</b> Severe storm during the period of October 29-30, 2011; all ten counties in the State of New Hampshire. (aka: Snowtober)
<b>EM-3333</b>	Hurricane Irene	August 26-September 6, 2011	All Ten	<b>Presidential Emergency Declaration EM-3333:</b> Emergency Declaration for Tropical Storm Irene for in all ten counties.
<b>EM-3297</b>	Severe Winter Storm	December 11, 2008	All Ten	<b>Presidential Emergency Declaration EM-3297:</b> Severe winter storm beginning on December 11, 2008.
<b>EM-3258</b>	Hurricane Katrina Evacuation	August 29-October 1, 2005	All Ten	<b>Presidential Emergency Declaration EM-3258:</b> Assistance to evacuees from the area struck by Hurricane Katrina and to provide emergency assistance to those areas beginning on August 29, 2005 and continuing; The President's action makes Federal funding available to the State and all 10 counties of the State of New Hampshire.
<b>EM-3211</b>	Snow	March 11-12, 2005	Carroll, Cheshire, Hillsborough, Rockingham & Sullivan	<b>Presidential Emergency Declaration EM-3211:</b> March snowstorm; more than \$2 million has been approved to help pay for costs of the snow removal; Total aid for the March storm is <b>\$2,112,182.01</b> (Carroll: \$73,964.57; Cheshire: \$118,902.51; Hillsborough: \$710,836; Rockingham: \$445,888.99; Sullivan: \$65,088.53; State of NH: \$697,501.41)
<b>EM-3208</b>	Snow	February 10-11, 2005	Carroll, Cheshire, Coos, Grafton & Sullivan	<b>Presidential Emergency Declaration EM-3208:</b> FEMA had obligated more than \$1 million by March 2005 to help pay for costs of the heavy snow and high winds; Total aid for the February storm was <b>\$1,121,727.20</b> (Carroll: \$91,832.72; Cheshire: \$11,0021.18; Coos: \$11,6508.10; Grafton: \$213,539.52; Sullivan: \$68,288.90; State of NH: \$521,536.78) <b>EM 3208-002:</b> The Federal Emergency Management Agency (FEMA) had obligated more than \$6.5 million to reimburse state and local governments in New Hampshire for costs incurred in three snow storms that hit the state earlier this year, according to disaster recovery officials. Total aid for all three storms was \$6,892,023.87 (January: \$3,658,114.66; February: \$1,121,727.20; March: \$2,113,182.01)

### NH Presidential Disaster Declarations (DR) since 1953

<b>EM-3207</b>	Snow	January, 22-23, 2005	Belknap, Carroll, Cheshire, Grafton, Hillsborough, Rockingham, Merrimack, Strafford & Sullivan	<b>Presidential Emergency Declaration EM-3207:</b> JANUARY STORM DAMAGE: More than \$3.5 million had been approved to help pay for costs of the heavy snow and high winds; Total aid for the January storm was <b>\$3,658,114.66</b> (Belknap: \$125,668.09; Carroll: \$52,864.23; Cheshire: \$134,830.95; Grafton: \$137,118.71; Hillsborough: \$848,606.68; Merrimack: \$315,936.55; Rockingham: \$679,628.10; Strafford: \$207,198.96; Sullivan: \$48,835.80; State of NH: \$1,107,426.59)
<b>EM-3193</b>	Snow	December 6-7, 2003	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack & Sullivan	<b>Presidential Emergency Declaration EM-3193:</b> The declaration covers jurisdictions with record and near-record snowfall that occurred over the period of December 6-7, 2003
<b>EM-3177</b>	Snowstorm	February 17-18, 2003	Cheshire, Hillsborough, Merrimack, Rockingham & Strafford	<b>Presidential Emergency Declaration EM-3177:</b> Declaration covers jurisdictions with record and near-record snowfall from the snowstorm that occurred February 17-18, 2003
<b>EM-3166</b>	Snowstorm	March 5-7, 2001	Cheshire, Coos, Grafton, Hillsborough, Merrimack, & Strafford	<b>Presidential Emergency Declaration EM-3166:</b> Declaration covers jurisdictions with record and near-record snowfall from the late winter storm that occurred March 2001
<b>EM-3101</b>	High Winds & Record Snowfall	March 13-17, 1994	NA	<b>Presidential Emergency Declaration EM-3101:</b>
<b>EM-3073</b>	Flooding	March 15, 1979	NA	<b>Presidential Emergency Declaration EM-3073:</b>

**Source:**

Disaster Declarations for New Hampshire

[http://www.fema.gov/disasters/grid/state-tribal-government/33?field\\_disaster\\_type\\_term\\_tid\\_1=All](http://www.fema.gov/disasters/grid/state-tribal-government/33?field_disaster_type_term_tid_1=All)

## Appendix E: Potential Mitigation Ideas<sup>47</sup>

### Drought

- D1 ..... Assess Vulnerability to Drought Risk
- D2 ..... Monitoring Drought Conditions
- D3 ..... Monitor Water Supply
- D4 ..... Plan for Drought
- D5 ..... Require Water Conservation during Drought Conditions
- D6 ..... Prevent Overgrazing
- D7 ..... Retrofit Water Supply Systems
- D8 ..... Enhance Landscaping & Design Measures
- D9 ..... Educate Residents on Water Saving Techniques
- D10 .... Educate Farmers on Soil & Water Conservation Practices
- D11 .... Purchase Crop Insurance

### Earthquake

- EQ1 .... Adopt & Enforce Building Codes
- EQ2 .... Incorporate Earthquake Mitigation into Local Planning
- EQ3 .... Map & Assess Community Vulnerability to Seismic Hazards
- EQ4 .... Conduct Inspections of Building Safety
- EQ5 .... Protect Critical Facilities & Infrastructure
- EQ6 .... Implement Structural Mitigation Techniques
- EQ7 .... Increase Earthquake Risk Awareness
- EQ8 .... Conduct Outreach to Builders, Architects, Engineers and Inspectors
- EQ9 .... Provide Information on Structural & Non-Structural Retrofitting

### Erosion

- ER1 .... Map & Assess Vulnerability to Erosion
- ER2 .... Manage Development in Erosion Hazard Areas
- ER3 .... Promote or Require Site & Building Design Standards to Minimize Erosion Risk
- ER4 .... Remove Existing Buildings & Infrastructure from Erosion Hazard Areas
- ER5 .... Stabilize Erosion Hazard Areas
- ER6 .... Increase Awareness of Erosion Hazards

### Extreme Temperatures

- ET1 .... Reduce Urban Heat Island Effect
- ET2 .... Increase Awareness of Extreme Temperature Risk & Safety
- ET3 .... Assist Vulnerable Populations
- ET4 .... Educate Property Owners about Freezing Pipes

### Hailstorm

- HA1 .... Locate Safe Rooms to Minimize Damage
- HA2 .... Protect Buildings from Hail Damage
- HA3 .... Increase Hail Risk Awareness

### Landslide

- LS1 .... Map & Assess Vulnerability to Landslides
- LS2 .... Manage Development in Landslide Hazard Areas
- LS3 .... Prevent Impacts to Roadways
- LS4 .... Remove Existing Buildings & Infrastructure from Landslide

### Lightning

- L1 ..... Protect Critical Facilities
- L2 ..... Conduct Lightning Awareness Programs

### Flood

- F1 ..... Incorporate Flood Mitigation in Local Planning
- F2 ..... Form Partnerships to Support Floodplain Management
- F3 ..... Limit or Restrict Development in Floodplain Areas
- F4 ..... Adopt & Enforce Building Codes and Development Standards
- F5 ..... Improve Storm water Management Planning
- F6 ..... Adopt Policies to Reduce Storm water Runoff
- F7 ..... Improve Flood Risk Assessment
- F8 ..... Join or Improve Compliance with NFIP
- F9 ..... Manage the Floodplain beyond Minimum Requirements
- F10 .... Participate in the CRS
- F11 .... Establish Local Funding Mechanism for Flood Mitigation
- F12 .... Remove Existing Structures from Flood Hazard Areas
- F13 .... Improve Storm water Drainage System Capacity
- F14 .... Conduct Regular Maintenance for Drainage Systems & Flood Control Structures
- F15 .... Elevate of Retrofit Structures & Utilities
- F16 .... Flood proof Residential & Non-Residential Structures
- F17 .... Protect Infrastructure
- F18 .... Protect Critical Facilities
- F19 .... Construct Flood Control Measures
- F20 .... Protect & Restore Natural Flood Mitigation Features
- F21 .... Preserve Floodplains as Open Space
- F22 .... Increase Awareness of Flood Risk & Safety
- F23 .... Educate Property Owners about Flood Mitigation Techniques

### Severe Wind

- SW1 ... Adopt & Enforce Building Codes
- SW2 ... Promote or Require Site & Building Design Standards to Minimize Wind Damage
- SW3 ... Assess Vulnerability to Severe Wind
- SW4 ... Protect Power Lines & Infrastructure
- SW5 ... Retrofit Residential Buildings
- SW6 ... Retrofit Public Buildings & Critical Facilities
- SW7 ... Increase Severe Wind Awareness

### Severe Winter Weather

- WW1.. Adopt & Enforce Building Codes
- WW2.. Protect Buildings & Infrastructure
- WW3.. Protect Power Lines
- WW4.. Reduce Impacts to Roadways
- WW5.. Conduct Winter Weather Risk Awareness Activities
- WW6.. Assist Vulnerable Populations

### Tornado

- T1 ..... Encourage Construction of Safe Rooms
- T2 ..... Require Wind-Resistant Building Techniques
- T2 ..... Conduct Tornado Awareness Activities

<sup>47</sup> Mitigation Ideas, A Resource for Reducing Risk to Natural Hazards, FEMA, January 2013

### **Wildfire**

WF1 ... Map & Assess Vulnerability to Wildfire  
WF2 ... Incorporate Wildfire Mitigation in the Comprehensive Plan  
WF3 ... Reduce Risk through Land Use Planning  
WF4 ... Develop a Wildland Urban Interface Code  
WF5 ... Require or Encourage Fire-Resistant Construction Techniques  
WF6 ... Retrofit At-Risk Structure with Ignition-Resistant Materials  
WF7 ... Create Defensible Space around Structures & Infrastructure  
WF8 ... Conduct Maintenance to Reduce Risk  
WF9 ... Implement a Fuels Management Program  
WF10 . Participate in the Firewise Program  
WF11 . Increase Wildfire Awareness  
WF12 . Educate Property Owners about Wildfire Mitigation Techniques

### **Multi-Hazards**

MU1 ... Assess Community Risk  
MU2 ... Map Community Risk  
MU3 ... Prevent Development in Hazard Areas  
MU4 ... Adopt Regulations in Hazard Areas  
MU5 ... Limit Density in Hazard Areas  
MU6 ... Integrate Mitigation into Local Planning  
MU7 ... Strengthen Land Use Regulations  
MU8 ... Adopt & Enforce Building Codes  
MU9 ... Create Local Mechanisms for Hazard Mitigation  
MU10 . Incentivize Hazard Mitigation  
MU11 . Monitor Mitigation Plan Implementation  
MU12 . Protect Structures  
MU13 . Protect Infrastructure & Critical Facilities  
MU14 . Increase Hazard Education & Risk Awareness  
MU15 . Improve Household Disaster Preparedness  
MU16 . Promote Private Mitigation Efforts

## Appendix F: Acronyms

### Hazard Mitigation Planning List of Acronyms

ACS.....	American Community Survey (Census)
BFE .....	Base Flood Elevation
BOCA.....	Building Officials and Code Administrators International
CIKR .....	Critical Infrastructure & Key Resources
CIP .....	Capital Improvements Program
CWPP .....	Community Wildfire Protection Plan
DRED .....	Department of Resources & Economic Development
EMD .....	Emergency Management Director
EMS .....	Emergency Medical Services
EOC .....	Emergency Operations Center
ERF.....	Emergency Response Facility
FEMA .....	Federal Emergency Management Agency
FIRM .....	Flood Insurance Rate Map
FPP .....	Facilities & Populations to Protect
GIS.....	Geographic Information System
HFRA .....	Healthy Forest Restoration Act
HMGP .....	Hazard Mitigation Grant Program
HSEM.....	Homeland Security & Emergency Management (NH)
ICS.....	Incident Command System
LEOP .....	Local Emergency Operations Plan
MOU.....	Memorandum of Understanding
NCRC&D.....	North Country Resource Conservation & Development Council
NOAA.....	National Oceanic and Atmospheric Association
NSSL.....	National Severe Storms Laboratory (NOAA)
MAPS.....	Mapping and Planning Solutions
NERF .....	Non-Emergency Response Facility
NFIP .....	National Flood Insurance Program
NGVD.....	National Geodetic Vertical Datum of 1929
NHDOT .....	NH Department of Transportation
NIMS .....	National Incident Management System
PR .....	Potential Resources
SPNHF.....	Society for the Protection of New Hampshire Forests
USDA .....	US Department of Agriculture
USDA-FS .....	USDA-Forest Service
USGS.....	United States Geological Society
WMNF.....	White Mountain National Forest
WUI.....	Wildland Urban Interface

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## **Appendix G: Map Documents**

The following 11" x 17" maps are included in hard copy plans:

*Map 1 – Base Risk Analysis*

*Map 2 – Historic Wildfires & Wildland Urban Interface*

*Map 3 – Past & Potential Areas of Concern*

*Map 4 – Critical Infrastructure & Key Resources*

*Map 5 – Downtown Berlin Critical Infrastructure & Key Resources*

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**To be replaced with 11" x 17" map in final hard copy.**

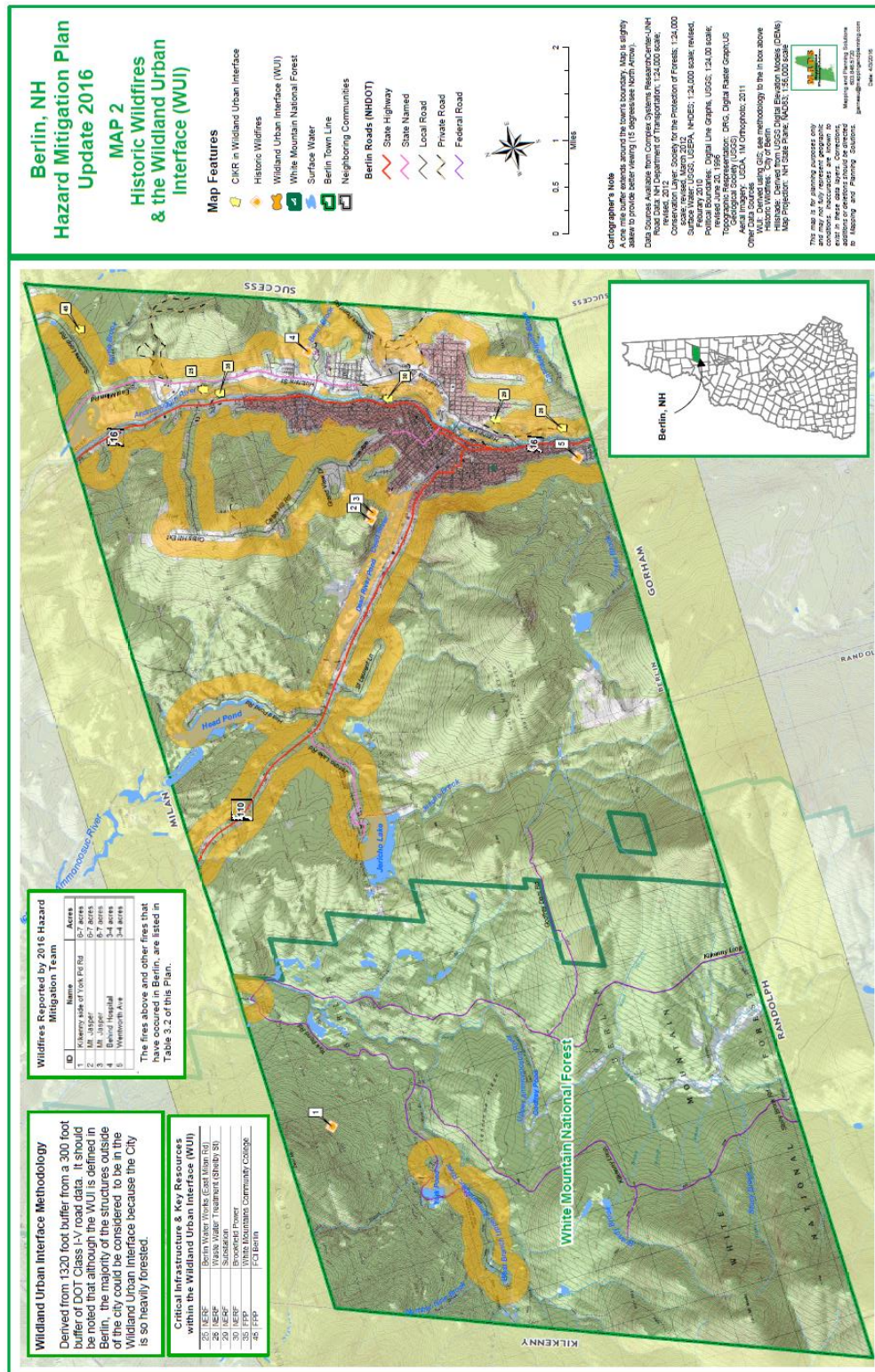


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## MAP 2 – HISTORIC WILDFIRES & THE WILDLAND URBAN INTERFACE

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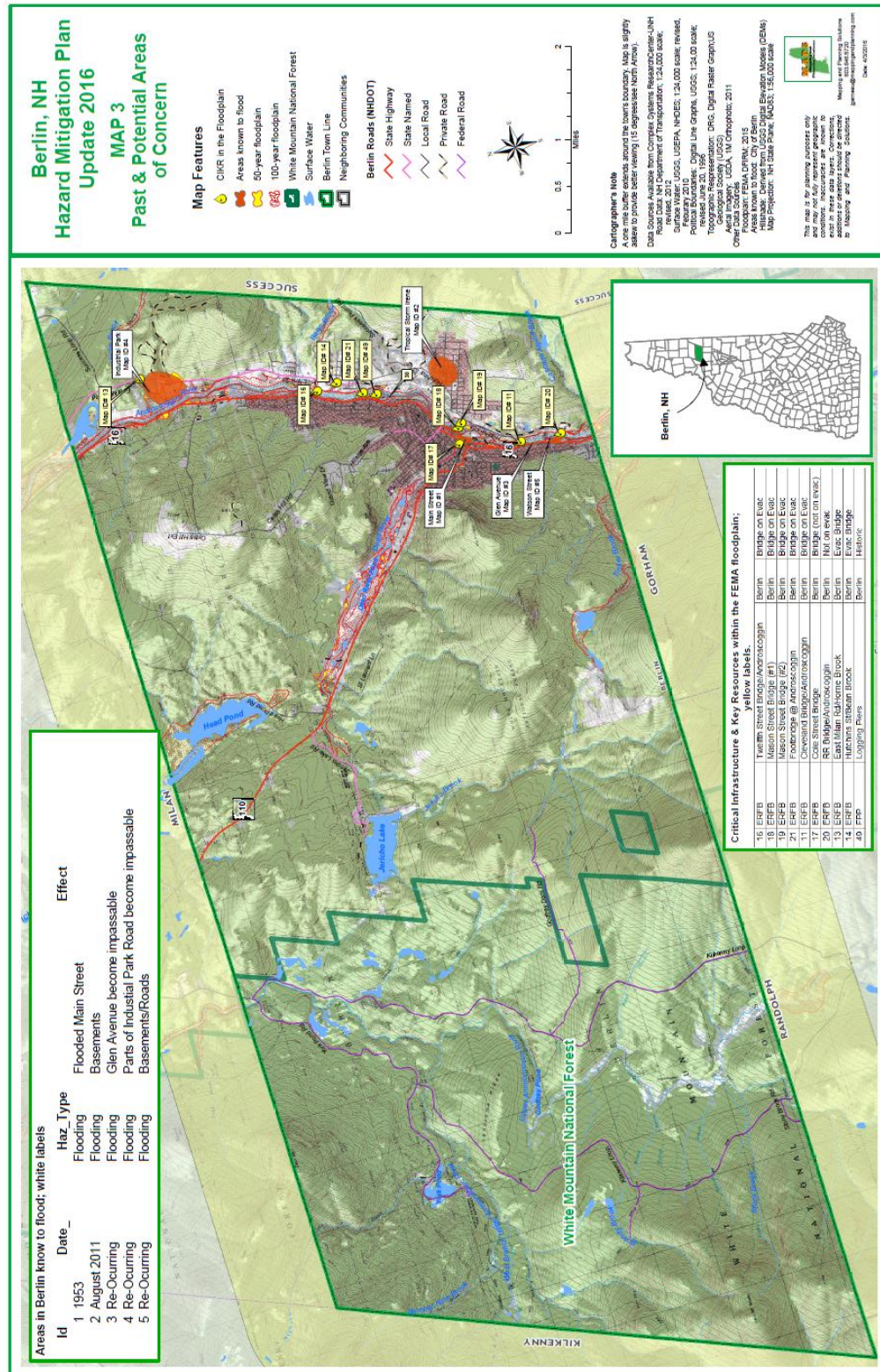


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### MAP 3 – PAST & POTENTIAL AREAS OF CONCERN

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*Androscoggin River Boom Piers*

*Photo Credit: <http://www.wmur.com/image/view/-/11950282/medRes/1/-/9v8b3d/-/Berlin--DD---30666633.jpg>*

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