

# Town of Tuftonboro, New Hampshire Hazard Mitigation Plan Update, 2015

*Prepared by the:*

**Tuftonboro Hazard Mitigation Update Committee**



**August 2015**

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# Town of Tuftonboro, New Hampshire Hazard Mitigation Plan Update

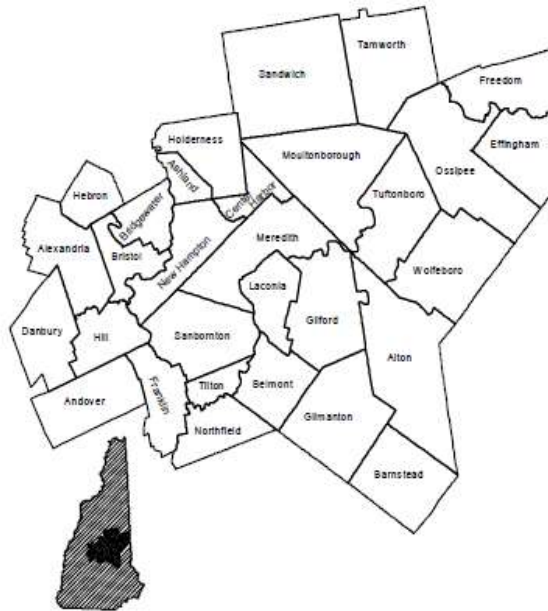
August 2015

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**Acronyms and Abbreviations**

|            |   |
|------------|---|
| AHHR       | All Hazards Health Region                                 |
| CCPHN      | Carroll County Public Health Network                      |
| CEO        | Code Enforcement Officer                                  |
| Cons. Com. | Conservation Commission                                   |
| COPS       | Community Oriented Policing Services                      |
| CRS        | Community Rating System                                   |
| DES        | New Hampshire Department of Environmental Services        |
| DOT        | New Hampshire Department of Transportation                |
| DPW        | Department of Public Works                                |
| Dth        | Death   |
| ESF        | Emergency Support Function                                |
| EMD        | Emergency Management Director                             |
| EMPG       | Emergency Mitigation Performance Grant                    |
| EOC        | Emergency Operations Center                               |
| FD         | Fire Department   |
| FEMA       | Federal Emergency Management Agency                       |
| GIS        | Geographic Information System                             |
| HazMat     | Hazardous Materials                                       |
| HD         | Highway Department  |
| HMGP       | Hazard Mitigation Grant Program                           |
| HSEM       | New Hampshire Homeland Security and Emergency Management  |
| Inj        | Injury  |
| IBC        | International Building Code                               |
| IPC        | International Plumbing Code                               |
| ISO        | Insurance Service Office - A fire protection rating scale |
| LEOP       | Local Emergency Operations Plan                           |
| LRPC       | Lakes Region Planning Commission                          |
| Mag        | Magnitude   |
| NIMS       | National Incident Management System                       |
| NFIP       | National Flood Insurance Program                          |
| NFPA       | National Fire Protection Association                      |
| NOAA       | National Oceanic and Atmospheric Administration           |
| PB         | Planning Board  |
| PD         | Police Department   |
| PHEPRP     | Public Health Emergency Preparedness Response Plan        |
| PrD        | Property Damages  |
| PSU        | Plymouth State University                                 |
| RSA        | Revised Statute Annotated (New Hampshire's state laws)    |
| SADES      | Statewide Asset Data Exchange System                      |
| T2         | New Hampshire Technology Transfer Center                  |
| UNH        | University of New Hampshire                               |
| USACE      | United States Army Corps of Engineers                     |

## EXECUTIVE SUMMARY

The *Tuftonboro Hazard Mitigation Plan Update* (the Plan) serves as a means to reduce future losses from natural or man-made hazard events before they occur. The Plan was developed by the Tuftonboro Hazard Mitigation Planning Update Committee (the Committee) with assistance from the Lakes Region Planning Commission, and contains statements of policy adopted by the Board of Selectmen in Chapter VI.

The Committee determined those natural and human-related hazards which pose at least a moderate risk, based on a ranking system detailed in Chapter III, and shown below. The Committee agreed that the High and Moderate Risk Hazards identified in the 2009 Plan continue today although the level of risk has changed on some of them. Flooding, Hazardous Materials in Transport, and Urban Fire are now viewed as moderate risk, not high risk. A breach of cyber security replaced biological terror as a moderate risk hazard.

| High Risk Hazard                | Moderate Risk Hazard            |
|---------------------------------|---------------------------------|
| Severe Wind (Tornado/Downburst) | Hazardous Materials (Transport) |
|                                 | Lightning                       |
|                                 | Severe Winter Weather           |
|                                 | Urban Fire                      |
|                                 | Cyber security breach           |
|                                 | Flooding                        |

The biggest change to the list of Critical Facilities is the addition of the new Fire Station. The Committee identified numerous existing programs related to hazard mitigation including the following:

| Existing Plans, Regulations and Practices Supporting Hazard Mitigation |  |
|--|--|
| Hazard Mitigation Plan 2009  | Subdivision Regulations                |
| Code Enforcement   | Site Plan Review Regulations           |
| Zoning Ordinance   | Master Plan, 2006                      |
| Flood Plain Ordinance  | School Emergency Operation Plan        |
| Mutual Aid Agreements  | Emergency Response Training and Drills |

About half of the Actions from the 2009 Plan have either been completed or are no longer pertinent. In its effort to further reduce the vulnerability of the town to future hazards, the committee developed a list of 18 general and hazard-specific mitigation actions. These actions were prioritized based on local criteria. Discussions were held regarding how implementation might occur over the next five years. The results of these discussions are summarized in Table 18: Implementation Schedule for Mitigation Actions.

## **CHAPTER I: PLANNING PROCESS**

### **A. BACKGROUND**

A community must have an approved hazard mitigation plan in order to apply for Federal Emergency Management Agency (FEMA) Hazard Mitigation Funding. These grant funds are to be used for hazard mitigation projects and actions that will ultimately reduce and mitigate future losses from natural or human hazard events. In response to this requirement, the NH Department of Safety's Division of Homeland Security and Emergency Management (HSEM) and the nine regional planning commissions in the state entered into agreements to aid communities with plan development and update. The plan development process generally followed the steps outlined in FEMA's *Local Mitigation Planning Handbook* (2013).

### **B. AUTHORITY**

The town of Tuftonboro Hazard Mitigation Plan was prepared pursuant to Section 322, Mitigation Planning of the Robert T. Stafford Disaster Relief and Emergency Assistance Act and Section 104 of the Disaster Mitigation Act (DMA) of 2000. Section 322 of DMA 2000 emphasizes the need for State, local and tribal entities to closely coordinate mitigation planning and implementation efforts.

### **C. FUNDING SOURCE**

The New Hampshire Department of Safety's Homeland Security and Emergency Management (NH HSEM) funded the Plan with matching funds from the Lakes Region Planning Commission.

### **D. PURPOSE**

The Tuftonboro Hazard Mitigation Plan is a planning tool to be used by the town of Tuftonboro, as well as other local, state, and federal government entities, in their efforts to reduce the negative effects from natural and human-related hazards. The Plan contains statements of policy as outlined in the [Implementation Schedule for Mitigation Actions](#) and in [Chapter VI: Plan Adoption and Monitoring](#). All other sections of this plan are support and documentation for informational purposes only and are not included as a statement of policy.

### **E. SCOPE OF PLAN**

The scope of this Plan includes the identification of natural and human-related hazards affecting the town of Tuftonboro, as identified by the Committee. Chapter III discusses the identification and review of these hazards. The plan also describes the process through which actions intended to mitigate these hazards were developed and prioritized.



## F. METHODOLOGY

The Lakes Region Planning Commission (LRPC) corresponded with the Tuftonboro Emergency Management Director (EMD) in the fall of 2013 to initiate the hazard mitigation update process in the town of Tuftonboro and was followed by a meeting with the Selectmen to discuss the process. The EMD established the Tuftonboro Hazard Mitigation Planning Update Committee in for the purpose of updating a long-range plan for hazard mitigation. The Committee consisted of representatives from the Police and Fire Departments, the Road Agent, the Code Enforcement Officer, a school employee, a local business owner, and one of the town's Board of Selectmen. All meetings were open to the public and a few did attend.

Using FEMA's *Local Mitigation Plan Review Guide (2011)*, *Mitigation Planning Workshop (2012)* materials, and the *Local Mitigation Planning Handbook (2013)* as guidance, the Committee reviewed and updated various elements of the town's 2009 Hazard Mitigation Plan. The planner and the committee reviewed and referenced a variety of plans, studies, reports, and technical information during the development of this Plan Update; a list of these resources can be found in Appendix I. Data on property valuation was provided by the town.

The Committee held meetings from January 2014 through March 2014, with committee and public review and comment on the draft in December 2014. The following timeline shows the dates and corresponding Committee actions. The committee reviewed each section of the plan and LRPC staff provided updated information on hazards in New Hampshire. Each section of the existing plan was revised and reformatted in order to develop a more comprehensive document. Meeting agendas were posted in Town Hall and at the LRPC web page and are included in Appendix D.

**October 28, 2013**      *Tuftonboro Board of Selectmen Meeting: Tuftonboro Town Offices*  
 Review of the purpose and key elements of the Hazard Mitigation Plan  
 Overview of the update process and the role of the Board of Selectmen  
 Discussion of outreach to potential committee members

### Committee Meetings

**January 28, 2014:**      *Introductory Committee Meeting: Tuftonboro Central Fire Station*  
 Overview of update process and objectives  
 Discussion of Development Trends since 2009  
 Locate critical facilities and hazards on map  
 Identify Hazard Events since 2009

**February 10, 2014:**      *Committee Meeting: Tuftonboro Central Fire Station*  
 Probability of Hazard Occurrence  
 Status of 2009 Recommendations  
 Risk Assessment

**February 24, 2014:**      *Committee Meeting: Tuftonboro Central Fire Station*  
 Status of 2009 Recommendations  
 Goals  
 Mitigation Actions

**March 10, 2014:**      *Committee Meeting: Tuftonboro Central Fire Station*  
                                  Prioritization of Actions  
                                  Implementation

### **Public Involvement**

The Tuftonboro EMD invited a variety of Hazard Mitigation Planning stakeholders to join the Hazard Mitigation Planning Committee. The Committee was well represented by municipal officials, including members of the Board of Selectmen. Specific opportunities for public input occurred at each meeting. Local businesses, neighboring communities, and members of the public were encouraged to attend all meetings through press releases and postings on the town and LRPC websites (Appendix C). Additionally, the Board of Selectmen meeting and one of the committee meetings was videotaped by a resident and broadcast on the local Community Access TV. Members of the public did engage in discussions regarding hazards and potential impacts and posed questions about funding of the planning process and potential funding assistance to town for mitigation projects (Potential resources are identified in both Table 18 and Appendix B). No additional public comments were received during the review period.

### **G. ACKNOWLEDGMENTS**

Special thanks to those that assisted in the development of this Plan:

|                      |   |
|----------------------|---|
| Adam Thompson        | Tuftonboro Fire Department, <i>Chief/EMD</i>  |
| Carolyn Sundquist    | Tuftonboro Board of Selectmen, <i>Selectman</i>   |
| Andrew Shagoury      | Tuftonboro Police Department, <i>Chief</i>  |
| Caleb Pike           | Tuftonboro Fire Department, <i>Lieutenant</i>   |
| Jack Parson          | Tuftonboro Planning Board, <i>Vice-Chair</i> and<br>Tuftonboro <i>Health and Code Enforcement Officer</i> |
| Jim Bean             | Tuftonboro Highway Department, <i>Road Agent</i>  |
| Frank Tranchita, Jr. | Tuftonboro <i>Citizen and Business Owner</i>  |
| Arthur Grupp         | Tuftonboro Central School, <i>Facilities Manager</i>  |

|              |   |
|--------------|---|
| Heidi Lawton | NH Homeland Security and Emergency Management, <i>Carroll County Field Representative</i> |
|--------------|---|

|               |   |
|---------------|---|
| David Jeffers | Lakes Region Planning Commission, <i>Regional Planner</i> |
|---------------|---|

Additional assistance was provided by:

|                  |   |
|------------------|---|
| Jennifer Gilbert | NH Office of Energy and Planning, <i>Floodplain Management Coordinator</i> ,    |
| Joe Kowalski     | Tuftonboro <i>Citizen and Videographer</i>                                      |
| Diane Falcey     | Tuftonboro <i>Administrative Assistant, Assessing</i>                           |
| Parker Moore     | NH Homeland Security and Emergency Management, <i>Hazard Mitigation Planner</i> |

## CHAPTER II: COMMUNITY PROFILE

### A. GEOGRAPHY



The town of Tuftonboro is located on the southwestern section of Carroll County. It is bordered by Wolfeboro to the southeast, Ossipee to the northeast, and Moultonborough to the northwest. The southwestern edge of town is formed by the shoreline of Lake Winnepesaukee including half a dozen seasonally inhabited islands.

Tuftonboro's northern section is dominated by the Ossipec Mountains with elevations reaching 3,000 feet. A quarter of the land in Tuftonboro has slopes greater than 15%.

The town of Tuftonboro contains 40.6 square miles (82%) of land area and 8.8 square miles (18%) of inland water area.<sup>3</sup> Lake Winnepesaukee is the most prominent surface water feature, others include Mirror Lake, Lower Beech Pond, Dan Hole Pond, Copp's Pond, and the Melvin River.

### B. WEATHER CONDITIONS

Like many New England towns, Tuftonboro's temperatures and precipitation vary greatly. January temperatures range from an average high of 28 degrees Fahrenheit to an average low of 5 degrees Fahrenheit. July temperatures range from an average high of 80 degrees Fahrenheit to an average low of 53 degrees Fahrenheit. Annual precipitation totals average about 53 inches, where the distribution is slightly lower in the winter months when compared to summer months.<sup>1</sup> Tuftonboro averages about 70 inches of snow per year.<sup>2</sup>

### C. PUBLIC SERVICES

A three-member Board of Selectmen governs the town of Tuftonboro. The Tuftonboro Fire Department has a chief and one full-time and 29 call firefighters and/or EMTs. The Fire Chief is also the Emergency Management Director. The Police Department consists of a Chief and four officers. The Road Agent maintains 35.4 miles of town roads. Most town facilities are located near the center of town along NH Route 109A. Huggins Hospital is located in Wolfeboro, twelve miles south of town. Additional hospitals are located in North Conway (33 miles) and Laconia (39 miles).

### D. DEVELOPMENT TRENDS

Like many Lakes Region communities, the population of Tuftonboro grew a great deal between 1980 and 2010 (Figure 1). Population growth is projected to continue but at a slower rate over the next few

<sup>1</sup> <http://www.weather.com/weather/wxclimatology/monthly/graph/03816>, visited October 10, 2013.

<sup>2</sup> <http://www.city-data.com/city/Tuftonboro-New-Hampshire.html>, visited October 10, 2013.

decades (Figure 2). The median age of residents in 2010 was 50.8 years, up from 47.7 on 2000. The population density of Tuftonboro is 58.3 persons per square mile of land area.<sup>3</sup>

**Table 1: Tuftonboro, NH Year-Round Population, 1980-2010**

| Year       | 1980  | 1990  | 2000  | 2010  |
|------------|-------|-------|-------|-------|
| Population | 1,500 | 1,842 | 2,148 | 2,387 |
| % Changed  | ---   | 23%   | 17%   | 11%   |

**Table 2: Tuftonboro, NH Projected Year-Round Population, 2020-2040<sup>4</sup>**

| Year       | 2010  | 2020  | 2030  | 2040  |
|------------|-------|-------|-------|-------|
| Population | 2,387 | 2,547 | 2,719 | 2,796 |
| % Change   | ---   | 7%    | 7%    | 3%    |

Between 2009 and 2012 a total of 19 Single Family Housing Permits were issued in Tuftonboro, down from the 108 that had been granted in the previous four years. There was one Manufactured Housing Unit permit issued during this time period; zero in the prior four years. There have been no Commercial or Industrial permits issued in this time period. Of Tuftonboro's 2,435 housing units in 2010, the Census reported that 1,293 or 53% were seasonal, slightly higher than in 2000. This is nearly twice the seasonal housing rate of the Lakes Region (29%). The 2006 Master Plan estimated that the seasonal population was likely more than 6,100 not including transient visitors and guests.<sup>5</sup>

Three state routes run through Tuftonboro, generally parallel to each other. NH Route 109 and 109A run from Wolfeboro to Moultonborough with Route 109 running along the lakeshore and Route 109A going through the center of town, serving most of the town's critical facilities. NH Route 171 runs across the northern section of town connecting Moultonborough with Ossipee.

Table 3 indicates the Average Annual Daily Traffic counts, measured in vehicles per day. As this is a projected average over the entire year, there are certainly many summer days when the volume of traffic on any one of these roads far exceeds these figures. These records from the NH Department of Transportation indicate little change in traffic volumes since 2007 along the major roadways in Tuftonboro.

<sup>3</sup> *New Hampshire Community Profiles*, NH Employment and Security Office, <http://www.nhes.state.nh.us/elmi/htmlprofiles/Tuftonboro.html>, visited October 9, 2013.

<sup>4</sup> New Hampshire Office of Energy and Planning, March 2013 <http://www.nh.gov/oep/data-center/documents/2013-projections-municipalities.pdf>.

<sup>5</sup> Tuftonboro Master Plan (2012) [http://www.tuftonboro.org/pages/TuftonboroNH\\_Boards/Planning/toc](http://www.tuftonboro.org/pages/TuftonboroNH_Boards/Planning/toc), Chapter 2, p.11.

**Table 3: Tuftonboro Traffic Counts**

Table 3: Tuftonboro Traffic Counts

| STATE OF NEW HAMPSHIRE<br>DEPARTMENT OF TRANSPORTATION<br>BUREAU OF TRAFFIC |      |  |    |      |      |      |      |      |      |      |           |
|---|------|--|----|------|------|------|------|------|------|------|-----------|
| Bureau of Planning, Traffic Section, Traffic Reports                        |      |  |    |      |      |      |      |      |      |      | 05-Mar-14 |
| STAT.   | TYPE | LOCATION   | FC | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013      |
| Town: TUFTONBORO  |      |  |    |      |      |      |      |      |      |      |           |
| 455011  | 82   | NH 109 (GOV WENTWORTH HWY) NORTH OF NH 109A      | 07 | *    | 2600 | *    | *    | 2400 | *    | *    | 2500      |
| 455051  | 82   | NH 109A (MIDDLE RD) NORTH OF FEDERAL CORNER RD   | 08 | *    | 2200 | *    | *    | 1800 | *    | *    | 1800      |
| 455052  | 62   | NH 109 (GOV WENTWORTH HWY) AT MOULTONBOROUGH TL  | 07 | *    | 2100 | *    | *    | 2000 | *    | *    | 2000      |
| 455053  | 82   | NH 171 (OLD MOUNTAIN RD) AT MOULTONBOROUGH TL    | 08 | *    | 1100 | *    | *    | 1100 | *    | *    | 1100      |
| 455056  | 82   | CANAAN RD SOUTH OF SENTINEL LODGE RD             | 09 | *    | 150  | *    | *    | 190  | *    | *    | 160       |
| 455057  | 82   | NEW RD OVER MELVIN RIVER                         | 09 | *    | 330  | *    | *    | 230  | *    | *    | 230       |
| 455058  | 82   | SODOM RD OVER MELVIN RIVER                       | 09 | *    | 520  | *    | *    | 440  | *    | *    | 490       |
| 455059  | 82   | COUNTY RD OVER MELVIN RIVER                      | 09 | *    | 90   | *    | *    | 100  | *    | *    | 110       |
| 455060  | 82   | HIGH ST OVER MELVIN RIVER                        | 09 | *    | 330  | *    | *    | 260  | *    | *    | 260       |
| 455061  | 82   | NH 109 (GOVERNOR WENTWORTH HWY) SOUTH OF NH 109A | 07 | *    | 1900 | *    | *    | 1900 | *    | *    | 1800      |
| 455062  | 82   | TUFTONBORO NECK RD SOUTH OF BASIN RD             | 09 | *    | 1200 | *    | *    | 990  | *    | *    | 1000      |

Although Tuftonboro's median age is average for the region, elderly and child age populations exist and may need special consideration in hazard event.

#### Future Development

"Development and land use are among the most important and controversial concerns of community planning. In the past, individual land owners made most decisions about Tuftonboro's villages and rural landscape. These decisions have become a legitimate public concern because they affect neighboring properties and property values, public services and facilities, environmental health, public safety, the availability of finite resources, economic opportunity and the overall quality of life in Tuftonboro."<sup>6</sup>

According to the town's Master Plan, about 11% of the land in Tuftonboro has been developed, 14% is in conservation, and 25% has some form of steep slopes, limiting development options. Nevertheless, there is certainly opportunity for further development in Tuftonboro.

Since 2009 there have been two new subdivisions approved, one along Union Wharf Road and the other along NH Route 171; neither are in areas of high risk or that have limited access. There are 185 approved lots on paper, all reviewed by the Fire Chief/EMD; some of these may be developed as the economy strengthens.

Development in the last five years has not had a significant adverse impact on the town's vulnerability to hazards. While construction of the Public Safety Building may not have impacted local vulnerability, this did improve the town's ability to respond to and manage the effects of a hazard event. Very little commercial development is anticipated for the next several years and while the town has approved well over 100 new residential units, they all meet existing zoning and land use regulations, limiting any additional vulnerability.

<sup>6</sup> Tuftonboro Master Plan (2006) Ch. 5 Land Use, p.64.

## CHAPTER III: RISK ASSESSMENT

### A. IDENTIFYING HAZARDS

The town of Tuftonboro is prone to a variety of natural and man-made hazards. The *2013 Multi-Hazard Mitigation Plan*, developed by the New Hampshire Department of Safety's Division of Homeland Security and Emergency Management identified the following hazards as those posing a risk to Carroll County communities.<sup>7</sup>

**Table 4: Carroll County Hazards**

| Very High | High     | Moderate              |
|-----------|----------|-----------------------|
| Flood     | Epidemic | Severe Winter Weather |
|           |          | Earthquake            |

Hazards that were rated Low on the county-wide risk rating were dam failure, drought, wildfire, landslide, tornado/downburst, hurricane, lightning, and avalanche.

The Committee reviewed all of the hazards identified in the 2009 Plan (Tables 5A and 5B).

### Tables 5A and 5B: Hazards identified in the 2009 Tuftonboro Hazard Mitigation Plan

Note: The 2009 Plan had four risk ratings, no hazards were rated as Severe Hazards.

#### A. Natural Hazards

| High Risk Hazard                   | Moderate Risk Hazard  | Low Risk Hazards |
|------------------------------------|-----------------------|------------------|
| Flood                              | Lightning             | Hurricane        |
| Severe Wind<br>(Tornado/Downburst) | Severe Winter Weather | Drought          |
|                                    |                       | Extreme Heat     |
|                                    |                       | Earthquake       |
|                                    |                       | Dam Failure      |
|                                    |                       | Wild/Forest Fire |

#### B. Human-Caused Hazards

| High Risk Hazard    | Moderate Risk Hazard | Low Risk Hazards                    |
|---------------------|----------------------|-------------------------------------|
| Haz Mat (Transport) | Biological Terrorism | Armed Attack (assault, sniper, WMD) |
| Urban Fire          | Utility Interruption | Transportation Incident             |
|                     |                      | Radiological Release                |
|                     |                      | Mass Casualty                       |
|                     |                      | Civil Disorder                      |
|                     |                      | Haz Mat (Fixed)                     |

<sup>7</sup> <http://www.nh.gov/safety/divisions/hsem/HazardMitigation/documents/hazard-mitigation-plan.pdf>, visited December 2013.

The Committee also reviewed historical information from internet sources about past hazard events in and near Tuftonboro since 2009. Through this review of state-wide hazards, past regional and local events, and with discussion, the committee identified the hazards listed in Table 6 as the most significant hazards to the town of Tuftonboro. The risk ratings are summarized on Section IV.C (Table 12); these rating factors are similar to those used in the previous plan.

**Table 6: Significant Hazards: Tuftonboro, NH**

| High Risk Hazard                   | Moderate Risk Hazard               | Low Risk Hazards |
|------------------------------------|------------------------------------|------------------|
| Severe Wind<br>(Tornado/Downburst) | Hazardous Materials<br>(Transport) | Hurricane        |
|                                    | Lightning                          | Drought          |
|                                    | Severe Winter Weather              | Extreme Heat     |
|                                    | Urban Fire (Conflagration)         | Earthquake       |
|                                    | Cyber security breach              | Dam Failure      |
|                                    | Flooding                           | Wildfire         |

There were no Severe Risk hazards. All others were viewed by the committee as Low Risk hazards. This differs from the earlier version of the Plan in that flooding, urban fire, and hazardous materials in transport are now considered Moderate Risk instead of High Risk hazards and cyber security was recognized by the committee as a moderate hazard. In most cases the reduction in these risk ratings result from a reduction in the committee's perception of the probability of several of these events occurring in Tuftonboro. In discussion, the committee felt that due to the limited flowing water in town and the location of development the impacts of flooding on the town would be low. The addition of cyber security was based input from the Police Chief that county and state law enforcement agencies are seeing greater activity in this arena and it has the potential to impact emergency communication and response. While utility interruptions certainly occur in conjunction with other hazards, for this update the committee did not view this as a hazard by itself.

## **B. PROFILING HAZARD EVENTS**

The committee reviewed the various hazards that might occur in Tuftonboro and assessed the Probability of such an event occurring in the town. This process began by taking the risk rating matrix from the previous plan, reviewing the hazards, past and recent occurrences, and specific areas of concern. Table 7 lists the Probability of Occurrence in Tuftonboro for each hazard and a definition of the rating scale is listed below it.

For this update, lightning was treated as a hazard distinct from thunderstorm. Tornado, downburst, and thunderstorm were grouped as "High Wind Event" and similarly, blizzard, nor'easter, and ice storm were grouped together.

**Table 7: Probability of Occurrence**

| <b>Tuftonboro Hazards</b>         | <b>Probability of Occurrence</b>   |
|-----------------------------------|--|
| Scale                             | 0: Not Applicable, 1: Unlikely, 2: Occasional, 3: Likely, 4: Highly Likely |
| Severe Wind (Tornado/Downburst)   | 4  |
| Lightning                         | 4  |
| Flood                             | 4  |
| Severe Winter Weather             | 3  |
| Urban Fire                        | 3  |
| Cyber security breach             | 3  |
| Haz. Mat. (Transport)             | 2  |
| Hurricane                         | 2  |
| Mass Casualty (Trauma or Medical) | 2  |
| Epidemic                          | 2  |
| Drought                           | 2  |
| Extreme Heat                      | 2  |
| Wildfire                          | 2  |
| Terror Attack (WMD)               | 1  |
| Dam Failure                       | 1  |
| Armed Attack                      | 1  |
| Earthquake                        | 1  |
| Biological Terror                 | 1  |
| Hail                              | 1  |
| Haz. Mat. (Fixed)                 | 1  |

#### Probability of Future Events

- **Unlikely:** <1% probability of occurrence in the next year or a recurrence interval of more than every 100 years.
- **Occasional:** 1 to 10 percent probability of occurrence in the next year or a recurrence interval of 11 to 100 years.
- **Likely:** 10 to 90 percent probability of occurrence in the next year or a recurrence interval of 1 to 10 years
- **Highly Likely:** 90 to 100% probability of occurrence in the next year or a recurrence interval of less than 1 year.

This was utilized as a guide for further discussion of hazards by the Committee with an emphasis on those most likely to impact Tuftonboro. The list of hazards initially included avalanche, landslide, and radiological. The committee decided to remove these three hazards from the list since there have been no known occurrences in Tuftonboro (not applicable). While utility interruptions do occasionally occur in Tuftonboro, the committee felt that this is the result of a hazard, not a hazard itself. The following section describes the likely location of each hazard, the extent of the hazard, and the history of recent occurrences in and around Tuftonboro. The extent is a description of the severity/magnitude of an event or “how bad the hazard could it get”. For more information on these hazards, please see Appendix G; a list of events prior to 2009 is included in Appendix E.<sup>8</sup>

<sup>8</sup> Unless otherwise indicated, the historical hazard information in the tables in this section comes from the NOAA Storm Events database <http://www.ncdc.noaa.gov/stormevents/>.



**SEVERE WINDS (TORNADO/DOWNBURST/THUNDERSTORM)**

**Location:** On average, six tornadoes touch down somewhere in New England each year. There is no way of knowing where or when the next damaging tornado will strike as they are among the most unpredictable weather phenomena. Generally, downbursts are 10 times more likely to occur than tornadoes in this region. All areas of town are susceptible to damage from high winds.

**Extent:** Tornadoes are violent rotating storms that extend to the ground with winds that can reach 300 miles per hour. They are produced from thunderstorms and can uproot trees and buildings. Tornadoes are classified using the Fujita Scale, based on wind speed and physical damage (Table 8).

**Table 8: Fujita Scale**

| F-Scale # | Intensity Phrase      | Wind Speed  | Type of Damage  |
|-----------|-----------------------|-------------|---|
| F0        | Gale tornado          | 40-72 mph   | Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.  |
| F1        | Moderate tornado      | 73-112 mph  | The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.   |
| F2        | Significant tornado   | 113-157 mph | Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.   |
| F3        | Severe tornado        | 158-206 mph | Roof and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted.   |
| F4        | Devastating tornado   | 207-260 mph | Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.  |
| F5        | Incredible tornado    | 261-318 mph | Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.   |
| F6        | Inconceivable tornado | 319-379 mph | These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies. |

Source: <http://www.tornadoproject.com/fscale/fscale.htm>

According to the National Oceanic and Atmospheric Administration (NOAA) a downburst is a strong downdraft, rotational in nature, which causes damaging winds on or near the ground. Winds can exceed 130 mph.<sup>9</sup> Downbursts fall into two categories based on their size:

- microbursts, which cover an area less than 2.5 miles in diameter, and
- macrobursts, which cover an area at least 2.5 miles in diameter.

<sup>9</sup> *Weather Glossary*, National Oceanic and Atmospheric Administration, <http://www.weather.gov/glossary/index.php?letter=d>, visited March 8, 2011.

**History:**

| <u>Location</u>  | <u>Date</u>                | <u>Type</u>               | <u>Mag</u>                 | <u>Dth</u>        | <u>Ini</u>        | <u>PrD</u>              | <u>Notes</u>  |
|--|----------------------------|---------------------------|----------------------------|-------------------|-------------------|-------------------------|---|
| <a href="#">CHATHAM</a>  | <a href="#">8/21/2009</a>  | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">SOUTHERN CARROLL (ZONE)</a>                          | <a href="#">2/26/2010</a>  | <a href="#">High Wind</a> | <a href="#">52 kts. MG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">MELVIN VLG</a>                                       | <a href="#">7/19/2010</a>  | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   | <a href="#">Downed tree on wires near Hasen Way</a>           |
| <a href="#">TUFTONBORO, SANDWICH, WAKEFIELD</a>                  | <a href="#">7/21/2010</a>  | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   | <a href="#">Downed tree on wires on Middle Road</a>           |
| <a href="#">SANDWICH, MOULTONBORO</a>                            | <a href="#">6/9/2011</a>   | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">MOULTONBORO</a>                                      | <a href="#">6/18/2011</a>  | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <u>Location</u>  | <u>Date</u>                | <u>Type</u>               | <u>Mag</u>                 | <u>Dth</u>        | <u>Ini</u>        | <u>PrD</u>              |   |
| <a href="#">CONWAY</a>   | <a href="#">7/4/2011</a>   | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">CENTER OSSIPEE</a>                                   | <a href="#">7/6/2011</a>   | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">WAKEFIELD</a>  | <a href="#">8/19/2011</a>  | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">CENTER TUFTONBORO, MOULTONBORO, CONWAY, SANDWICH</a> | <a href="#">8/21/2011</a>  | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">TUFTONBORO</a>                                       | <a href="#">9/5/2011</a>   | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   | <a href="#">Downed tree on wires on Middle and Lang Roads</a> |
| <a href="#">MOULTONBORO</a>                                      | <a href="#">7/17/2012</a>  | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">TUFTONBORO, MOULTONBORO, SANDWICH</a>                | <a href="#">8/5/2012</a>   | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   | <a href="#">Downed tree and wires</a>                         |
| <a href="#">OSSIPEE</a>  | <a href="#">8/12/2012</a>  | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">TUFTONBORO, MOULTONBORO, TAMWORTH, MADISON</a>       | <a href="#">9/8/2012</a>   | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   | <a href="#">Downed tree on Number 9 Road</a>                  |
| <a href="#">SOUTHERN CARROLL (ZONE)</a>                          | <a href="#">10/29/2012</a> | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">100.00K</a> | <a href="#">Tropical Storm Sandy</a>                          |
| <a href="#">BARTLETT, CHATHAM, CONWAY, JACKSON</a>               | <a href="#">6/2/2013</a>   | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">FREEDOM</a>  | <a href="#">6/23/2013</a>  | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">EFFINGHAM, NORTH CONWAY, WAKEFIELD</a>               | <a href="#">7/17/2013</a>  | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">WAKEFIELD</a>  | <a href="#">7/19/2013</a>  | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">EAST CONWAY, MOULTONBORO, SANDWICH</a>               | <a href="#">9/11/2013</a>  | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">TUFTONBORO</a>                                       | <a href="#">10/7/2013</a>  | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   | <a href="#">Downed trees and wires on Federal Corner Road</a> |
| <a href="#">SOUTHERN CARROLL (ZONE)</a>                          | <a href="#">11/24/2013</a> | <a href="#">High Wind</a> | <a href="#">43 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.50K</a>   |   |
| <a href="#">EFFINGHAM FALLS, OSSIPEE</a>                         | <a href="#">7/2/2014</a>   | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">EAST SANDWICH, MOULTONBORO</a>                       | <a href="#">7/3/2014</a>   | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |
| <a href="#">CONWAY, NORTH CONWAY, TAMWORTH</a>                   | <a href="#">7/28/2014</a>  | <a href="#">High Wind</a> | <a href="#">50 kts. EG</a> | <a href="#">0</a> | <a href="#">0</a> | <a href="#">0.00K</a>   |   |

**Probability of Occurrence:** **Highly Likely**

**LIGHTNING**

**Location:** Lightning can strike anywhere in town.

**Extent:** Lightning is a giant spark of electricity that occurs within the atmosphere, or between the atmosphere and the ground. As lightning passes through the air, it heats the air to a temperature of about 50,000 degrees Fahrenheit, considerably hotter than the surface of the Sun. During a lightning

discharge, the sudden heating of the air causes it to expand rapidly, resulting in thunder.<sup>10</sup> Thunderstorms occur mainly in the summertime; some can be anticipated and detected well in advance while others are “pop-up” storms that are limited in size and duration. Exactly where and when lightning will strike is unknown. Most thunderstorms do not last long in any one location but move through fairly quickly. These giant sparks of electricity can result in fire or electrical damage to property or electrocution of people.

The National Weather Service does utilize a six-point scale for characterizing lightning activity called the Lightning Activity Level (LAL) based on frequency of ground strikes along with rainfall and ground conditions.<sup>11</sup>

**Table 9: Lightning Activity Level scale**

|       |   |
|-------|---|
| LAL 1 | No thunderstorms  |
| LAL 2 | Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five minute period.                                      |
| LAL 3 | Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a 5 minute period.                                      |
| LAL 4 | Scattered thunderstorms. Moderate rain is commonly produced Lightning is frequent, 11 to 15 cloud to ground strikes in a 5 minute period.   |
| LAL 5 | Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a 5 minute period.   |
| LAL 6 | Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning. |

#### History:

| <u>Location</u>     | <u>Date</u> | <u>Type</u> | <u>Dth</u> | <u>Inj</u> | <u>PrD</u> | <u>Notes</u>                       |
|---------------------|-------------|-------------|------------|------------|------------|------------------------------------|
| <u>NORTH CONWAY</u> | 8/21/2009   | Lightning   | 0          | 0          | 20.00K     |                                    |
| <u>MELVIN VLG</u>   | 7/18/2013   | Lightning   | 0          | 0          | 20.00K     | Boat struck by lightning and sank. |
| <u>EAST MADISON</u> | 7/2/2014    | Lightning   | 0          | 2          | 0.00K      |                                    |

In the spring of 2012 the Moultonborough Public Safety Building was hit by lightning, resulting in the need to replace numerous computer systems.

**Probability of Occurrence:** Highly Likely

#### **FLOODING**

**Location:** The Tuftonboro Digital Flood Insurance Rate Maps (FIRM) show the flood boundaries in the event of a 100-year flood. These maps were updated and adopted March 19, 2013. Floodplains in Tuftonboro tend to be associated with relatively large wetland complexes such as the Great Meadow (Melvin River), Copp’s Pond, Twenty-Mile Brook, and Nineteen-Mile Brook. Some road segments are susceptible to flooding or erosion, including Sodom, Canaan, Lang Pond, Brown, and Curtis Roads, along with two sections of Union Wharf Road.

<sup>10</sup> <http://www.nh.gov/safety/divisions/hsem/HazardMitigation/documents/hmp-chapter-3.pdf> accessed September 16, 2013.

<sup>11</sup> NWS Definitions webpage, <http://graphical.weather.gov/definitions/defineLAL.html>. Accessed June 3, 2014.

**Extent:** Flooding is defined as a temporary overflow of water onto lands that are not normally covered by water. It results from the overflow of rivers and tributaries or inadequate drainage. Flooding is most commonly associated with structures and properties located within the 1% annual (or 100-year) floodplain. Areas in this floodplain have been identified as having a one percent chance of flooding any given year.

There are no USGS stream gauges on any of the streams in Tuftonboro to indicate the rate of flow or depth of water; the nearest ones are on the Bearcamp River in Tamworth and in Tilton on the Winnepesaukee River (recording drainage of Lake Winnepesaukee); this would only give an indication of flood conditions for properties along the lakefront.<sup>12</sup> Current lake levels, both current and historical data can be found at the NH DES website.<sup>13</sup>

Dams in New Hampshire are classified by the New Hampshire Department of Environmental Services Dams Bureau. The four dam hazard classifications (High, Significant, Low, and Non-Menace) are based on the potential losses associated with a dam failure (see Appendix G for a detailed description). High (H) and Significant (S) Hazard dams have the highest potential for damage; this could include damage to state or municipal roadways as well as structures. There are eight active dams in Tuftonboro (Table 10); including three Significant (S) Hazard, one Low (L) Hazard, and four Non-Menace (NM) Hazard dams.

**Table 10: Dams in Tuftonboro**

| HAZ CLASS | NAME                       | RIVER            | IMPOUND (acres) | HEIGHT (ft.) | OWNER                             |
|-----------|----------------------------|------------------|-----------------|--------------|-----------------------------------|
| S         | MELVIN RIVER DAM           | MELVIN RIVER     | 2.500           | 16.50        | NH FISH & GAME DEPARTMENT         |
| S         | CAMP BELKNAP SEWAGE LAGOON | NA               | 0.900           | 10.00        | YMCA CAMP BELKNAP                 |
| S         | COPPS POND DAM             | WINGATE BROOK    | 89.000          | 16.00        | NH FISH & GAME DEPARTMENT         |
| L         | LOWER BEECH POND DAM       | LOWER BEECH POND | 155.000         | 8.00         | LOWER BEECH POND VILLAGE DISTRICT |
| NM        | LOWER BEECH POND DAM       | BEECH BROOK      | 0.110           | 6.00         | S TRUMAN LITWHLER                 |
| NM        | TR MELVIN RIVER            | TR MELVIN RIVER  | 1.300           | 8.00         | MS PACKARD & MS BARWIS            |
| NM        | TR MELVIN BROOK DAM        | TR MELVIN RIVER  | 1.000           | 6.00         | MS PACKARD & MS BARWIS            |
| NM        | SHINGLE MILL DAM           | TR WINGATE BROOK | 0.300           | 12.00        | MR JOHN PIPER                     |

#### History:

| <u>Location</u>               | <u>Date</u> | <u>Type</u> | <u>Mag</u> | <u>Dth</u> | <u>Ini</u> | <u>PrD</u> | Notes                |
|-------------------------------|-------------|-------------|------------|------------|------------|------------|----------------------|
| <a href="#">CENTER CONWAY</a> | 1/26/2010   | Flood       |            | 0          | 0          | 0.00K      |                      |
| <a href="#">NORTH CHATHAM</a> | 3/15/2010   | Flood       |            | 0          | 0          | 135.00K    |                      |
| <a href="#">CENTER CONWAY</a> | 3/31/2010   | Flood       |            | 0          | 0          | 0.00K      |                      |
| <a href="#">CONWAY</a>        | 12/2/2010   | Flood       |            | 0          | 0          | 0.00K      |                      |
| <a href="#">CONWAY</a>        | 12/13/2010  | Flood       |            | 0          | 0          | 0.00K      |                      |
| <a href="#">BARTLETT</a>      | 8/28/2011   | Flash Flood |            | 0          | 0          | 2.400M     | Tropical Storm Irene |
| <a href="#">JACKSON</a>       | 8/28/2011   | Flash Flood |            | 0          | 0          | 345.00K    | Tropical Storm Irene |

<sup>12</sup> USGS stream gauges <http://waterdata.usgs.gov/nh/nwis/rt>.

<sup>13</sup> NH DES Winnepesaukee Watershed data [http://des.nh.gov/organization/divisions/water/dam/winni\\_levels/index.htm](http://des.nh.gov/organization/divisions/water/dam/winni_levels/index.htm).

| Location                                | Date       | Type           | Mag | Dth | Ini | PrD     | Notes                |
|---|------------|----------------|-----|-----|-----|---------|----------------------|
| <a href="#">SAWYER STATION</a>          | 8/28/2011  | Flash Flood    |     | 0   | 0   | 100.00K | Tropical Storm Irene |
| <a href="#">CONWAY</a>                  | 8/28/2011  | Flood          |     | 0   | 0   | 500.00K | Tropical Storm Irene |
| <a href="#">MOULTONBORO</a>             | 8/28/2011  | Flood          |     | 0   | 0   | 150.00K | Tropical Storm Irene |
| <a href="#">OSSIPPEE</a>                | 8/28/2011  | Flood          |     | 0   | 0   | 400.00K | Tropical Storm Irene |
| <a href="#">SANDWICH</a>                | 8/28/2011  | Flood          |     | 0   | 0   | 25.00K  | Tropical Storm Irene |
| <a href="#">SOUTHERN CARROLL (ZONE)</a> | 8/28/2011  | Tropical Storm |     | 0   | 0   | 0.00K   | Tropical Storm Irene |
| <a href="#">EAST CONWAY</a>             | 10/15/2011 | Flood          |     | 0   | 0   | 50.00K  |                      |
| <a href="#">NORTH CONWAY ARPT</a>       | 11/30/2011 | Flood          |     | 0   | 0   | 50.00K  |                      |
| <a href="#">CONWAY</a>                  | 6/3/2012   | Flood          |     | 0   | 0   | 0.00K   |                      |
| <a href="#">CONWAY</a>                  | 9/19/2012  | Flood          |     | 0   | 0   | 0.00K   |                      |
| <a href="#">NORTH CONWAY ARPT</a>       | 10/30/2012 | Flood          |     | 0   | 0   | 0.00K   |                      |
| <a href="#">CONWAY</a>                  | 1/12/2014  | Flood          |     | 0   | 0   | 0.00K   |                      |
| <a href="#">CONWAY</a>                  | 4/15/2014  | Flood          |     | 0   | 0   | 156.00K |                      |
| <a href="#">CONWAY</a>                  | 5/17/2014  | Flood          |     | 0   | 0   | 0.00K   |                      |
| <a href="#">CONWAY, JACKSON</a>         | 6/26/2014  | Flash Flood    |     | 0   | 0   | 100.00K |                      |
| <a href="#">FREEDOM</a>                 | 7/2/2014   | Flash Flood    |     | 0   | 0   | 25.00K  |                      |

**Probability of Occurrence:** Highly Likely

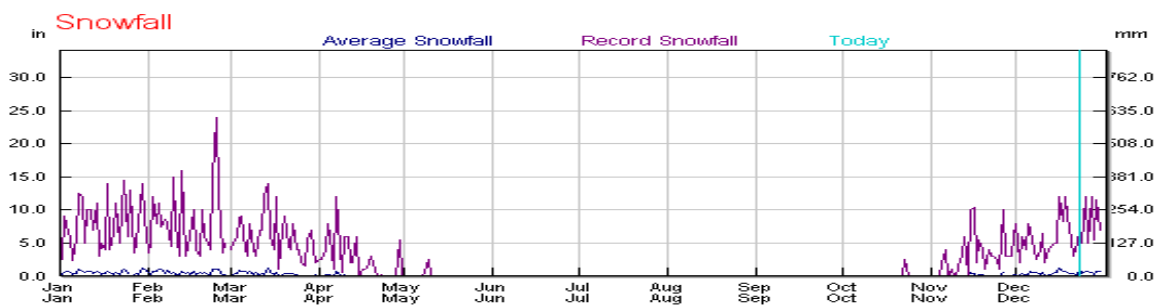
#### **SEVERE WINTER WEATHER (SNOW STORMS, NOR'EASTERS, ICE STORMS)**

**Location:** Snow and Ice Storms can affect the entire town. Severe winter weather occurs frequently in the northeast and the possibility exists for residents to have to withstand several days without power. No one area of the town and region is at greater risk than another, but there are segments of the population that are more at risk. These include the elderly, people that are in need of regular medical care, and young children. These weather events can vary greatly based on slight differences in temperature, humidity, and elevation. Some events will produce a combination of winter weather types.

**Extent:** A heavy snowstorm can be defined as one which deposits four or more inches of snow in a twelve hour period. The region typically receives greater than 66" of snow annually.<sup>14</sup> Records indicate that eight or more inches have fallen in a single day on most dates from late November through mid-March but the average snowfall in the Lakes Region on any day from November through April is less than an inch. The record also shows that deposits of more than ten inches have happened in each of these months and on several days in February the town has seen more than fifteen and even twenty inches of snow in one day.

<sup>14</sup> Northeast States Emergency Consortium, <http://www.nesec.org/>, visited January 25, 2011.

### Average and Record Snowfalls for New Hampshire's Lakes Region<sup>15</sup>



In the winter months, the region may experience blizzard conditions. A blizzard is characterized by sustained winds or frequent gusts to 35 miles per hour or greater and considerable amounts of falling or blowing snow that last for a duration of three hours or longer. The combination of winds and snow reduce visibility to less than a quarter mile.<sup>16</sup>

New Hampshire generally experiences at least one or two nor'easters each year with varying degrees of severity. A nor'easter is defined as a large anticyclone weather system that resides near the New England region. These storms have the potential to inflict more damage than many hurricanes because high winds can last from twelve hours to three days, while the duration of hurricanes ranges from six to twelve hours. A nor'easter also has the potential to sustain hurricane force winds, produce torrential rain, and create blizzard conditions in winter months.

An ice storm coats trees, power lines, streets, vehicles, and roofs with a very slick and heavy coating of ice. In the winter of 1998, a major ice storm crippled much of New Hampshire, coating everything with as much as three inches of ice. The U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory estimates a 40 – 90 year return period for an event with a uniform ice thickness of between 0.75 and 1.25 inches. Ten years later (2008), however, New Hampshire was struck again by another severe ice storm.

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

| ICE DAMAGE INDEX | AVERAGE NWS ICE AMOUNT (in inches)<br><small>*Based on 2001</small> | WIND (mph) | DAMAGE AND IMPACT DESCRIPTIONS   |
|------------------|---|------------|--|
| 0                | < 0.25  | < 15       | Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, for outages.  |
| 1                | 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       |  |
| 2                | 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       |  |
| 3                | 0.25 – 0.50   | > 25       | Numerous utility interruptions with some damage to main feeder lines and equipment expected. The likelihood of damage is excessive. Outages lasting 1 – 8 days.                      |
|                  | 0.50 – 0.75   | 25 – 35    |  |
|                  | 0.75 – 1.00   | 15 – 25    |  |
|                  | 0.75 – 1.00   | < 15       |  |
| 4                | 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       |  |
| 5                | 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   | > 35       |  |
|                  | 1.00 – 1.50   | > 15       |  |
|                  | > 1.50  | Any        |  |

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

The Sperry-Piltz Ice Accumulation (SPIA) Index is being used to forecast and classify ice storms based on a combination of the average thickness of ice coating (referencing expected temperature and precipitation levels) and wind speed; ratings range from 0 to 5.<sup>17</sup> The SPIA Index was first used in the United States in 2009 and is now beginning to be utilized by the National Weather Service.

<sup>15</sup> Weather Underground, Season Weather Averages

<http://www.wunderground.com/NORMS/DisplayNORMS.asp?AirportCode=KLCL&SafeCityName=Tuftonboro&StateCode=NH&Units=none&IATA=LCL>.

<sup>16</sup> "Winter storm terms," [http://www.fema.gov/hazard/winter/wi\\_terms.shtml](http://www.fema.gov/hazard/winter/wi_terms.shtml), visited February 8, 2011.

<sup>17</sup> SPIA Northeast webpage, <http://www.spia-index.com/neIce.php>, June 3, 2014.



**History:**

| <u>Type</u>  | <u>Date</u> | <u>Location</u>                         | <u>Magnitude</u>   |
|--------------|-------------|---|--|
| Winter Storm | 12/9/2009   | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 6-10 inches  |
| Heavy Snow   | 1/17/2010   | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 6-10 inches  |
| Heavy Snow   | 2/23/2010   | <a href="#">Statewide</a>               | Nor'easter 12-24 inches. Winds over 45 mph. Statewide - Snow and ice; 330,000 without power \$2 million; Presidential Disaster |
| Heavy Snow   | 12/26/2010  | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 6-16 inches  |
| Heavy Snow   | 1/12/2011   | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 10-19 inches   |
| Heavy Snow   | 1/18/2011   | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 4-8 inches   |
| Heavy Snow   | 2/2/2011    | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 8-12 inches  |
| Heavy Snow   | 2/25/2011   | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 8-12 inches  |
| Heavy Snow   | 4/1/2011    | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 6-12 inches  |
| Heavy Snow   | 10/29/2011  | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 16-18 inches   |
| Heavy Snow   | 11/22/2011  | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 6-12 inches  |
| Heavy Snow   | 1/12/2012   | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 6-8 inches   |
| Heavy Snow   | 1/19/2012   | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 6-8 inches   |
| Heavy Snow   | 3/1/2012    | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 8-14 inches  |
| Winter Storm | 12/26/2012  | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 6-14 inches  |
| Heavy Snow   | 2/8/2013    | <a href="#">SOUTHERN CARROLL (ZONE)</a> | Blizzard conditions, 18 inches   |
| Heavy Snow   | 2/23/2013   | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 6-14 inches  |
| Heavy Snow   | 2/27/2013   | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 6-10 inches  |
| Heavy Snow   | 3/19/2013   | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 10-12 inches   |
| Heavy Snow   | 12/14/2013  | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 8-14 inches  |
| Heavy Snow   | 12/29/2013  | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 5-10 inches  |
| Heavy Snow   | 1/2/2014    | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 6-14 inches  |
| Heavy Snow   | 2/5/2014    | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 6-12 inches  |
| Heavy Snow   | 2/13/2014   | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 6-14 inches  |
| Heavy Snow   | 2/18/2014   | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 6-14 inches  |
| Heavy Snow   | 3/19/2014   | <a href="#">SOUTHERN CARROLL (ZONE)</a> | 6-18 inches  |

**Probability of Occurrence:** Likely

**FIRE (WILDFIRE/CONFLAGRATION)**

**Location:** Much of Tuftonboro is wooded and the northern section is characterized by steep slopes. Tuftonboro does not have any urban areas; however, the mobile home park of North Country Village and some waterfront homes are close together and some are difficult to access, especially those on islands.

**Extent:** A wildfire is defined as a fire in wooded, potentially remote areas that may endanger lives. New Hampshire has about 500 wild land fires each year; most of these burn less than half an



Alton Bay Christian Conference Center,  
2009

acre. Much of the Lakes Region is forested and susceptible to fire.

The National Wildfire Coordinating Group (NWCG) has defined seven classes of wildfire based on size:

- Class A - one-fourth acre or less;
- Class B - more than one-fourth acre, but less than 10 acres;
- Class C - 10 acres or more, but less than 100 acres;
- Class D - 100 acres or more, but less than 300 acres;
- Class E - 300 acres or more, but less than 1,000 acres;
- Class F - 1,000 acres or more, but less than 5,000 acres;
- Class G - 5,000 acres or more.

Conflagration is an extensive, destructive fire in a populated area that endangers lives and affects multiple buildings. Hillsides provide a natural updraft that makes firefighting more difficult. In particular, structural fires spread more readily in hillside developments because burning buildings pre-heat the structures that are situated above them.

**History:** In Carroll County, from 2002 – 2011 (last year for which published data is available) the number and size of wildfires annually fluctuated but is relatively small. The table below indicate that less than ten acres burned in the county each year.<sup>18</sup> In 1953 more than 1,500 acres burned in an Ossipee/Tuftonboro wildfire. There have not been any wildfires in Tuftonboro recently. No local occurrences have been reported. On April 12, 2009 the Alton Bay Christian Conference Center complex caught fire, resulting in an 11-alarm fire and destroying more than 40 structures.

Department of Resources and Economic Development  
Division of Forests and Lands – Forest Protection Bureau  
**WILDLAND FIRE STATISTICS**

| YEAR                                  | Belknap    |       | Carroll    |       | Cheshire   |       | Coos       |       | Crawford   |       | Hillsborough |       | Merrimack  |       | Rockingham |       | Strafford  |       | Sullivan   |       |
|---------------------------------------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|--------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|
|                                       | # OF FIRES | ACRES | # OF FIRES | ACRES | # OF FIRES | ACRES | # OF FIRES | ACRES | # OF FIRES | ACRES | # OF FIRES   | ACRES | # OF FIRES | ACRES | # OF FIRES | ACRES | # OF FIRES | ACRES | # OF FIRES | ACRES |
| 2002                                  | 52         | 14    | 80         | 11    | 39         | 17    | 3          | 3     | 53         | 21    | 108          | 55    | 94         | 14    | 60         | 26    | 31         | 23    | 20         | 6     |
| 2003                                  | 40         | 5     | 46         | 14    | 8          | 1     | 7          | 17    | 22         | 13    | 60           | 11    | 98         | 11    | 56         | 19    | 34         | 8     | 3          | 2     |
| 2004                                  | 60         | 5     | 55         | 8     | 15         | 12    | 12         | 4     | 75         | 78    | 61           | 10    | 103        | 8     | 25         | 1     | 29         | 2     | 3          | 3     |
| 2005                                  | 53         | 15    | 79         | 5     | 11         | 29    | 42         | 8     | 49         | 11    | 115          | 15    | 80         | 25    | 40         | 24    | 22         | 32    | 8          | 2     |
| 2006                                  | 76         | 39    | 44         | 27    | 38         | 42    | 30         | 104   | 24         | 53    | 114          | 75    | 91         | 40    | 49         | 74    | 26         | 10    | 8          | 8     |
| 2007                                  | 95         | 30    | 53         | 11    | 36         | 44    | 15         | 6     | 30         | 4     | 71           | 61    | 73         | 16    | 22         | 16    | 32         | 19    | 10         | 5     |
| 2008                                  | 82         | 43    | 40         | 6     | 45         | 28    | 18         | 5     | 52         | 12    | 54           | 13    | 67         | 12    | 43         | 35    | 20         | 9     | 31         | 12    |
| 2009                                  | 16         | 13    | 30         | 7     | 29         | 3     | 42         | 42    | 35         | 11    | 94           | 12    | 45         | 1     | 30         | 62    | 3          | 2     | 10         | 20    |
| 2010                                  | 8          | 5     | 38         | 1     | 33         | 33    | 8          | 1     | 36         | 13    | 101          | 21    | 73         | 20    | 43         | 18    | 9          | 16    | 11         | 17    |
| 2011                                  | 1          | 5     | 11         | 5     | 3          | 2     | 30         | 7.5   | 57         | 17.5  | 12           | 2     | 3          | 4     | 0          | 0     | 2          | 5     | 6          | 3     |
| TOTAL 2002 through 2011               | 483        | 169.5 | 476        | 95    | 257        | 211   | 207        | 197.5 | 433        | 233.5 | 790          | 275   | 727        | 151   | 368        | 275   | 208        | 121.5 | 110        | 78    |
| Ten Year Average per year 2002 - 2011 | 48         | 17    | 48         | 10    | 26         | 21    | 21         | 20    | 43         | 23    | 79           | 28    | 73         | 15    | 37         | 28    | 21         | 12    | 11         | 8     |

**Probability of Occurrence:** Wildfire: Occasional, Conflagration: **Likely**

<sup>18</sup> NH Division of Forest and Lands, <http://www.nhdf.org/fire-control-and-law-enforcement/fire-statistics.aspx>, Accessed May 15, 2014.



**HAZARDOUS MATERIALS IN TRANSPORT**

**Location:** Major roadways, especially in populated areas or near water bodies are areas of concern. A spill along NH Route 109 as it hugs the Lake Winnepesaukee shoreline could impact the water and shoreline.

**Extent:** Oil or chemical spills along the routes noted above could result in the contamination of wells or waterbodies in the watershed. NH Route 109 runs along both Lake Winnepesaukee and Mirror Lake while substantial portions of NH Routes 109A and 171 run over top of aquifers.<sup>19</sup>

In addition to distributing fuel to central locations in the region, tankers travel throughout the area daily to deliver home heating fuel. Many oil tankers have the capacity to carry 10,000 gallons of home heating oil.

**History:** No local incidents were identified; however the proximity of state highways to vulnerable water bodies led the Committee to consider a spill of hazardous materials while in transport a concern.

**Probability of Occurrence:** Occasional

**TERRORISM/CYBER SECURITY BREACH**

**Location:** There are multiple types of terrorist activity. The nature of the action will determine the location of vulnerability. Public safety and municipal computers and communications equipment may be vulnerable to cyber-terrorism, while the Tuftonboro Central School would be a likely focus of some sort of armed attack.

**Extent:** While the Lakes Region is known as a vacation destination, it does nevertheless have the potential to be the site of some incidents of terrorism. A determined individual intent on inflicting harm or terror might gain access to a site where they could do harm to individuals or large groups of people. The primary target site is the school where several hundred children learn and play. Cyber-terrorists could disrupt, damage, or destroy local or regional communications and computer equipment, limiting the ability of emergency responders to provide services.

**History:** No local incidents were identified.

**Probability of Occurrence:** Cyber Security Breach – Likely, Armed Attack, Biological - Unlikely

**Summary**

It is cost prohibitive to make the built environment resistant to the most devastating natural hazards that could occur, though reasonable measures can be taken to minimize loss of life and property damage. Tuftonboro may be affected by an unavoidable extraordinary circumstance such as a violent earthquake, but historically, events of this magnitude have been infrequent. Those natural events that are common to the northeast also have common elements of concern for public safety. These include the potential for long-term power outages, the potential need for short-term sheltering facilities, and the availability of equipment and trained personnel. Key to loss prevention in these relatively common event scenarios is pre-event planning that critically assesses communications within the community, mutual aid resources regionally, public awareness and education, and emergency response training.

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<sup>19</sup> Tuftonboro Master Plan (2006) Map 3-1

## CHAPTER IV: VULNERABILITY ASSESSMENT

### A. INVENTORY ASSETS

The list of critical infrastructure for the town of Tuftonboro (Table 11) was updated by the Committee and the values updated by the town's Assessing (2013). The critical infrastructure list has five facility classifications, 1) Essential Services; 2) Emergency Shelter; 3) Structures and Services; 4) Populations to Protect, and 5) Other. The first category contains facilities essential in a hazard event, including the Emergency Operation Center. The second contains the emergency shelters. The third category is a list of facilities that have been identified by the Committee as facilities to protect in order to minimize additional risk to hazards. The fourth category contains special populations that may require additional attention in the event of a disaster and the final category includes town recreation areas and some of the town's historic resources. In some cases a facility may fall into multiple classifications because, as in many small communities, it serves multiple functions.

**Table 11: Critical Facilities**

| TYPE       | NAME                           | ADDRESS                  | Owner                     | Structural Value | Notes                              |
|------------|--------------------------------|--------------------------|---------------------------|------------------|------------------------------------|
| Ess Serv   | Town Office and Police Station | 240 Middle Road          | Municipality              | \$436,600        | Town Office, Secondary EOC         |
| Ess Serv   | Central Fire Station           | 189 Middle Road          | Municipality              | \$1,318,900      | Primary EOC                        |
| Ess Serv   | Mirror Lake Fire Station       | 11 Tuftonboro Neck Road  | Municipality              | \$38,100         | Vehicle storage                    |
| Ess Serv   | Melvin Village Fire Station    | 451 Gov. Wentworth Hwy   | Municipality              | \$56,000         | Vehicle storage                    |
| Shelter    | Tuftonboro Elementary School   | 205 Middle Road          | GWRSD                     | \$1,638,100      | Primary Shelter                    |
| StructServ | Town House                     | 247 Middle Road          | Municipality              | \$197,100        | Secondary Shelter                  |
| Ess Serv   | Town Highway Garage            | 69 Sodom Road            | Municipality              | \$26,400         |                                    |
| Ess Serv   | Transfer Station               | 20 Sargent's Crossing    | Municipality              | \$148,500        |                                    |
| Ess Serv   | State Highway Garage           | 328 Middle Road          | NH DOT                    | \$176,700        |                                    |
| StructServ | NH Electric Co-Op Substation   | 71 Ledge Hill Road       | NHECoOp                   | \$9,804,400      |                                    |
| StructServ | PSNH Transformer site          | Mountain Road            | PSNH                      | \$2,754,100      |                                    |
| StructServ | Tuftonboro Free Library        | 221 Middle Road          | Municipality              | \$367,300        |                                    |
|            |                                |                          |                           |                  |                                    |
| PopProt    | Camp Northwoods                | 144 Gov. Wentworth Hwy   | Boston YMCA               | \$2,396,900      |                                    |
| PopProt    | Camp Merrow Vista              | 147 Canaan Road          | American Youth Foundation | \$3,415,400      |                                    |
| PopProt    | Camp Belknap                   | 172 Gov. Wentworth Hwy   | YMCA                      | \$371,500        |                                    |
| PopProt    | Camp Sentinal                  | 26 Sentinel Lodge Road   | NH Youth                  | \$892,500        |                                    |
| PopProt    | William Lawrence Camp          | 139 Federal Corners Road | William Lawrence Camp     | \$935,700        |                                    |
| PopProt    | Sandy Island                   | Lake Winnepesaukee       | Boston YMCA               | \$1,986,400      |                                    |
| PopProt    | Apple Gate Garden              | 141 Mountain Road        | Private                   | \$272,900        |                                    |
| Other      | Historical Society             | 449 Gov. Wentworth Hwy   | Historic Society          | \$189,800        | Historic                           |
| Other      | Union Wharf                    | 19 Mile Bay              | Municipality              | \$19,100         | Recreation Area - Boat dock        |
| Other      | Melvin Wharf                   | Melvin Wharf Road        | Municipality              | \$7,400          | Recreation Area - Boat dock        |
| Other      | Town Beach                     | 19 Mile Bay              | Municipality              | \$1,104,800      | Recreation Area - Structure & land |
| Other      | Lake Road Pier                 | Lake Road                | Municipality              | \$554,400        | Recreation Area - Land             |
| Other      | Davis Field                    | 205 Middle Road          | GWRSD                     | \$137,400        | Recreation Area - Land             |
| Other      | Lang Pond Beach (Mirror Lake)  | Lang Pond Road           | Municipality              | \$40,900         | Recreation Area - Land             |

The *Critical Facilities and Potential Hazards Map* (Appendix F) identifies the location of the critical facilities in relation to mapped hazard areas.

## B. IMPACT OF HAZARDS

The impact of a hazard is the potential degree of damage that could occur in Tuftonboro. This includes the consequences or effects that a hazard has on the community and its assets. The committee considered the probability of death or injury, physical loss (including cost), and interruption of services to the community, the results are summarized in Table 12.

The 2013 assessed value of the critical facilities identified in Section A are listed in Table 11, totaling nearly \$17 million. This does not; however, include the contents of the building and does not necessarily reflect the cost of full replacement. Also not reflected in this assessment is the value of built infrastructure such as streets, bridges, drainage, and utility transmission lines. These values can also be used to determine potential loss estimates in the event that a natural or manmade hazard damages a facility. Some of the facilities listed here are privately owned but represent structures or service that the Committee considered to be essential in terms of mitigating vulnerability to hazards.

The 2013 assessed value of all of the structures in Tuftonboro is \$399,400,300. The value of the residential structures in town totals \$355,339,700, three percent of which is manufactured housing. The value of the value of the tax-exempt structures in Tuftonboro is \$16,622,700, the commercial/industrial structures is \$14,645,300, and utilities are valued at \$12,792,600. Residential structures comprise nearly 90% of the town's structural value. The figures used above are from the town's 2013 Assessor's Database.

### High Winds (Tornado, Downburst, Thunderstorm)

Tornados and downbursts could strike anywhere in town with little, if any warning. While individual events may be small and rare, their impacts could be devastating. All structures, especially older ones, which are not necessarily built to the current building code standards, could be at risk.

Damage can occur to most structures in town as a result of downed trees in any high wind event, including the commonly occurring thunderstorms. These winds can bring down limbs and trees, causing damage to structures as well as pulling down power and telephone lines and blocking roads. This is particularly the case along private roadways that may only get limited cutback of vegetation.



Tuftonboro, September 2008

All structures in Tuftonboro are susceptible to damage by high wind events, whether through thunderstorms, downburst, or tornado. Assuming 1% to 5% town-wide damage to buildings any given year, high winds could result in \$3,994,003 to \$19,970,015 in damages annually.

**Lightning**

Although the numbers have trended downward in recent decades, during the last half of the twentieth century more people were killed in the United States each year by lightning than by any other weather event. It can also wreak havoc with electrical and communications systems.

Power outages, whether associated with natural or man-made hazards have the potential to cause great disruption to residents and the functioning of the town. There is back-up power for most municipal facilities.

All structures in Tuftonboro are susceptible to damage by lightning and resulting fires. The town's computer and communication systems could also be impacted by lightning. Assuming 1% town-wide damage to buildings annually, then each year lightning could result in \$3,994,003 in damages.

**Flooding**

The town of Tuftonboro actively participates in the National Flood Insurance Program (NFIP) through the administration of its floodplain ordinance by the Selectmen and Code Enforcement Officer. This includes correspondence with the NH Floodplain Manager regarding specific issues and periodically updating the town's floodplain ordinance. By actively participating in the NFIP property owners are able to purchase flood insurance through the FEMA program.

The town joined the program on June 15, 1976 through emergency entry, regular entry occurred on May 4, 1989. The original Flood Insurance Rate Maps (FIRM) were published by FEMA on May 4, 1989; these were recently updated (adopted March 19, 2013) and are available in digital form (DFIRM) at <http://msc.fema.gov/portal>. The Flood Insurance Study (FIS) for Carroll County was also adopted by the town on March 19, 2013.

The town's Level C Floodplain Ordinance was last amended on March 19, 2013. The Code Enforcement Officer is responsible for maintaining floodproofing and elevation certificates. Information regarding floodplains, floodproofing, and flood insurance are provided with all building permit applications. The NH Floodplain Coordinator considers the town officials to be knowledgeable regarding floodplains and the town compliant with floodplain administration.

There are currently 16 structures with flood insurance policies in force through the NFIP with a total insurance value of \$4,780,000 (average of \$298,750 per structure). Five of the NFIP-insured structures are in "A" (High Risk) Zones, while eleven are in the B, C, or X (Low Risk) Zones. Since 1976 there have been zero losses paid out in Tuftonboro.<sup>20</sup>

Over the past several decades, the Planning Board, Land Use staff, and Code Enforcement Officer have sought and received assistance from the NH Floodplain Manager, in the form of Community Assistance Calls and Visits and General Technical Assistance from the NH Floodplain Manager.

Several road segments are prone to flooding or washout. No critical facilities are susceptible to flooding.

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<sup>20</sup> NFIP State Coordinator, NH Office of Energy and Planning, July, 2013.



### **Winter Weather (Snow storms/Ice Storms)**

Almost all facilities in town can be impacted by heavy snow or ice. Flat-roofed buildings are all susceptible to damage from snow and ice loads.

Downed limbs and wires and unplowed or untreated roads can severely limit emergency access to many residences. The potential for very cold temperatures and loss of power can quickly compound the issue. A severe ice storm struck central and southern New Hampshire and New England on December 11, 2008. Over 400,000 people were without power, some for over two weeks, and overall damages exceeded \$15 million.

All structures in Tuftonboro are susceptible to damage by winter weather events, whether through ice storms, blizzards, or the heavy, wet snow often associated with a nor'easter. Assuming 1% to 5% town-wide damage to buildings, winter weather could result in \$3,994,003 to \$19,970,015 in damages annually.

### **Fire (Wildfire & Conflagration)**

While all properties in Tuftonboro have the potential to be impacted by fire, no facilities were noted as being particularly impacted by wildfire. Areas that might be impacted are a few sparsely developed areas in the northern section of town. Those susceptible to conflagration are those in close proximity to each other or with limited access, such as North Country Village or island homes. The impact of a fire would vary greatly depending upon its location and any structures involved. Assuming 1% town-wide damage to buildings, each year wildfire could result in \$3,994,003 in damages.

**Hazardous Materials**

The release of hazardous materials along the various roadways in town has the potential to cause damage. There are many variables that could affect the degree of impact, including the nature of the material, the location of the accident and its proximity to surface and groundwater, as well as structures.

A hazardous materials accident would not likely impact structures; rather the impact would be environmental. A 2007 report from NH Department of Environmental Services found that a reduction in water quality could lead to \$25 million of lost income to the Lakes Region (30 communities).<sup>21</sup>

**Terrorism/Cyber Security Breach**

Actions taken to harm or terrorize individuals or segments of the population may injure, scar, or result in fatalities. Damage to structures is not a likelihood. A breach in cyber security would compromise the ability to communicate and respond effectively.

**C. SUMMARY OF RISK**

The committee used the matrix below (Table 12) to put some simple numerical ratings to the various impacts that a hazard might have on the town of Tuftonboro and to ensure that they considered the three major impacts (Human, Business, and Property) in addition to those on the critical facilities.

It should be noted that the ranking of individual hazards for the purposes of planning discussion should not in any way diminish the potential severity of the impacts of a given hazard event. Further, hazards ranked as low risk may have the impact of increasing the risk of other hazards when they occur. For example, in the event of a drought, the risk of woodland fire may be greater. In combination, hazard events may have the impact of overwhelming existing emergency response systems.

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<sup>21</sup> [http://des.nh.gov/organization///commissioner/pip/publications/wd/documents/whats\\_our\\_water\\_worth.pdf](http://des.nh.gov/organization///commissioner/pip/publications/wd/documents/whats_our_water_worth.pdf).

Table 12: Hazard Risk

| Tuftonboro Hazards                | Probability of Occurrence   | Human Impact  | Property Impact   | Business Impact   | Average Impact  | Risk  |
|-----------------------------------|---|---|---|---|---|---|
| Definition                        | Likelihood this will occur w/in 100 yrs                                 | Probability of Death or Injury                                | Physical Loss or damage                                       | Interruption of Service                                       | Average of Human, Property, Business                          | Probability x Avg. Impact                               |
| Scale                             | 0: n/a<br>1: Unlikely<br>2: Occasional<br>3: Likely<br>4: Highly Likely | 0: n/a<br>1: Low<br>2: Moderate<br>3: High<br>4: Catastrophic | 0: n/a<br>1: Low<br>2: Moderate<br>3: High<br>4: Catastrophic | 0: n/a<br>1: Low<br>2: Moderate<br>3: High<br>4: Catastrophic | 0: n/a<br>1: Low<br>2: Moderate<br>3: High<br>4: Catastrophic | 0-3: Low<br>4-6: Moderate<br>7-9: High<br>10-12: Severe |
| Severe Wind (Tornado/Downburst)   | 4   | 1   | 3   | 2   | 2.00  | 8.00  |
| Haz. Mat. (Transport)             | 2   | 3   | 3   | 3   | 3.00  | 6.00  |
| Lightning                         | 4   | 1   | 1   | 2   | 1.33  | 5.33  |
| Severe Winter Weather             | 3   | 1   | 2   | 2   | 1.67  | 5.00  |
| Urban Fire                        | 3   | 2   | 2   | 1   | 1.67  | 5.00  |
| Cyber security breach             | 3   | 1   | 2   | 2   | 1.67  | 5.00  |
| Flood                             | 4   | 1   | 1   | 1   | 1.00  | 4.00  |
| Hurricane                         | 2   | 1   | 2   | 2   | 1.67  | 3.33  |
| Mass Casualty (Trauma or Medical) | 2   | 3   | 1   | 1   | 1.67  | 3.33  |
| Epidemic                          | 2   | 3   | 0   | 2   | 1.67  | 3.33  |
| Terror Attack (WMD)               | 1   | 3   | 3   | 3   | 3.00  | 3.00  |
| Drought                           | 2   | 1   | 1   | 1   | 1.00  | 2.00  |
| Extreme Heat                      | 2   | 1   | 1   | 1   | 1.00  | 2.00  |
| Wildfire                          | 2   | 1   | 1   | 1   | 1.00  | 2.00  |
| Dam Failure                       | 1   | 1   | 2   | 2   | 1.67  | 1.67  |
| Armed Attack                      | 1   | 2   | 1   | 2   | 1.67  | 1.67  |
| Earthquake                        | 1   | 1   | 2   | 1   | 1.33  | 1.33  |
| Biological Terror                 | 1   | 1   | 1   | 2   | 1.33  | 1.33  |
| Hail                              | 1   | 1   | 1   | 1   | 1.00  | 1.00  |
| Haz. Mat. (Fixed)                 | 1   | 1   | 1   | 1   | 1.00  | 1.00  |

#### Impact - Human, Property, Business

**Low:** There is little likelihood that injury or death will result from this hazard. The damage to land and property will likely be limited. Essential services and other services that residents and visitors depend upon will not be interrupted.

**Moderate:** There is some likelihood that injury or death will result from this hazard. There will likely be some damage to land and property. There will likely be some interruption of essential services and other services that residents and visitors depend upon for hours of days.

**High:** It is quite likely that injury or death will result from this hazard. There will be damage to multiple properties. Essential services and other services that residents and visitors depend upon be likely be interrupted for days.

**Catastrophic:** Multiple injuries or deaths will likely result from this hazard. Damage to properties will be widespread and extensive. Essential services and other services that residents and visitors depend upon be likely be interrupted for days or weeks.

## CHAPTER V: MITIGATION STRATEGIES

### A. CURRENT PLANS, POLICIES, AND REGULATIONS

The planning decisions that affect community growth patterns have evolved over the years as Tuftonboro has developed. Many local programs have the effect of mitigating disasters; some of these have been in effect for years, others have been updated since the development of the 2009 Hazard Mitigation Plan. A review of existing mitigation strategies was conducted and included review of pertinent documents including the zoning ordinance, subdivision regulations, emergency management plan, site plan regulations, and discussion with Committee members. The following strategies (Table 13) detail existing plans and regulations related to hazard mitigation.

The review of existing capabilities (Table 13) and the status of the 2009 Actions (Table 14) utilized these categorizations:

**Poor (P)**..... *The policy, plan or mutual aid system does **not work as well as it should** and **often** falls short of meeting its goals.*

**Fair (F)**.....*The policy, plan or mutual aid system does **not work as well as it should** and **sometimes** falls short of meeting its goals.*

**Good (G)**.....*The policy, plan or mutual aid system **works well** and **is achieving** its goals.*

**Excellent (E)**.....*The policy, plan or mutual aid system **works very well** and **often exceeds** its goals.*

**Untested (U)**.....*The policy, plan or mutual aid system has not yet been utilized or tested.*

**Table 13: Existing Protections and Policies**

| Protection                      | Description   | Year | Comments  | Effectiveness |
|---------------------------------|---|------|---|---------------|
| Master Plan                     | Guiding document for land use planning. It serves to guide the overall character, physical form, growth, and development of the community. It is the foundation upon which the town's zoning and regulations are based. RSA 674:2     | 2006 | This is developed by the Planning Board with public input and is referred to by the Board frequently. | G/E           |
| Capital Improvement Plan        | The Tuftonboro CIP is an outline of anticipated expenditures for capital projects over at least six years. It links local infrastructure investments with master plan goals, land use ordinances, and economic development. RSA 674:5 | 2013 | The town's first CIP was developed in 2007. Threshold - \$10,000 and lifespan of at least two years.  | G/E           |
| Local Emergency Operations Plan | The town maintains an LEOP in ESF format. This plan identifies the capabilities and response procedures of the town in response to an emergency.  | 2011 | Due for an update in 2015.  | E             |



| Protection                                     | Description  | Year | Comments  | Effectiveness |
|--|--|------|---|---------------|
| Water Resources Plan for Rural Fire Protection | Inventories, assesses, and maps local water resources for fire protection (fire ponds, cistern, dry hydrants) and recommends any additional actions to enhance fire protection.  | 2009 | This is referenced as Subdivision or Site Plan proposals are reviewed for fire protection.  | G             |
| Building Codes and Inspector                   | The town utilizes the NH Building Code and Life Safety Code, which incorporates the IBC, IPC, and NFPA. This ensures that new structures meet basic safety standards.  | 2009 | Having a full-time Code Enforcement Officer is an effective means of assuring that standards are met.   | E             |
| Fire Dept. ISO rating                          | Insurance rating system. It is based on a number of factors including firefighting resources, staffing, and response time. Impacts insurance rates for home and business owners. The lower the number, the better the rating.  | 2013 | 6/8B, 10 on the islands. The first number is for structures within 1,000' of a hydrant or large cistern. The new Fire Station lowered the rating in town.                     | G             |
| Site Plan Regulations                          | Site Plan Review by the Planning Board is required of all non-residential and multi-family (two or more units) housing development. RSA 674:43   | 2011 | Fire Department reviews and comments.   | G             |
| Zoning Ordinance                               | Zoning involves regulating the size, location, and use of structures for the purpose of promoting the health, safety, and general welfare of the community. RSA 674:16   | 2012 | Reviewed in 2012.   | G             |
| Subdivision Regulations                        | Regulation of subdivision guides municipal development, protecting residents from poorly designed areas. New development must mesh efficiently with the municipal pattern of infrastructure, essential services, and vehicular access. RSA 674:35  | 2011 | 2009 Plan recommended checking for consistency with the Master Plan. Completed.   | G             |
| Floodplain Ordinance                           | The minimum requirements of the National Flood Insurance Program (NFIP) have been adopted as part of Tuftonboro's Zoning Ordinance. This regulates all new and substantially improved structures in the 1% (or 100-year) floodplain, requiring floodproofing actions on any permitted development. | 2013 | Requirement for participation in the National Flood Insurance Program (NFIP).   | G             |
| Flood Insurance Rate Maps (FIRM)               | Maps developed by FEMA delineating boundaries of various flood-prone areas, including the 1% Annual (100-year) Floodplain.   | 2013 | Maps were updated in 2012 and provided in digital format (DFIRMs) <a href="http://msc.fema.gov/portal">http://msc.fema.gov/portal</a> . Some minor boundary changes occurred. | G             |

| Protection                          | Description   | Year | Comments   | Effectiveness         |
|-------------------------------------|---|------|--|-----------------------|
| Elevation Certificates              | Elevation Certificates are maintained and on file with the town's Code Enforcement Officer. These certify the elevation of flood-prone structures as identified on the FIRM.                      |      | Because of the limited floodplain area, very few structures in town require an Elevation Certificate.  | G                     |
| Regional Planning                   | In New Hampshire communities may be members of region planning commissions and receive assistance with land use planning.   |      | Tuftonboro is a member of LRPC and receives assistance with land use, transportation, environmental planning along with GIS mapping assistance.                    | G                     |
| Maintenance programs to reduce risk | Tree trimming, clearing drainage systems  |      | DPW funds are budgeted for annual tree trimming. Drainage by DPW annually in spring and before heavy storms.   | Tree - G<br>Drain - G |
| Mutual Aid Agreements               | Agreements with nearby communities to receive or provide assistance in emergency/call situations. Usually written agreements updated on a regular basis.  |      | Fire - Yes, Police - Yes, DPW - No   | G, G, G               |
| Emergency Warning System            | The town has cable TV and emergency vehicles with PA systems that can be used to notify the public. Now also have Reverse 911.  |      | There are gaps in terms of who is signed up. An effort should be made to sign up more residents.   | F/G                   |
| Septic Code                         | The NH Department of Environmental Services (DES) regulates septic design and installation. This helps protect drinking water quality.  |      | None   | G                     |
| Road Design Standard                | The Tuftonboro Subdivision Regulations now include road design standards that control the amount and retention of stormwater runoff. It also insures that emergency vehicles can access the site. | 2010 | These standards only address new road construction. There are some driveways and pre-existing roads that are difficult for emergency vehicles to access.           | G                     |
| Bridge Maintenance Program          | The state maintains state bridges and every other year inspects all bridges.  |      | There are no red-listed State bridges in town. The Sodom Road bridge is on the Municipal red-list. It is scheduled to be addressed by the town in the current CIP. | G                     |

| Protection                             | Description   | Year | Comments  | Effectiveness |
|--|---|------|---|---------------|
| Storm Drain/<br>Culvert<br>Maintenance | The Tuftonboro Road Agent and State DOT clean the drainage basins once a year and after major flooding events. Culverts are repaired as needed.   |      | ID in 2009: Upgrade High St. culvert, Lang Pond Rd. culvert, and Dame Rd. High St. and Dame Rd. have been done.                               | G             |
| State Dam<br>Program                   | The NH Department of Environmental Services (DES) inspects dams and maintains state dams.   |      | This is continues to be a role/responsibility of the state.   | E             |
| Wetlands<br>Protection                 | The Zoning Ordinance contains a Wetlands Conservation District.   |      | 2009 Recommend - Establish structure setbacks, none have been implemented. There is debate regarding whether current ordinance is too strict. | G             |
| Hazardous<br>Materials<br>Team         | There are no substantial Hazardous Materials facilities that warrant a Hazardous Materials Plan. There is a regional HazMat response team that serves the town.                                       |      | The team that serves Tuftonboro is now called the Carroll County HazMat Team.   | G             |
| Public<br>Education<br>Programs        | Tuftonboro Police and Fire Departments conduct public outreach at school and several community activities.  |      | Address protecting home and health.   | G             |
| Public Health<br>Plan and<br>Network   | The Public Health Emergency Preparedness Response Plan (PHEPRP) establishes methods and procedures for local regional, and state emergency planning agencies to respond to public health emergencies. |      | Plan is complete. Coordinate through Carroll County Regional Public Health Network.   | G             |
| HazMat in<br>Transport                 | Coordinate and train with Carroll County HazMat Team as well as maintain appropriate supplies to be able to handle initial spill response.  |      | Regular training, coordination, and resupply are required to maintain efficacy.   | G             |
| Cyber Security<br>Breach               | Communicate and coordinate with regional, state, and national partners to keep abreast of malicious activities and maintain the integrity of the town's electronic data and communications capacity.  |      | Requires diligent coordination and dedication of resources.   | G             |

## B. STATUS OF 2009 ACTIONS

The 2009 HMP contained 20 recommendations. The status of the mitigation actions recommended in the 2009 plan is indicated in Table 14 as either, Completed, Deleted, or Deferred. The committee determined that ten have been completed and three others are no longer considered pertinent (deleted). Some of the completed Actions are now listed above as “Current Plans, Policies, and Regulations”. Deferred Actions (or deferred portions of Actions) were carried forward to be considered as new Mitigation Actions (Table 15). This table also indicates whether the action is considered a mitigation or preparedness action, the effectiveness of the action, and any changes that may be needed to improve upon it. Mitigation actions are taken to reduce or eliminate long-term risk to hazards while preparedness actions are taken to improve emergency response or operational preparedness.<sup>22</sup> Effectiveness utilizes the same ratings definitions used for Table 13.

**Table 14: Status of Actions from the 2009 Hazard Mitigation Plan**

| ID | Action (2009)  | Hazard   | Mit/<br>Prep | Status    | Effectiveness | Comments/ Is further action required?  |
|----|--|--|--------------|-----------|---------------|--|
| 1  | Install town frequency repeater on County Road   | Wind, Lightning,<br>Winter Weather,<br>Hurricane | Prep         | Deferred  | n/a           | This was in the CIP. Similar action is being considered by the County.   |
| 2  | Purchase Reverse 911 to alert Tuftonboro residents of emergencies.                                     | All  | Prep         | Completed | Good          | More could be done to encourage full enrollment.   |
| 3  | Assist school with emergency planning and conduct an "Active Shooter" drill                            | Terrorism  | Prep         | Completed | Good          | Have done a lock down and critiqued the exercise.  |
| 4  | Develop an emergency alerting system in coordination with All Hazards Health Region #8.                | Epidemic   | Prep         | Deferred  | Good          | Does overlap with Reverse 911. Requires periodic review and updating.  |
| 5  | Increase the size of the culverts on Dame Road, Sodom Road, and Canaan Valley Road.                    | Flood, Hurricane                                 | Mitig.       | Deferred  | Fair          | Dame Road has been upgraded. Sodom Road and Canaan Valley Road have not, in part due to insufficient funds.            |
| 6  | Raise road on Brown Road and Curtis Road to accommodate larger culverts.                               | Flood, Hurricane                                 | Mitig.       | Deferred  | n/a           | Insufficient funds.  |
| 7  | Conduct an Emergency Operations Center (EOC) drill or table top exercise.                              | All Hazards                                      | Prep         | Completed | Good          | Table top exercise   |
| 8  | Implement the Firewise Program to emphasize community responsibility for planning for fire protection. | Drought, Fire                                    | Mitig.       | Deferred  | n/a           | Limited interest. On islands, the Shoreland Protection regulations limit the implementation of some of these elements. |

<sup>22</sup> *Mitigation Ideas: Possible Mitigation Measures by Hazard Type*, FEMA Region I (2014), p.1.

| ID | Action (2009)  | Hazard                                     | Mit/<br>Prep | Status    | Effectiveness | Comments/ Is further action required?  |
|----|--|--|--------------|-----------|---------------|--|
| 9  | Establish wetlands setback regulations and method of enforcement.  | Flood                                      | Mitig.       | Deferred  | n/a           | This has been discussed. It is not viewed as a big issue and it is perceived to add cost to the developer.   |
| 10 | Develop agreement with Northwoods and Belknap camps to use their facilities as an emergency shelter.   | All Hazards                                | Prep         | Deleted   | n/a           | Upon review, this does not warrant implementation. Camp Belknap is seasonal and Camp Northwoods does not have a generator.                               |
| 11 | Install cisterns/ dry hydrants as a result of Resource Conservation and Development (RCD) study.   | Drought, Fire                              | Prep         | Deferred  | Good          | Some have been implemented - Pier 19, Deer Run, Farm Pond Road (dry hydrant) and Melvin Village (30,000 gal cistern) As opportunities arise.             |
| 12 | Purchase generator for Town Hall.  | Wind, Lightning, Winter Weather, Hurricane | Prep         | Completed | Excellent     | Purchased through the state's EMPG program.  |
| 13 | Purchase office equipment for the EOC (white board, phones, laptop, etc.).   | All Hazards                                | Prep         | Completed | Good          | Included with the construction and outfitting of the new Fire Station/EOC.   |
| 14 | Review subdivision regulations for consistency with Master Plan.   | Fire                                       | Mitig.       | Completed | Good          | This is now a regular policy.  |
| 15 | Investigate joining the Community Rating System, which will lower flood insurance premiums for flood insurance policy holders in Tuftonboro. | Flood                                      | Mitig.       | Completed | Good          | This was done by the CEO and he determined that the benefits were not worth the administrative costs associated with joining and maintaining CRS status. |
| 16 | Conduct Emergency Preparedness outreach i.e. lightning, extreme heat.  | Lightning, Extreme Heat                    | Mitig.       | Completed | Good          | This is done through pamphlets and the town websites.  |
| 17 | Conduct Forest Fire Training for the Fire Department   | Fire                                       | Prep         | Completed | Good          | Training is held each year.  |
| 18 | Provide Haz-Mat training for fire, police, and road agent.   | Human-Caused Hazards                       | Prep         | Completed | Good          | Training is held each year.  |

| ID | Action (2009)   | Hazard   | Mit/<br>Prep | Status  | Effectiveness | Comments/ Is further action required?   |
|----|---|--|--------------|---------|---------------|---|
| 19 | Purchase NOAA weather radios for the town office and elementary school. | Flood, Wind,<br>Lightning,<br>Winter Weather,<br>Hurricane | Prep         | Deleted | n/a           | This is a preparation action and no longer considered a necessary element of this plan. |
| 20 | Purchase shelter supplies including cots and blankets.                  | All  | Prep         | Deleted | n/a           | Have six cots and 25 sets of bedding on site. Utilize regional supply.                  |

## C. MITIGATION GOALS AND TYPES OF ACTIONS

In the 2009 Plan, the committee affirmed its support for the goals stated in the State HMP at the time. While the overall goals of the town of Tuftonboro have not changed substantially since then, the form in which they are stated has. The general goals below are similar to the goals in the earlier plan while the hazard-specific goals address specific local concerns and were not included in the last plan.

### General Goals:

1. Improve upon the protection of the residents of Tuftonboro and its visitors from all hazards, raise general awareness, and reduce the liability to the town from hazard events.
2. Reduce the potential impact of hazard events on Tuftonboro's critical support services, facilities, and infrastructure.
3. Improve emergency preparedness.
4. Improve the response and recovery capability of Tuftonboro to hazard events.
5. Reduce the potential impact of hazard events on private and public property, the natural environment, and economic resources.
6. Work in cooperation with surrounding communities and in support of New Hampshire's Hazard Mitigation goals.

### Hazard Specific

#### Severe Wind

7. Reduce the likelihood of damage or loss of life due to high wind events.

#### Winter Weather

8. Minimize the impact of severe winter weather on people living in or visiting Tuftonboro along with structures and infrastructure.

#### Flooding

9. Minimize the impact that flooding would have on life, property, and infrastructure in Tuftonboro.

#### Fire

10. Reduce the risk of loss of life, and damage to property and infrastructure due to structural or wildfires.
11. Minimize the impact to life, property, and the environment during a hazardous materials spill.
12. Reduce the impact on life, structures, and infrastructure (especially communications infrastructure) as a result of a lightning strike.

#### Epidemic

13. Minimize the impact that an epidemic or other health hazard may have on the people in the town of Tuftonboro

There are a number of types of actions that communities may take to reduce the likelihood that a hazard might impact the community. These include:

- Local Plans and Regulations
- Structure and Infrastructure Projects
- Natural Systems Protection
- Education and Awareness Programs

#### D. POTENTIAL ACTIONS

Through a review of the risk assessment and local vulnerabilities, a number of Problem Statements were identified and refined by the Committee. Brainstorming yielded an updated list of mitigation strategies to address these current problems. Table 15 lists the problems and actions along with the hazard(s) that they address and notes whether the action addresses existing structures/infrastructure or future (new) structures/infrastructure as well as which goal(s) they address and the type of mitigation action each represents. The ID numbers are used simply for tracking purposes; they do not indicate any sort of prioritization. Note: the goals and their numbers are listed in the previous section.

**Table 15: Problems and Proposed Actions indicating Hazard, Structure, Goal, and Types of Action**

| Hazard                         | ID | Problem Statement   | Tuftonboro: Proposed Actions  | Comment  | Mitig./Prep. | N/E | Goal    | Type                 |
|--------------------------------|----|---|---|--|--------------|-----|---------|----------------------|
| Wind, Light, Winter, Hurricane | 1A | Due to the topography of the town, there are numerous areas that do not have good radio coverage. Better radio coverage would provide for safer and more efficient use of manpower and equipment. | Identify the best solution to improve emergency response communications coverage. This may involve a new repeater, upgraded technology, and partnering with Carroll County. | The County is working towards upgrading its infrastructure to address this issue. Their improvements and timeline will determine Action #1B.             | Preparation  | E   | 1.3.4.6 | Response-Commun.     |
| Wind, Light, Winter, Hurricane | 1B | Due to the topography of the town, there are numerous areas that do not have good radio coverage. Better radio coverage would provide for safer and more efficient use of manpower and equipment. | Once the best solution has been identified to improve emergency response communications coverage (technology, location, and partner), implement it.                         | The County is working towards upgrading its infrastructure to address this issue. Their improvements and timeline will impact this action. In CIP (2016) | Preparation  | E   | 1.3.4.6 | Response-Commun.     |
| Human Caused Hazards           | 2  |   | Develop an emergency alerting system in coordination with All Health Hazards Region #8.   | AHHR #8 has an Emergency Call Tree and tests it monthly.   | Preparation  | n/a | 1.3.4.6 | Response-Commun.     |
| Flood, Hurricane               | 3A | Flooding and washouts occur on sections of the road, impacting its use and compromising the roadway.  | Study downstream impacts on Sodom Road drainage   | Upgrading the culverts may resolve this problem but may also lead to additional impacts downstream.  | Mitigation   | E   | 1.2.5.9 | Struct./Infrastruct. |
| Flood, Hurricane               | 3B | Flooding and washouts occur on sections of the road, impacting its use and compromising the roadway.  | Implement the recommendations of the Sodom Road study to enhance drainage.  | In current CIP.  | Mitigation   | E   | 1.2.5.9 | Struct./Infrastruct. |
| Flood, Hurricane               | 4  | Flooding and washouts occur on sections of the road, impacting its use and compromising the roadway.  | Upgrade the culverts on Canaan Rd.  | In current CIP. There is no alternate access route to this area (a dozen homes and one summer camp).   | Mitigation   | E   | 1.2.5.9 | Struct./Infrastruct. |



| Hazard           | ID  | Problem Statement   | Tuftonboro: Proposed Actions   | Comment  | Mitig./Prep. | N/E                     | Goal          | Type                      |
|------------------|-----|---|--|--|--------------|-------------------------|---------------|---------------------------|
| Flood, Hurricane | 5   | Flooding and erosion along Lang Pond Rd. impact both Mirror Lake and the road.  | Replace culverts and conduct ditch work along the Lang Pond Road.  | In current CIP (defer)   | Mitigation   | E                       | 1.2.5.9       | Struct./<br>Infrastruct.  |
| Flood, Hurricane | 6   | Flooding and washouts occur on sections of the road, impacting its use and compromising the roadway.  | Raise the roadbed on Brown Rd. to accommodate larger culverts  | Crosses Beech River between Upper and Lower Beech Ponds.   | Mitigation   | E                       | 1.2.5.9       | Struct./<br>Infrastruct.  |
| Flood, Hurricane | 7   | Flooding and washouts occur on sections of the road, impacting its use and compromising the roadway.  | Raise the roadbed on Curtis Rd. to accommodate larger culverts   | Three homes on this road.  | Mitigation   | E                       | 1.2.5.9       | Struct./<br>Infrastruct.  |
| Fire, Drought    | 8   | Homeowners can take steps to better protect their properties against fire, especially those in more remote sections of town (least accessible to firefighters). | Work with homeowners to implement the Firewise program, emphasizing community responsibility for planning for fire protection. | No interest among homeowners   | Mitigation   | E                       | 1.3.4.5.10    | Educ. &<br>Aware.         |
| Flood            | 9   | Ensuring that buildings are constructed a sufficient distance from areas that are prone to being wet can reduce damage to the structure and contents.           | Establish wetlands setback regulations and a method of enforcement.  | There is a financial impact on homeowners  | Mitigation   | N                       | 1.5.9         | Local<br>Plans &<br>Regs. |
| Fire             | 10A | If there is not an appropriate water supply nearby, structures and people are at greater risk in a fire event.  | Install cisterns/dry hydrants as indicated in the Tuftonboro Water Resources Plan for Rural Fire Protection.                   | Part of the subdivision/site plan review process for new development. This is a town expense for installations & maintenance in existing developments. | Preparation  | Some<br>N,<br>some<br>E | 1.3.4.5.10.12 | Struct./<br>Infrastruct.  |
| Fire             | 10B | If there is not an appropriate water supply nearby, structures and people are at greater risk in a fire event.  | Develop and fund a Capital Reserve Program for cisterns and Dry Hydrants.  | This would fund installation, upgrade, and maintenance of infrastructure to protect existing structures.   | Preparation  | E                       | 1.3.4.5.10.12 | Struct./<br>Infrastruct.  |
| Flood, Hurricane | 11  | Flooding and washouts occur on sections of the road, impacting its use and compromising the roadway.  | Upgrade two culverts along Union Wharf Rd. to reduce flooding.   | Connector between two state Routes.  | Mitigation   | E                       | 1.2.5.9       | Struct./<br>Infrastruct.  |
| Flood, Hurricane | 12  | Red-listed bridges require repair or replacement to come up to state safety standards.  | Repair or replace the municipal red-listed bridge on New Road over the Melvin River.   | Listed as structurally deficient.  | Mitigation   | E                       | 1.2.5.9       | Struct./<br>Infrastruct.  |

| Hazard                | ID | Problem Statement   | Tuftonboro: Proposed Actions   | Comment                            | Mitig./Prep. | N/E | Goal     | Type                     |
|-----------------------|----|---|--|------------------------------------|--------------|-----|----------|--------------------------|
| Lightning             | 13 | Most buildings are not protected from lightning strikes.  | Add surge protection and lightning rods to critical facilities.  | Include in the next CIP.           | Mitigation   | E   | 1.2.5.12 | Struct./<br>Infrastruct. |
| Severe Winter Weather | 14 | Renovation of older homes (improving roof insulation) can sometimes lead to increased snow loads, through less melting of snow. | Conduct more public education regarding home renovations and the impacts of changes (such as improved insulation leading to greater snow loads). | Code changes are due in late 2015. | Mitigation   | E   | 1.5.7.8  | Educ. &<br>Aware.        |
| Flood, Hurricane      | 15 | Red-listed bridges require repair or replacement to come up to state safety standards.  | Repair or replace the municipal red-listed bridge on Sodom Road over the Melvin River.   | Listed as structurally deficient.  | Mitigation   | E   | 1.2.5.9  | Struct./<br>Infrastruct. |

After hearing a number of comments regarding each proposed action, the Committee decided to drop Items #2 and #8 from further discussion as they were deemed not necessary or unworkable.

NH RSA 674:2(e) does allow for the inclusion of a natural hazards chapter in a local master plan. This was not a specific recommendation of the 2009 Hazard Mitigation Plan. The town will be updating its Master Plan in 2015 and should consider incorporating this plan into the new Master Plan.

The Committee identified the various costs and benefits associated with each action. The estimated cost represents what the town estimates it will cost in terms of dollars or staff hours to implement each action. Table 16 shows the costs as well as the various benefits associated with each action.

**Table 16: Mitigation Actions by Hazard Type – Estimated Cost**

| Hazard  | ID | Problem Statement   | Tuftonboro: Proposed Actions  | Cost (\$ or Hours)  | Potential Funding          |
|---|----|---|---|---------------------|----------------------------|
| <b>Under \$10,000 or under 200 hours</b>        |    |   |   |                     |                            |
| Wind, Light, Winter, Hurricane                  | 1A | Due to the topography of the town, there are numerous areas that do not have good radio coverage. Better radio coverage would provide for safer and more efficient use of manpower and equipment. | Identify the best solution to improve emergency response communications coverage. This may involve a new repeater, upgraded technology, and partnering with Carroll County. | 20 hours staff time | Operating Budget           |
| Flood   | 9  | Ensuring that buildings are constructed a sufficient distance from areas that are prone to being wet can reduce damage to the structure and contents.   | Establish wetlands setback regulations and a method of enforcement.   | 40 hours staff time | Operating Budget           |
| Severe Winter Weather                           | 14 | Renovation of older homes (improving roof insulation) can sometimes lead to increased snow loads, through less melting of snow.   | Conduct more public education regarding home renovations and the impacts of changes (such as improved insulation leading to greater snow loads).                            | 10 hours/year       | Operating Budget           |
| <b>\$10,000 - \$99,999 or 200 - 2,000 hours</b> |    |   |   |                     |                            |
| Wind, Light, Winter, Hurricane                  | 1B | Due to the topography of the town, there are numerous areas that do not have good radio coverage. Better radio coverage would provide for safer and more efficient use of manpower and equipment. | Once the best solution has been identified to improve emergency response communications coverage (technology, location, and partner)f, implement it.                        | \$15,000            | Town                       |
| Flood, Hurricane                                | 3B | Flooding and washouts occur on sections of the road, impacting its use and compromising the roadway.  | Implement the recommendations of the Sodom Road study to enhance drainage.  | at least \$15,000   | Highway Dept. budget, FEMA |
| Flood, Hurricane                                | 4  | Flooding and washouts occur on sections of the road, impacting its use and compromising the roadway.  | Upgrade the culverts on Canaan Rd.  | \$15,000            | Highway Dept. budget, FEMA |
| Flood, Hurricane                                | 11 | Flooding and washouts occur on sections of the road, impacting its use and compromising the roadway.  | Upgrade two culverts along Union Wharf Rd. to reduce flooding.  | \$15,000            | Highway Dept. budget, FEMA |
| Flood, Hurricane                                | 3A | Flooding and washouts occur on sections of the road, impacting its use and compromising the roadway.  | Study downstream impacts on Sodom Road drainage   | \$25,000            | Highway Dept. budget       |

| Hazard  | ID  | Problem Statement  | Tuftonboro: Proposed Actions   | Cost (\$ or Hours)                       | Potential Funding          |
|---|-----|--|--|--|----------------------------|
| Lightning   | 13  | Most critical facility buildings are not protected from lightning strikes.                                     | Add surge protection and lightning rods to critical facilities.  | \$50,000                                 | FEMA, Town Warrant         |
| Fire, Drought                                     | 10A | If there is not an appropriate water supply nearby, structures and people are at greater risk in a fire event. | Install cisterns/dry hydrants as indicated in the Tuftonboro Water Resources Plan for Rural Fire Protection. | Cistern \$60,000, Dry hydrant \$3,000/yr | Developer                  |
| <b>\$100,000 or more or more than 2,000 hours</b> |     |  |  |  |                            |
| Fire, Drought                                     | 10B | If there is not an appropriate water supply nearby, structures and people are at greater risk in a fire event. | Develop and fund a Capital Reserve Program for cisterns and Dry Hydrants                                     | \$100,000                                | Town Warrant               |
| Flood, Hurricane                                  | 5   | Flooding and erosion along Lang Pond Rd. impact both Mirror Lake and the road.                                 | Replace culverts and conduct ditchwork along the Lang Pond Road.   | <\$440,000                               | Highway Dept. budget, FEMA |
| Flood, Hurricane                                  | 6   | Flooding and washouts occur on sections of the road, impacting its use and compromising the roadway.           | Raise the roadbed on Brown Rd. to accommodate larger culverts  | at least \$100,000                       | Highway Dept. budget, FEMA |
| Flood, Hurricane                                  | 7   | Flooding and washouts occur on sections of the road, impacting its use and compromising the roadway.           | Raise the roadbed on Curtis Rd. to accommodate larger culverts   | at least \$100,000                       | Highway Dept. budget, FEMA |
| Flood, Hurricane                                  | 12  | Red-listed bridges require repair or replacement to come up to state safety standards.                         | Repair or replace the municipal red-listed bridge on New Road over the Melvin River.                         | at least \$100,000                       | Highway Dept. budget, FEMA |
| Flood, Hurricane                                  | 15  | Red-listed bridges require repair or replacement to come up to state safety standards.                         | Repair or replace the municipal red-listed bridge on Tuftonboro Neck Rd. bridge.                             | at least \$100,000                       | Highway Dept. budget, FEMA |

## E. PRIORITIZATION OF ACTIONS

After considering the pros and cons of each project, the Committee prioritized the various projects which had been identified and discussed. Committee members agreed to use an adaptation of a standard prioritization tool to better reflect the concerns of the community. Using the tool the committee considered eleven separate aspects for each Action including the Costs (See Appendix H for full details). Table 17 shows the Actions grouped by anticipated cost, then ordered by their overall score. Total scores range from a high of 10 to a low of 0.

**Table 17: Recommended Actions in Ranked Order**

| Hazard  | ID  | Tuftonboro: Proposed Actions  | Total |
|---|-----|---|-------|
| <b>Under \$10,000 or under 200 hours</b>          |     |   |       |
| Wind, Light, Winter, Hurricane                    | 1A  | Identify the best solution to improve emergency response communications coverage. This may involve a new repeater, upgraded technology, and partnering with Carroll County. | 9     |
| Flood   | 9   | Establish wetlands setback regulations and a method of enforcement.   | 5     |
| Severe Winter Weather                             | 14  | Conduct more public education regarding home renovations and the impacts of changes (such as improved insulation leading to greater snow loads).                            | 5     |
| <b>\$10,000 - \$99,999 or 200 - 2,000 hours</b>   |     |   |       |
| Fire, Drought                                     | 10A | Install cisterns/dry hydrants as indicated in the Tuftonboro Water Resources Plan for Rural Fire Protection.  | 10    |
| Wind, Light, Winter, Hurricane                    | 1B  | Once the best solution has been identified to improve emergency response communications coverage (technology, location, partner), implement it.                             | 9     |
| Flood, Hurricane                                  | 3A  | Study downstream impacts on Sodom Road drainage   | 7     |
| Flood, Hurricane                                  | 3B  | Implement the recommendations of the Sodom Road study to enhance drainage.  | 6     |
| Flood, Hurricane                                  | 4   | Upgrade the culverts on Canaan Rd.  | 6     |
| Flood, Hurricane                                  | 11  | Upgrade two culverts along Union Wharf Rd. to reduce flooding.  | 6     |
| Lightning   | 13  | Add surge protection and lightning rods to critical facilities.   | 6     |
| <b>\$100,000 or more or more than 2,000 hours</b> |     |   |       |
| Fire, Drought                                     | 10B | Develop and fund a Capital Reserve Program for cisterns and Dry Hydrants  | 8     |
| Flood, Hurricane                                  | 5   | Replace culverts and conduct ditchwork along the Lang Pond Road.  | 6     |
| Flood, Hurricane                                  | 6   | Raise the roadbed on Brown Rd. to accommodate larger culverts   | 6     |
| Flood, Hurricane                                  | 7   | Raise the roadbed on Curtis Rd. to accommodate larger culverts  | 6     |
| Flood, Hurricane                                  | 12  | Repair or replace the municipal red-listed bridge on New Road over the Melvin River.  | 0     |
| Flood, Hurricane                                  | 15  | Repair or replace the municipal red-listed bridge on Tuftonboro Neck Rd. bridge.  | 0     |

## F. IMPLEMENTATION OF MITIGATION ACTIONS

There are many factors that influence how a town chooses to spend its energy and resources in implementing recommended actions. Factors include:

- Urgency
- How quickly an action could be implemented
- Likelihood that the action will reduce future emergencies
- Regulations required to implement the action
- Administrative burdens
- Time (both paid and volunteer)
- Funding availability
- Political acceptability of the action.

In the context of these factors, the Committee discussed the mitigation actions and relative level of priority, recognizing that some actions are of greater priority to different town departments. This implementation schedule contains a matrix (Table 18) indicating the estimated cost of implementation, potential funding sources, the parties responsible for bringing about these actions, and implementation time frame. Though a number of recommended mitigation actions received high scores, the time frame for which the actions are executed may depend upon staff time, budgetary limitations, and additional factors.

These are listed in order of their Time Frame. To keep the plan current, the implementation schedule should be updated and re-evaluated on a regular basis as outlined in the monitoring section of this plan. The Tracking Tools in Appendix J may be helpful for this process.

**Table 18: Implementation Schedule for Mitigation Actions**

| Hazard           | ID  | Tuftonboro: Proposed Actions   | Comment   | Cost (\$ or Hours)                       | Potential Funding          | Responsible Party  | Time Frame |
|------------------|-----|--|---|--|----------------------------|--------------------|------------|
| Flood, Hurricane | 11  | Upgrade two culverts along Union Wharf Rd. to reduce flooding.   | Connector between two state Routes.   | \$15,000                                 | Highway Dept. budget, FEMA | Road Agent         | 1 year     |
| Fire, Drought    | 10A | Install cisterns/dry hydrants as indicated in the Tuftonboro Water Resources Plan for Rural Fire Protection. | Part of the subdivision/site plan review process for new development. Town expense for other installations & maintenance. | Cistern \$60,000, Dry hydrant \$3,000/yr | Developer                  | Planning Board, FD | Ongoing*   |

| Hazard                         | ID  | Tuftonboro: Proposed Actions  | Comment  | Cost (\$ or Hours)  | Potential Funding          | Responsible Party | Time Frame |
|--------------------------------|-----|---|--|---------------------|----------------------------|-------------------|------------|
| Lightning                      | 13  | Add surge protection and lightning rods to critical facilities.   | Include in CIP.  | \$50,000            | FEMA, Town Warrant         | Code Enforcement  | 1-2 years  |
| Wind, Light, Winter, Hurricane | 1A  | Identify the best solution to improve emergency response communications coverage. This may involve a new repeater, upgraded technology, and partnering with Carroll County. | The County is working towards upgrading its infrastructure to address this issue. Their improvements and timeline will determine Action #1B.             | 20 hours staff time | Operating Budget           | EMD               | 1-2 years  |
| Wind, Light, Winter, Hurricane | 1B  | Once the best solution has been identified to improve emergency response communications coverage (technology, location, partner), implement it.                             | The County is working towards upgrading its infrastructure to address this issue. Their improvements and timeline will impact this action. In CIP (2016) | \$15,000            | Town                       | EMD               | 1-2 years  |
| Severe Winter Weather          | 14  | Conduct more public education regarding home renovations and the impacts of changes (such as improved insulation leading to greater snow loads).                            | Code changes are due in late 2015.   | 10 hours/year       | Operating Budget           | Code Enforcement  | Ongoing*   |
| Fire, Drought                  | 10B | Develop and fund a Capital Reserve Program for cisterns and Dry Hydrants  | This would fund installation, upgrade, and maintenance of infrastructure to protect existing structures.   | \$100,000           | Town Warrant               | FD                | Ongoing*   |
| Flood, Hurricane               | 3A  | Study downstream impacts on Sodom Road drainage   | Upgrading the culverts may resolve this problem but may also lead to additional impacts downstream.  | \$25,000            | Highway Dept. budget       | Road Agent        | 2-3 years  |
| Flood, Hurricane               | 3B  | Implement the recommendations of the Sodom Road study to enhance drainage.  | In CIP   | at least \$15,000   | Highway Dept. budget, FEMA | Road Agent        | 3-4 years  |
| Flood, Hurricane               | 4   | Upgrade the culverts on Canaan Rd.  | In CIP. There is no alternate access route to this area (a dozen homes and one summer camp).   | \$15,000            | Highway Dept. budget, FEMA | Road Agent        | 4-5 years  |
| Flood, Hurricane               | 5   | Replace culverts and conduct ditchwork along the Lang Pond Road.  | In CIP (defer)   | <\$440,000          | Highway Dept. budget, FEMA | Road Agent        | 4-5 years  |
| Flood, Hurricane               | 6   | Raise the roadbed on Brown Rd. to accommodate larger culverts   | Crosses Beech River between Upper and Lower Beech Ponds.   | at least \$100,000  | Highway Dept. budget, FEMA | Road Agent        | 4-5 years  |



| Hazard           | ID | Tuftonboro: Proposed Actions   | Comment                                   | Cost (\$ or Hours)  | Potential Funding          | Responsible Party                | Time Frame |
|------------------|----|--|---|---------------------|----------------------------|----------------------------------|------------|
| Flood, Hurricane | 7  | Raise the roadbed on Curtis Rd. to accommodate larger culverts                       | Three homes on this road.                 | at least \$100,000  | Highway Dept. budget, FEMA | Road Agent                       | 4-5 years  |
| Flood            | 9  | Establish wetlands setback regulations and a method of enforcement.                  | There is a financial impact on homeowners | 40 hours staff time | Operating Budget           | Planning Board, Code Enforcement | 4-5 years  |
| Flood, Hurricane | 12 | Repair or replace the municipal red-listed bridge on New Road over the Melvin River. | Listed as structurally deficient.         | at least \$100,000  | Town Warrant               | Road Agent                       | 4-5 years  |
| Flood, Hurricane | 15 | Repair or replace the municipal red-listed bridge on Tuftonboro Neck Rd. bridge.     | Listed as structurally deficient.         | at least \$100,000  | Town Warrant               | Road Agent                       | 4-5 years  |

\*This action will be completed on an ongoing basis throughout the life of the plan.

While not a mitigation action on its own, a Capital Improvements Program (CIP) is a tool that can be useful in helping a community budget for a variety of expensive, capital projects, including those that mitigate hazards. Tuftonboro has a CIP Committee appointed by the Board of Selectmen. The town has used operating budgets and Capital Reserve accounts to help pay for most of its hazard mitigation expenses.

## **CHAPTER VI: PLAN ADOPTION AND MONITORING**

### **A. IMPLEMENTATION**

The Tuftonboro Hazard Mitigation Plan Update Committee, established by the EMD and Board of Selectmen, will meet annually to review the Plan and provide a mechanism for ensuring that an attempt is made to incorporate the actions identified in the plan into ongoing town planning activities. Essential elements of implementation require that all responsible parties for the various recommendations understand what is expected of them, and that they are willing to fulfill their role in implementation. It is therefore important to have the responsible parties clearly identified when the town adopts the final plan. Where appropriate it would be helpful to have any hazard mitigation activities identified in job descriptions.

Some of the actions in this plan rely on the town's operating budget along with grant funds available through FEMA and other sources such as those listed in Appendix B. The Emergency Management Director will coordinate with the department heads, Budget Committee, and Selectmen to ensure that funds and staff time for these projects are available. The EMD and Hazard Mitigation Committee will work with the Selectmen and Capital Improvements Plan (CIP) Committee to incorporate the various projects into subsequent budgets. The EMD will also coordinate with the NH HSEM Field Representative to ensure that the town applies for appropriate grant funds.

For those mitigation actions which involve either revisions to the Subdivision or Site Plan Review Regulations or the Zoning Ordinance or incorporation into the Master Plan, members of the Hazard Mitigation Committee will work with the Planning Board to develop appropriate language.

When appropriate, an effort will be made to incorporate this plan into the Emergency Operations Plan. Within a year after the town officially adopts the 2015 update to the Hazard Mitigation Plan, an attempt will be made to have hazard mitigation strategies integrated into these existing mechanisms and into all other ongoing town planning activities.

### **B. PLAN MAINTENANCE & PUBLIC INVOLVEMENT**

The Tuftonboro Hazard Mitigation Planning Committee and the Selectboard, in order to track progress and update the mitigation strategies identified in Chapter V, Section F will review the Tuftonboro Hazard Mitigation Plan every year or after a hazard event. Town of Tuftonboro Emergency Management Director is responsible for initiating this review and needs to consult with members of the Tuftonboro Committee identified in this Plan. Changes will be made to the Plan to accommodate projects that have failed, are no longer consistent with the timeframe identified, are no longer consistent with the community's priorities, or lack funding resources. Priorities that were not ranked high, but identified as potential mitigation strategies, will be reviewed during the monitoring and update of this Plan to determine feasibility of future implementation. In keeping with the process of adopting the Plan, a public hearing will be held to receive public comment on the Plan.

Maintenance and updating will be held during the annual review period and the final product adopted by the Selectboard. The Committee will meet annually as part of this plan maintenance.

The Emergency Management Director is also responsible for updating and resubmitting the plan to FEMA to be re-approved every five years. The EMD will convene a plan update committee in early 2019 to begin updating this plan before it expires.

On behalf of the Hazard Mitigation Committee, the Emergency Management Director, under direction of the Selectboard, will be responsible for ensuring that town's departments and the public have adequate opportunity to participate in the planning process during the Plan's annual review and during any Hazard Mitigation Committee meetings. Administrative staff may be utilized to assist with the public involvement process.

For each committee meeting, and the annual update process, techniques that will be utilized for public involvement include:

- ❖ Provide invitations to Budget Committee members;
- ❖ Provide invitations to municipal department heads;
- ❖ Post notices of meetings at the Town Hall, Fire Station, Library, and on the town website;
- ❖ Submit press releases for publication in the *Granite State News*, *Tuftonboro Times*, and *Conway Daily Sun*, and other appropriate newspapers or media outlets.

Entities to invite to future Hazard Mitigation plan updates include the Emergency Management Directors of the neighboring communities of Wolfeboro, Moultonborough, and Ossipee.

**C. SIGNED CERTIFICATE OF ADOPTION**

Town of Tuftonboro, NH Board of Selectmen

**A RESOLUTION ADOPTING THE TUFTONBORO, NH HAZARD MITIGATION PLAN UPDATE 2015**

WHEREAS, the town of Tuftonboro has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of high winds, fire, snow and ice storms, lightning, flooding, as well as hazardous materials in transport and breaches in cybersecurity resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the town of Tuftonboro has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan Update 2015 under the requirements of 44 CFR 201.6; and

WHEREAS, public and committee meetings were held between January and December 2014 regarding the development and review of the Hazard Mitigation Plan Update 2015; and

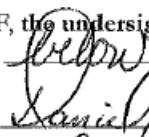
WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the town of Tuftonboro; and

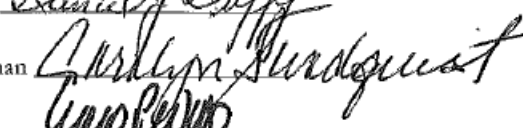
WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the town of Tuftonboro, with the effect of protecting people and property from loss associated with those hazards; and

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


RESOLVED by the Board of Selectmen:

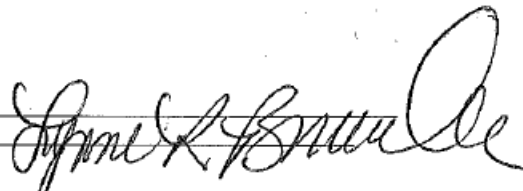
1. The Plan is hereby adopted as an official plan of the town of Tuftonboro;
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Board of Selectmen by the Emergency Management Director

IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the Town Seal or Notary  Date: This 27 day of July, 2015.

Daniel J. Duffy, Chairman 

Carolyn Sundquist, Selectman

Lloyd P. Wood, Selectman 



LYNNE R. BRUNELLE, Notary Public  
My Commission Expires October 2, 2018

## APPENDIX A: TECHNICAL RESOURCES

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|   |                |
|---|----------------|
| <b>NH Homeland Security and Emergency Management</b> .....  | 271-2231       |
| <a href="http://www.nh.gov/safety/divisions/HSEM/">http://www.nh.gov/safety/divisions/HSEM/</a>   |                |
| Hazard Mitigation Section.....  | 271-2231       |
| <a href="http://www.nh.gov/safety/divisions/hsem/HazardMitigation/index.html">http://www.nh.gov/safety/divisions/hsem/HazardMitigation/index.html</a>   |                |
| <b>Federal Emergency Management Agency</b> .....  | (617) 223-4175 |
| <a href="http://www.fema.gov/">http://www.fema.gov/</a>   |                |
| FEMA, National Flood Insurance Program, Community Status Book   |                |
| <a href="http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-status-book">http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-status-book</a> |                |
| <b>NH Regional Planning Commissions:</b>  |                |
| Central NH Regional Planning Commission .....   | 796-2129       |
| <a href="http://www.cnhrpc.org/">http://www.cnhrpc.org/</a>   |                |
| Lakes Region Regional Planning Commission.....  | 279-8171       |
| <a href="http://www.lakesrpc.org/">http://www.lakesrpc.org/</a>   |                |
| Nashua Regional Planning Commission .....   | 883-0366       |
| <a href="http://www.nashuarpc.org/">http://www.nashuarpc.org/</a>   |                |
| North Country Council.....  | 444-6303       |
| <a href="http://www.nccouncil.org/">http://www.nccouncil.org/</a>   |                |
| Rockingham Regional Planning Commission .....   | 778-0885       |
| <a href="http://www.rpc-nh.org/">http://www.rpc-nh.org/</a>   |                |
| Southern New Hampshire Regional Planning Commission.....  | 669-4664       |
| <a href="http://www.snhpc.org/">http://www.snhpc.org/</a>   |                |
| Southwest Regional Planning Commission .....  | 357-0557       |
| <a href="http://www.swrpc.org/">http://www.swrpc.org/</a>   |                |
| Strafford Regional Planning Commission.....   | 742-2523       |
| <a href="http://www.straftford.org/">http://www.straftford.org/</a>   |                |
| Upper Valley Lake Sunapee Regional Planning Commission.....   | 448-1680       |
| <a href="http://www.uvlsrc.org/">http://www.uvlsrc.org/</a>   |                |
| <b>NH Governor's Office of Energy and Planning</b> .....  | 271-2155       |
| <a href="http://www.nh.gov/oep/index.htm">http://www.nh.gov/oep/index.htm</a>   |                |
| New Hampshire Floodplain Management Program   |                |
| <a href="http://www.nh.gov/oep/programs/floodplainmanagement/index.htm">http://www.nh.gov/oep/programs/floodplainmanagement/index.htm</a>   |                |
| <b>NH Department of Transportation</b> .....  | 271-3734       |
| <a href="http://www.nh.gov/dot/index.htm">http://www.nh.gov/dot/index.htm</a>   |                |
| <b>NH Department of Cultural Affairs</b> .....  | 271-2540       |
| <a href="http://www.nh.gov/nhculture/">http://www.nh.gov/nhculture/</a>   |                |
| Division of Historical Resources .....  | 271-3483       |
| <a href="http://www.nh.gov/nhdhr/">http://www.nh.gov/nhdhr/</a>   |                |
| <b>NH Department of Environmental Services</b> .....  | 271-3503       |
| <a href="http://www.des.state.nh.us/">http://www.des.state.nh.us/</a>   |                |
| Dam Bureau.....   | 271-63406      |
| <a href="http://www.des.state.nh.us/organization/divisions/water/dam/index.htm">http://www.des.state.nh.us/organization/divisions/water/dam/index.htm</a>   |                |
| <b>NH Municipal Association</b> .....   | 224-7447       |
| <a href="http://www.nhmunicipal.org/LGCWebsite/index.asp">http://www.nhmunicipal.org/LGCWebsite/index.asp</a>   |                |

|   |                |
|---|----------------|
| <b>NH Fish and Game Department</b> .....  | 271-3421       |
| <a href="http://www.wildlife.state.nh.us/">http://www.wildlife.state.nh.us/</a>   |                |
| <b>NH Department of Resources and Economic Development</b> .....  | 271-2411       |
| <a href="http://www.dred.state.nh.us/">http://www.dred.state.nh.us/</a>   |                |
| Division of Forests and Lands.....  | 271-2214       |
| <a href="http://www.nhdf.org/">http://www.nhdf.org/</a>   |                |
| Natural Heritage Inventory .....  | 271-2215       |
| <a href="http://www.nhdf.org/about-forests-and-lands/bureaus/natural-heritage-bureau/">http://www.nhdf.org/about-forests-and-lands/bureaus/natural-heritage-bureau/</a> |                |
| Division of Parks and Recreation.....   | 271-3255       |
| <a href="http://www.nhstateparks.org/">http://www.nhstateparks.org/</a>   |                |
| <b>NH Department of Health and Human Services</b> .....   | 271-9389       |
| <a href="http://www.dhhs.state.nh.us/">http://www.dhhs.state.nh.us/</a>   |                |
| <b>Northeast States Emergency Consortium, Inc. (NESEC)</b> .....  | (781) 224-9876 |
| <a href="http://www.nesec.org/">http://www.nesec.org/</a>   |                |
| <b>US Department of Commerce</b> .....  | (202) 482-2000 |
| <a href="http://www.commerce.gov/">http://www.commerce.gov/</a>   |                |
| National Oceanic and Atmospheric Administration.....  | (202) 482-6090 |
| <a href="http://www.noaa.gov/">http://www.noaa.gov/</a>   |                |
| National Weather Service, Eastern Region Headquarters   |                |
| <a href="http://www.erh.noaa.gov/">http://www.erh.noaa.gov/</a>   |                |
| National Weather Service, Tauton, Massachusetts.....  | (508) 824-5116 |
| <a href="http://www.erh.noaa.gov/er/box/">http://www.erh.noaa.gov/er/box/</a>   |                |
| National Weather Service, Gray, Maine .....   | (207) 688-3216 |
| <a href="http://www.erh.noaa.gov/er/gyx/">http://www.erh.noaa.gov/er/gyx/</a>   |                |
| <b>US Department of the Interior</b>  |                |
| <a href="http://www.doi.gov/">http://www.doi.gov/</a>   |                |
| US Fish and Wildlife Service.....   | 225-1411       |
| <a href="http://www.fws.gov/">http://www.fws.gov/</a>   |                |
| US Geological Survey.....   | 225-4681       |
| <a href="http://www.usgs.gov/">http://www.usgs.gov/</a>   |                |
| US Geological Survey Real Time Hydrologic Data  |                |
| <a href="http://waterdata.usgs.gov/nwis/rt">http://waterdata.usgs.gov/nwis/rt</a>   |                |
| US Army Corps of Engineers.....   | (978) 318-8087 |
| <a href="http://www.usace.army.mil/">http://www.usace.army.mil/</a>   |                |
| <b>US Department of Agriculture</b>   |                |
| <a href="http://www.usda.gov/wps/portal/usdahome">http://www.usda.gov/wps/portal/usdahome</a>   |                |
| US Forest Service .....   | (202) 205-8333 |
| <a href="http://www.fs.fed.us/">http://www.fs.fed.us/</a>   |                |
| <b>New Hampshire Electrical Cooperative</b> .....   | (800) 698-2007 |
| <a href="http://www.nhec.com/">http://www.nhec.com/</a>   |                |
| <b>Cold Region Research Laboratory</b> .....  | 646-4187       |
| <a href="http://www.crrel.usace.army.mil/">http://www.crrel.usace.army.mil/</a>   |                |
| <b>National Emergency Management Association</b> .....  | (859) 244-8000 |
| <a href="http://nemaweb.org">http://nemaweb.org</a>   |                |

**National Aeronautics and Space Administration**

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

NASA Optical Transient Detector – Lightning and Atmospheric Research

<http://thunder.msfc.nasa.gov/>

**National Lightning Safety Institute**

<http://lightningsafety.com/>

**The Tornado Project Online**

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

**National Severe Storms Laboratory**

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

**Plymouth State University Weather Center**

<http://vortex.plymouth.edu/>



## **APPENDIX B: MITIGATION FUNDING RESOURCES**

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There are numerous potential sources of funding to assist with the implementation of mitigation efforts. Two lists of state and federal resources are provided below. Some of these may not apply or be appropriate for Tuftonboro. The NH Homeland Security and Emergency Management Field Representative for Carroll County provided some assistance during the meetings and should be contacted for further grant assistance.

|   |   |
|---|---|
| 404 Hazard Mitigation Grant Program (HMGP) .....  | NH Homeland Security and Emergency Management     |
| 406 Public Assistance and Hazard Mitigation ..... | NH Homeland Security and Emergency Management     |
| Community Development Block Grant (CDBG) .....    | NH HSEM, NH OEP, also refer to RPC                |
| Dam Safety Program .....                          | NH Department of Environmental Services           |
| Emergency Watershed Protection (EWP) Program..... | USDA, Natural Resources Conservation Service      |
| Flood Mitigation Assistance Program (FMAP) .....  | NH Homeland Security and Emergency Management     |
| Highway Safety Improvement Program.....           | NH Department of Transportation                   |
| Mitigation Assistance Planning (MAP).....         | NH Homeland Security and Emergency Management     |
| Mutual Aid for Public Works.....                  | NH Municipal Association                          |
| National Flood Insurance Program (NFIP) .....     | NH Office of Energy & Planning                    |
| Project Impact .....                              | NH Homeland Security and Emergency Management     |
| Roadway Repair & Maintenance Program(s) .....     | NH Department of Transportation                   |
| Shoreline Protection Program .....                | NH Department of Environmental Services           |
| Various Forest and Lands Program(s).....          | NH Department of Resources & Economic Development |
| Wetlands Programs .....                           | NH Department of Environmental Services           |
| State Aid Bridge Program for Communities .....    | NH Department of Transportation                   |
| Contribution to Damage Losses (RSA 235:34).....   | NH Department of Transportation                   |

## Federal Emergency Management Agency (FEMA)

FEMA makes funds available for mitigation efforts to reduce future costs associated with hazard damage.

| Mitigation Funding Sources Program        | Details   | Notes                                      |
|---|---|--|
| Flood Mitigation Assistance Program (FMA) | Provides funding to implement measures to reduce or eliminate the long-term risk of flood damage<br><a href="http://www.fema.gov/government/grant/fma/index.shtm">http://www.fema.gov/government/grant/fma/index.shtm</a>   | States and localities                      |
| Hazard Mitigation Grant Program (HMGP)    | Provides grants to implement long-term hazard mitigation measures after a major disaster declaration<br><a href="http://www.fema.gov/government/grant/hmpg/index.shtm">http://www.fema.gov/government/grant/hmpg/index.shtm</a>   | Open                                       |
| National Flood Insurance Program (NFIP)   | Enables property owners to purchase insurance as a protection against flood losses in exchange for state and community floodplain management regulations that reduce future flood damages <a href="http://www.fema.gov/business/nfip/">http://www.fema.gov/business/nfip/</a> | States, localities, and individuals        |
| Pre-Disaster Mitigation Program (PDM)     | Provides funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event<br><a href="http://www.fema.gov/government/grant/pdm/index.shtm">http://www.fema.gov/government/grant/pdm/index.shtm</a>                                | States, localities, and tribal governments |

## Environmental Protection Agency (EPA)

The EPA makes funds available for water management and wetlands protection programs that help mitigate against future costs associated with hazard damage.

| Mitigation Funding Sources Program | Details  | Notes   |
|------------------------------------|--|---|
| Clean Water Act Section 319 Grants | Grants for water source management programs including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and regulation.<br><a href="http://www.epa.gov/OWOW/NPS/cwact.html">http://www.epa.gov/OWOW/NPS/cwact.html</a>   | Funds are provided only to designated state and tribal agencies |
| Clean Water State Revolving Funds  | State grants to capitalize loan funds. States make loans to communities, individuals, and others for high-priority water-quality activities.<br><a href="http://www.epa.gov/owow/wetlands/initiative/srf.html">http://www.epa.gov/owow/wetlands/initiative/srf.html</a>  | States and Puerto Rico  |
| Wetland Program Development Grants | Funds for projects that promote research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction, and elimination of water pollution.<br><a href="http://www.epa.gov/owow/wetlands/initiative/#financial">http://www.epa.gov/owow/wetlands/initiative/#financial</a> | See website   |

## Floodplain, Wetland and Watershed Protection Programs

US Army Corps of Engineers (USACE) and the U.S. Fish and Wildlife Service offer funding and technical support for programs designed to protect floodplains, wetlands, and watersheds.

| Mitigation Funding Sources Program        | Details  | Notes                        |
|---|--|------------------------------|
| USACE Planning Assistance to States (PAS) | Fund plans for the development and conservation of water resources, dam safety, flood damage reduction and floodplain management.<br><a href="http://www.lre.usace.army.mil/planning/assist.html">http://www.lre.usace.army.mil/planning/assist.html</a> | 50 percent non-federal match |

|  |  |  |
|--|--|--|
| USACE Flood Plain Management Services (FPMS)                             | Technical support for effective floodplain management.<br><a href="http://www.lrl.usace.army.mil/p3md-o/article.asp?id=9&amp;MyCategory=126">http://www.lrl.usace.army.mil/p3md-o/article.asp?id=9&amp;MyCategory=126</a>  | See website                              |
| USACE Environmental Laboratory   | Guidance for implementing environmental programs such as ecosystem restoration and reuse of dredged materials.<br><a href="http://el.erdc.usace.army.mil/index.cfm">http://el.erdc.usace.army.mil/index.cfm</a>  | See website                              |
| U.S. Fish & Wildlife Service Coastal Wetlands Conservation Grant Program | Matching grants to states for acquisition, restoration, management or enhancement of coastal wetlands.<br><a href="http://ecos.fws.gov/coastal_grants/viewContent.do?viewPage=home">http://ecos.fws.gov/coastal_grants/viewContent.do?viewPage=home</a>                | States only.<br>50 percent federal share |
| U.S. Fish & Wildlife Service Partners for Fish and Wildlife Program      | Program that provides financial and technical assistance to private landowners interested in restoring degraded wildlife habitat.<br><a href="http://ecos.fws.gov/partners/viewContent.do?viewPage=home">http://ecos.fws.gov/partners/viewContent.do?viewPage=home</a> | Funding for volunteer-based programs     |

### Bureau of Land Management

The Bureau of Land Management (BLM) has two technical assistance programs focused on fire mitigation strategies at the community level.

| Mitigation Funding Sources Program          | Details   | Notes       |
|---|---|-------------|
| Community Assistance and Protection Program | Focuses on mitigation/prevention, education, and outreach. National Fire Prevention and Education teams are sent to areas across the country at-risk for wildland fire to work with local residents.<br><a href="http://www.blm.gov/nifc/st/en/prog/fire/community_assistance.html">http://www.blm.gov/nifc/st/en/prog/fire/community_assistance.html</a> | See website |
| Firewise Communities Program                | Effort to involve homeowners, community leaders, planners, developers, and others in the effort to protect people, property, and natural resources from the risk of wildland fire before a fire starts.<br><a href="http://www.firewise.org/">http://www.firewise.org/</a>  | See website |

### Housing and Urban Development

The Community Development Block Grants (CDBG) administered by HUD can be used to fund hazard mitigation projects.

| Mitigation Funding Sources Program        | Details  | Notes  |
|---|--|--|
| Community Development Block Grants (CDBG) | Grants to develop viable communities, principally for low and moderate income persons. CDBG funds available through Disaster Recovery Initiative.<br><a href="http://www.hud.gov/offices/cpd/communitydevelopment/programs/">http://www.hud.gov/offices/cpd/communitydevelopment/programs/</a>           | Disaster funds contingent upon Presidential disaster declaration |
| Disaster Recovery Assistance              | Disaster relief and recovery assistance in the form of special mortgage financing for rehabilitation of impacted homes.<br><a href="http://www.hud.gov/offices/cpd/communitydevelopment/programs/dri/assistance.cfm">http://www.hud.gov/offices/cpd/communitydevelopment/programs/dri/assistance.cfm</a> | Individuals  |

|                                    |   |   |
|------------------------------------|---|---|
| Neighborhood Stabilization Program | Funding for the purchase and rehabilitation of foreclosed and vacant property in order to renew neighborhoods devastated by the economic crisis.<br><a href="http://www.hud.gov/offices/cpd/communitydevelopment/programs/neighborhoodspg/">http://www.hud.gov/offices/cpd/communitydevelopment/programs/neighborhoodspg/</a> | State and local governments and non-profits |
|------------------------------------|---|---|

### U.S. Department of Agriculture

There are multiple mitigation funding and technical assistance opportunities available from the USDA and its various sub-agencies: the Farm Service Agency, Forest Service, and Natural Resources Conservation Service.

| Mitigation Funding Sources Agency Program   | Details   | Notes                                       |
|---|---|---|
| USDA Smith-Lever Special Needs Funding  | Grants to State Extension Services at 1862 Land-Grant Institutions to support education-based approaches to addressing emergency preparedness and disasters.<br><a href="http://www.csrees.usda.gov/funding/rfas/smith_lever.html">http://www.csrees.usda.gov/funding/rfas/smith_lever.html</a> | Population under 20,000                     |
| USDA Community Facilities Guaranteed Loan Program   | This program provides an incentive for commercial lending that will develop essential community facilities, such as fire stations, police stations, and other public buildings.<br><a href="http://www.rurdev.usda.gov/rhs/cf/cp.htm">http://www.rurdev.usda.gov/rhs/cf/cp.htm</a>              | Population under 20,000                     |
| USDA Community Facilities Direct Loans  | Loans for essential community facilities.<br><a href="http://www.rurdev.usda.gov/rhs/cf/cp.htm">http://www.rurdev.usda.gov/rhs/cf/cp.htm</a>  | Population of less than 20,000              |
| USDA Community Facilities Direct Grants   | Grants to develop essential community facilities.<br><a href="http://www.rurdev.usda.gov/rhs/cf/cp.htm">http://www.rurdev.usda.gov/rhs/cf/cp.htm</a>  | Population of less than 20,000              |
| USDA Farm Service Agency Disaster Assistance Programs                                       | Emergency funding and technical assistance for farmers and ranchers to rehabilitate farmland and livestock damaged by natural disasters.<br><a href="http://www.fsa.usda.gov/">http://www.fsa.usda.gov/</a>   | Farmers and ranchers                        |
| USDA Forest Service National Fire Plan  | Funding for organizing, training, and equipping fire districts through Volunteer, State and Rural Fire Assistance programs. Technical assistance for fire related mitigation.<br><a href="http://www.forestsandrangelands.gov/">http://www.forestsandrangelands.gov/</a>                        | See website                                 |
| USDA Forest Service Economic Action Program   | Funds for preparation of Fire Safe plans to reduce fire hazards and utilize byproducts of fuels management activities in a value-added fashion.<br><a href="http://www.fs.fed.us/spf/coop/programs/eap/">http://www.fs.fed.us/spf/coop/programs/eap/</a>  | 80% of total cost of project may be covered |
| USDA Natural Resources Conservation Service Emergency Watershed Protection Support Services | Funds for implementing emergency measures in watersheds in order to relieve imminent hazards to life and property created by a natural disaster.<br><a href="http://www.nrcs.usda.gov/programs/ewp/">http://www.nrcs.usda.gov/programs/ewp/</a>   | See website                                 |
| USDA Natural Resources Conservation   | Funds for soil conservation; flood prevention; conservation, development, utilization and disposal of   | See website                                 |

|   |  |  |
|---|--|--|
| Service Watershed Protection and Flood Prevention | water; and conservation and proper utilization of land.<br><a href="http://www.nrcs.usda.gov/programs/watershed/index.html">http://www.nrcs.usda.gov/programs/watershed/index.html</a> |  |
|---|--|--|

### Health and Economic Agencies

Alternative mitigation programs can be found through health and economic agencies that provide loans and grants aimed primarily at disaster relief.

| <b>Federal Loans and Grants for Disaster Relief Agency Program</b>                                | <b>Details</b>   | <b>Notes</b>  |
|---|--|---|
| Department of Health & Human Services Disaster Assistance for State Units on Aging (SUAs)         | Provide disaster relief funds to those SUAs and tribal organizations who are currently receiving a grant under Title VI of the Older Americans Act.<br><a href="http://www.aoa.gov/doingbus/fundopp/fundopp.asp">http://www.aoa.gov/doingbus/fundopp/fundopp.asp</a>                         | Areas designated in a Disaster Declaration issued by the President          |
| Economic Development Administration (EDA) Economic Development Administration Investment Programs | Grants that support public works, economic adjustment assistance, and planning. Certain funds allocated for locations recently hit by major disasters.<br><a href="http://www.eda.gov/AboutEDA/Programs.xml">http://www.eda.gov/AboutEDA/Programs.xml</a>                                    | The maximum investment rate shall not exceed 50 percent of the project cost |
| U.S. Small Business Administration Small Business Administration Loan Program                     | Low-interest, fixed rate loans to small businesses for the purpose of implementing mitigation measures. Also available for disaster damaged property.<br><a href="http://www.sba.gov/services/financialassistance/index.html">http://www.sba.gov/services/financialassistance/index.html</a> | Must meet SBA approved credit rating  |

## APPENDIX C: PUBLICITY AND INFORMATION

Committee meetings were announced on the town of Tuftonboro and LRPC webpage calendars. An article appeared on the front page of the *Granite State News* covering the meeting of the Planner and EMD with the Selectmen to discuss the HMP Update Process. Press releases similar to the one below were sent to the weekly *Granite State News* and the local daily papers *Conway Daily Sun* prior to the Committee meetings. Several informational handouts and the 2009 Hazard Mitigation Plan were distributed to the committee and available at all meetings.





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Lakes Region Planning Commission

www.lakesrpc.org

**Lakes Region Planning Commission**  
*Planning Regionally - Growing Locally*  
 103 Main Street, Suite #3 - Meredith, NH - 603-279-8171

Commission Meetings  
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**Welcome!**  
 The Lakes Region Planning Commission is a unique association of local governments that provides comprehensive planning services to meet the diverse needs of New Hampshire's Lakes Region. Our mission is to provide effective planning, in order to achieve and sustain a quality environment, a dynamic economy, and local cultural values by supporting community efforts through leadership, education, technical assistance, information, advocacy, coordination and responsive representation.

**Recent Publications**  
[Mondragon Hazard Mitigation Plan](#)  
[US Route 3 Corridor Transportation Demand Management Plan](#)  
[NH Route 140 Corridor Study](#)  
[Lakes Region Planning Commission FY2014 Annual Report](#)  
[Lakes Region Comprehensive Economic Development Strategy \(CEDS\) 2013 Report](#)  
[2012 Household Hazardous Product Facility Report](#)  
[Mid-State Regional Coordinating Council Preliminary Service Availability Map](#)  
[Perriswasset River Corridor Management Plan](#)  
[CEDS Lakes Region Winter 2013 Newsletter](#)  
[The Lakes Region Planning Commission FY2013 Annual Report](#)  
[Development Trends in the Lakes Region: 2012 Annual Report](#)  
[Sandwich Smart Growth Assessment](#)  
[Map of Road Shoulder Width as Reported by NHDOT](#)  
[Winnepesaukee Gateway - maps, environmental plans, water quality data and more](#)

Visit the "Standard Map Set" page for a complete set of community maps.

**Upcoming Events**

**Commission Meeting**  
 1/28/2014 - 10:00 AM  
[Details...](#)

**Tuftonboro Hazard Mitigation Plan Update Committee**  
 1/28/2014 - 10:00 AM  
[Details...](#)

**Perriswasset River Local Advisory Committee**  
 1/28/2014 - 7:00 PM  
[Details...](#)

**Natural Resources in the Lakes Region: Regional Stories, Trends & Goals for the Future**  
 1/31/2014 - 10:30 AM

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Lakes Region Planning Commission Welcome to Tuftonboro

www.tuftonboro.org/pages/index

**TOWN OF TUFTONBORO**  
 NEW HAMPSHIRE

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**IMPORTANT NOTICES**  
[Press Release - Current Use Board - Public Forum](#)  
[Proposed Ordinance - Zoned Lots](#)

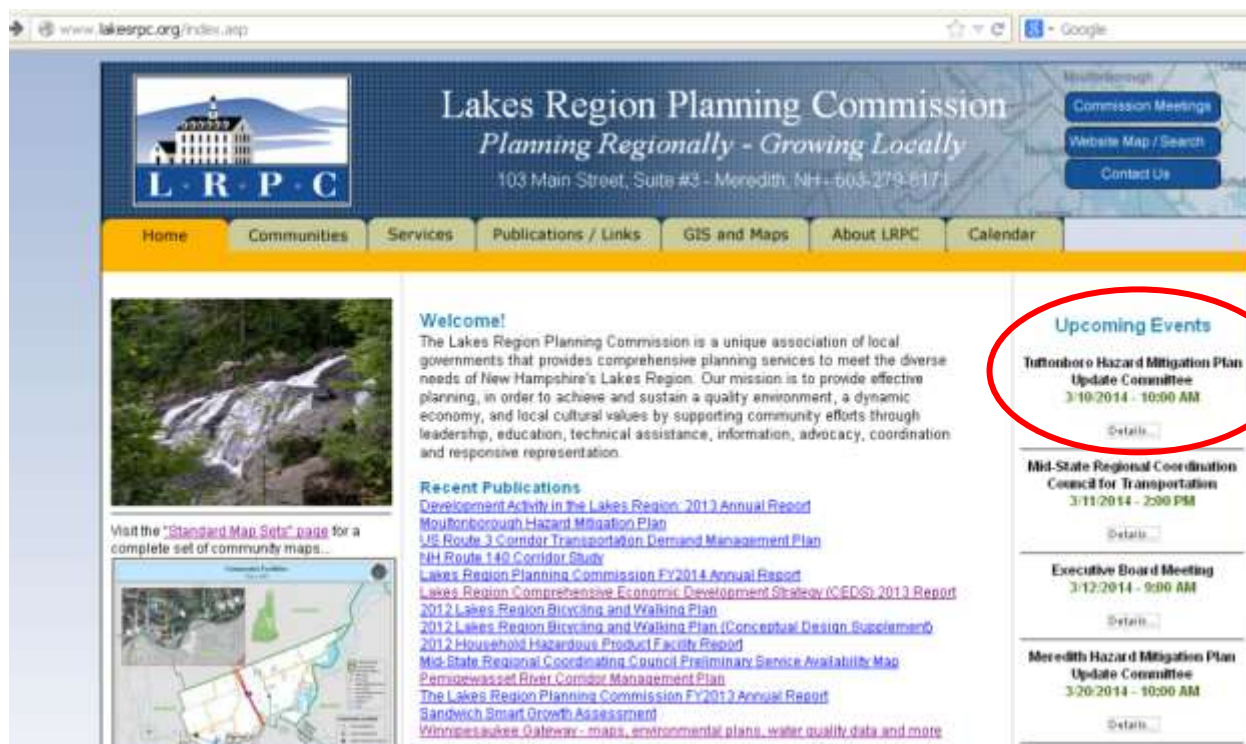
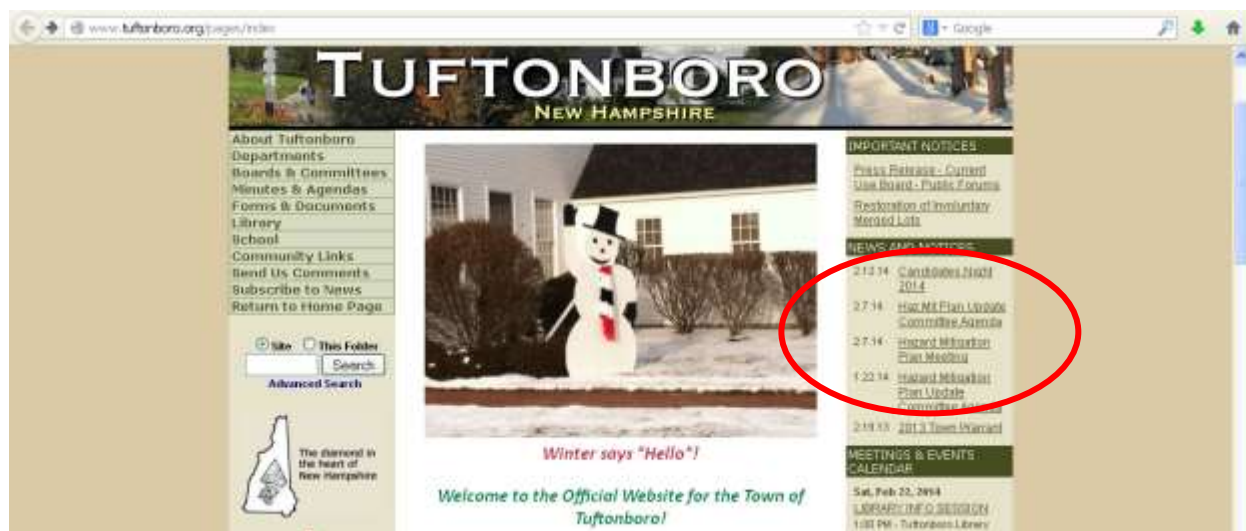
**NEWS AND NOTICES**

1/22/14 [Hazard Mitigation Plan Meeting](#)  
 1/22/14 [Hazard Mitigation Plan Update Committee Agenda](#)  
 2/19/13 [2013 Town Warrant](#)  
 12/14/10 [NEW Subdivision and Site Plan Review regulations](#)  
 6/5/10 [Lost and Found](#)

**MEETINGS & EVENTS**  
 CAL FAIR

**Winter says "Hello!"**

Welcome to the Official Website for the Town of





## LAKES REGION PLANNING COMMISSION

103 Main Street, Suite #3  
 Meredith, NH 03253  
 tel. (603) 279-8171  
 fax (603) 279-0200  
 www.lakesrpc.org



January 22, 2014

## For Immediate Release

Contact: David Jeffers, 279-8171, [djeffers@lakesrpc.org](mailto:djeffers@lakesrpc.org)

### Town of Tuftonboro Hazard Mitigation Plan Meeting

The Tuftonboro Hazard Mitigation Plan Committee will begin the process of updating its 2009 Hazard Mitigation Plan. The committee, which is represented by a variety of local interests, will focus on the natural and manmade hazards that put Tuftonboro at risk as well as the development of recommendations to protect the safety and well being of town residents. ~~The committee will have its first meeting on January 23, 2014 at the new Fire Station 189 Middle Road, Tuftonboro starting at 10:00 AM. Residents of Tuftonboro and representatives from neighboring communities are encouraged to attend and provide input.~~

~~Hazard Mitigation Planning is as important to reducing disaster losses as are appropriate regulations and land use ordinances. The most significant areas of concern for Tuftonboro will be determined as a result of this process. With the update to the Hazard Mitigation Plan, community leaders will be able to prioritize actions to reduce the impacts of these and other hazards. Community leaders want the town to be a disaster resistant community and believe that updating the Hazard Mitigation Plan will bring Tuftonboro one step closer to that goal.~~

For more information please call Chief Adam Thompson, Tuftonboro Fire Chief and Emergency Management Director at 569-3381 or David Jeffers, Regional Planner, Lakes Region Planning Commission at 279-8171.

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ALEXANDRIA • ALTON • ANDOVER • ASHLAND • BARNSTABLE • BELMONT • BRIDGEWATER • BRISTOL • CENTER HARBOR • DANBURY  
 EFFINGHAM • FRANKLIN • FREEDOM • GILFORD • GILMANTON • HERRON • HILL • MOLDENESS • LACONIA • MEREDITH • MOULTONBOROUGH  
 NEW HAMPTON • NORTHFIELD • OSSISPEE • SANBORNTON • SANDWICH • TOWNFORTH • TILTON • TUFTONBORO • WOLFEBORO

# Local Hazard Mitigation Planning

## Hazard Mitigation:

*"Hazard Mitigation means any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards"*

## Questions to address:

- Where are potential hazards?
- What are the risks?
- What are we already doing?
- Where are the gaps?
- What actions can be taken?
- What actions are feasible?
- What are our priorities?
- How will these actions be implemented?
- How will the plan be monitored?

## What is a Hazard Mitigation Plan?

In cooperation with the NH Bureau of Emergency Management (BEM), the Lakes Region Planning Commission (LRPC) is working with several of its member communities each year to develop local Hazard Mitigation Plans.

The Hazard Mitigation Plans are designed to address each particular community's vulnerability to natural and man-made hazards. The local plan serves as a means to reduce future losses from hazard events before they occur. This local initiative is guided by a community-based Hazard Mitigation Planning Committee, with the LRPC providing technical support. The structure for plan development is provided through the *Guide to Hazard Mitigation Planning for New Hampshire Communities* which ensures that the community has considered the content of the State of New Hampshire Hazard Mitigation (409) Plan.



## MITIGATION PROCESS

- IDENTIFY HAZARDS
- PROFILE HAZARD EVENTS
- INVENTORY ASSETS
- ESTIMATE LOSSES
- PRIORITIZE ACTION STEPS
- ADOPT THE PLAN
- IMPLEMENTATION

## Why create a plan?

Development of a local Hazard Mitigation Plan is a chance for the community to assess the hazards that have the potential to threaten residents and their property. It also gives the community an opportunity to identify at-risk populations as well as resources within the community that might be at risk. The committee can then explore a variety of steps that might be put into place to help the community reduce damage and loss.

Having a Hazard Mitigation Plan in place, enables many communities to allocate their resources more effectively. It can also be a useful tool for leveraging additional sources of funding in the event of a disaster.

### *Federal Emergency Management Agency (FEMA) Requirement:*

In order for communities to be eligible for the full spectrum of mitigation program funding, local hazard mitigation plans must be approved by FEMA. The staff of LRPC attend semi-annual hazard mitigation meetings and training programs that are designed to expedite the approval process.

Lakes Region Planning Commission  
103 N. Main St., Suite #3  
Meredith, NH 03253

(603) 279-8171 - phone  
(603) 279-0200 - fax



## Frequently asked questions

- **What will a Hazard Mitigation Plan cost?**

Since this project is funded by the NH Bureau of Emergency Management, the only cost to the community is the dedication of committee members' time and energy.

- **How is a Hazard Mitigation Plan different from an Emergency Action Plan?**

Although there is some overlap, these are different plans, each serving a different function in helping a community to minimize the potential for damage and loss in a community.

Emergency Action Plans (EAP) identifies potential hazard events and the resources available to address them; it also addresses how a community responds to an emergency.

A Hazard Mitigation Plan (HMP) also identifies potential hazard events and community resources. However, an HMP looks at the situation in terms of prevention instead of response. Gaps in coverage, programs, and structural needs are analyzed and specific mitigation steps are recommended and potential funding sources are identified.

- **Is this a community plan, a state plan, or a federal plan?**

The state of New Hampshire does require that each community develop an HMP. Once a plan is approved by FEMA and adopted by the community, should there be a need for Federal Mitigation money, more funding would be available. However, local public involvement is required. The local Emergency Management Director or a committee of citizens should help in plan development; there should also be several public presentations where citizens can make recommendations, provide input, and participate in development of the plan. In the end, the Board of Selectmen need to approve the plan.



Alton dam breach, 1996



## The Essentials

At a minimum, each local Hazard Mitigation Plan should contain the following sections:

- An evaluation of the potential hazards within the community
- A description and analysis of local, state, and federal hazard mitigation policies, programs, and capabilities to mitigate the identified hazards in the area
- Goals, objectives, strategies and actions to reduce long-term vulnerability to hazards
- An evaluation of the costs and benefits of the recommended mitigation projects.





### Building stronger and safer

Hazard mitigation planning is the process state, local and tribal governments use to identify risks and vulnerabilities associated with natural disasters and to develop long-term strategies for protecting people and property in future hazard events. The process results in a mitigation plan that offers a strategy for breaking the cycle of disaster damage, reconstruction and repeated damage and a framework for developing feasible and cost-effective mitigation projects. Under the Disaster Mitigation Act of 2000 (Public Law 106-390), State, local and Tribal governments are required to develop a hazard mitigation plan as a condition for receiving certain types of non-emergency disaster assistance.

### Reducing risks through mitigation planning

A hazard mitigation plan is a long-term strategy for reducing disaster losses. The planning process promoted by the Disaster Mitigation Act of 2000 is as important as the resulting plan because it encourages jurisdictions to integrate mitigation with day-to-day decision-making regarding land-use planning, floodplain management, site design and other functions.

### Mitigation planning elements

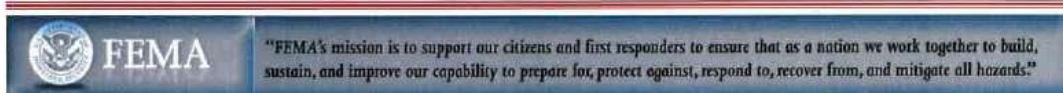
- **Public involvement** – In addition to government agencies involved in incident management, floodplain management and economic development, the planning process usually involves a range of stakeholders, including representatives of neighborhood groups, civic organizations, academia, environmental groups, the business community and individual citizens. Involving stakeholders is essential to determining the

most vulnerable populations and facilities in the community and to assuring community wide support for the plan.

- **Risk assessment** – A risk assessment is the process of identifying natural hazards and risks associated with them, including threats to public health and safety, property damage and economic loss. The assessment answers the fundamental question, “What would happen if a natural disaster occurred?” and provides a factual basis for the mitigation activities proposed in the strategy. The assessment includes a description of the type, location and extent of natural hazards; the jurisdiction’s vulnerability to the hazards; and the type and numbers of buildings, infrastructure and critical facilities located in identified hazard areas.
- **Mitigation strategy** – Based on the risk assessment, State, local and Tribal governments develop mitigation goals and objectives and a strategy for mitigating disaster losses. The strategy sets forth an approach for implementing activities that are cost-effective, technically feasible and environmentally sound.

### Hazard mitigation plan required to receive HMGP Project Grants

Local jurisdictions are required by federal law to have a FEMA-approved hazard mitigation plan in order to receive Pre-Disaster Mitigation (PDM) or Hazard Mitigation Grant Program (HMGP) project grant funding. However, in extraordinary circumstances, HMGP funds can be awarded to communities that agree to develop a hazard mitigation plan within 12 months of receiving the project grant. Every State has a FEMA-approved hazard mitigation plan, though many local jurisdictions still do not.



## Fact Sheet

### State and Local Mitigation Planning



#### Mitigation Examples

History shows that the physical, financial and emotional losses caused by disasters can be reduced significantly through mitigation planning. Mitigation focuses attention and resources on solving a particular problem (such as reducing repetitive flood losses) and thereby produces successive benefits over time. Through implementation of local floodplain ordinances, for example, it is estimated that \$1.1 billion in flood damages are prevented annually.

Mitigation includes a broad range of activities designed to protect homes, schools, public buildings and critical facilities. Examples include the following types of projects:

- Adopting and enforcing more stringent building codes, flood-proofing requirements, seismic design standards, or wind-bracing requirements for new construction or the retrofit of existing buildings.
- Exceeding the National Flood Insurance Program (NFIP) floodplain management regulations by elevating structures above the base flood elevation (BFE) in high-risk areas.
- Adopting stricter development regulations and zoning ordinances that steer development away from areas subject to flooding, storm surge, or coastal erosion.
- Retrofitting public buildings, schools and critical facilities, such as police and fire stations, to withstand hurricane-strength winds or ground shaking from earthquakes.
- Using public funds to acquire damaged homes or businesses in flood-prone areas, demolish or relocate the structures and use the property for open space, wetlands, or recreational uses.
- Building community shelters and "safe rooms" to help protect people in public buildings and schools in hurricane- and tornado-prone areas.

#### Planning tool available for government agencies

FEMA has developed a number of planning tools to help government agencies develop mitigation plans. These include how-to guides, CD ROMs and online information about organizing a planning team, involving stakeholders, conducting risk assessments, evaluating potential mitigation measures, conducting benefit-cost analyses and other planning issues.

#### For more information

Please visit: <http://www.fema.gov/plan/mitplanning/index>.

For state name disaster recovery, visit [www.fema.gov](http://www.fema.gov) or your state Web-site.



"FEMA's mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards."

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## **APPENDIX D: MEETING AGENDAS and PARTICIPATION**

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This section contains copies of the Committee meeting agendas and a summary of participation. Meetings were held at the Tuftonboro Central Fire Station. Agendas were developed by the LRPC planner and meetings were chaired by the Emergency Management Director. At each meeting there was opportunity for public input.

### **Tuftonboro Hazard Mitigation Plan Update Committee**

January 28, 2014 – 10:00 AM  
Fire Station  
189 Middle Road, Tuftonboro, NH

#### **AGENDA**

1. Introductions
2. What is Hazard Mitigation Planning?
  - a. Mitigation planning vs. emergency response planning
3. Purpose of Committee
4. Review Community Capabilities
  - a. Planning & Regulatory
  - b. Administrative and Technical
  - c. Financial
  - d. Education & Outreach
  - e. National Flood Insurance Program (NFIP)
5. Discussion of Development Trends
6. Identify Critical Facilities on base map
7. Identify all hazards (past – especially since 2009 & potential) in Tuftonboro and mark on map
8. Set schedule for future meetings
9. Public Input

Goals for next meeting:

- a. Risk Assessment, including data collection
- b. Town Goals

## **Tuftonboro Hazard Mitigation Plan Update Committee**

February 10, 2014 – 10:00 AM  
Fire Station  
189 Middle Road, Tuftonboro, NH

### **AGENDA**

1. Introductions
2. Status of 2009 Mitigation Projects
3. Risk Assessment
  - a. Hazards
    - i. location
    - ii. extent
    - iii. frequency
  - b. Assets
    - i. people
    - ii. economy
    - iii. built environment
      1. existing structures
      2. infrastructure
      3. critical facilities
      4. cultural resources
      5. future development
  - c. Impacts
4. Schedule next meeting
5. Public Input

Goals for next meeting:

- a. Goals
- b. Mitigation Actions

## **Tuftonboro Hazard Mitigation Plan Update Committee**

February 24, 2014 – 10:00 AM  
Fire Station  
189 Middle Road, Tuftonboro, NH

### **AGENDA**

1. Introductions
2. Review of Hazard Significance
3. Goals
4. Mitigation Actions
5. Schedule next meeting
6. Public Input

Goals for next meeting:

- a. Costs of Actions
- b. Prioritization of Actions



## Tuftonboro Hazard Mitigation Plan Update Committee

March 10, 2014 – 10:00 AM  
Fire Station  
189 Middle Road, Tuftonboro, NH

### AGENDA

1. Introductions
2. Goals
3. Mitigation Actions
4. Prioritization of Mitigation Actions
5. Public Input

### Participation

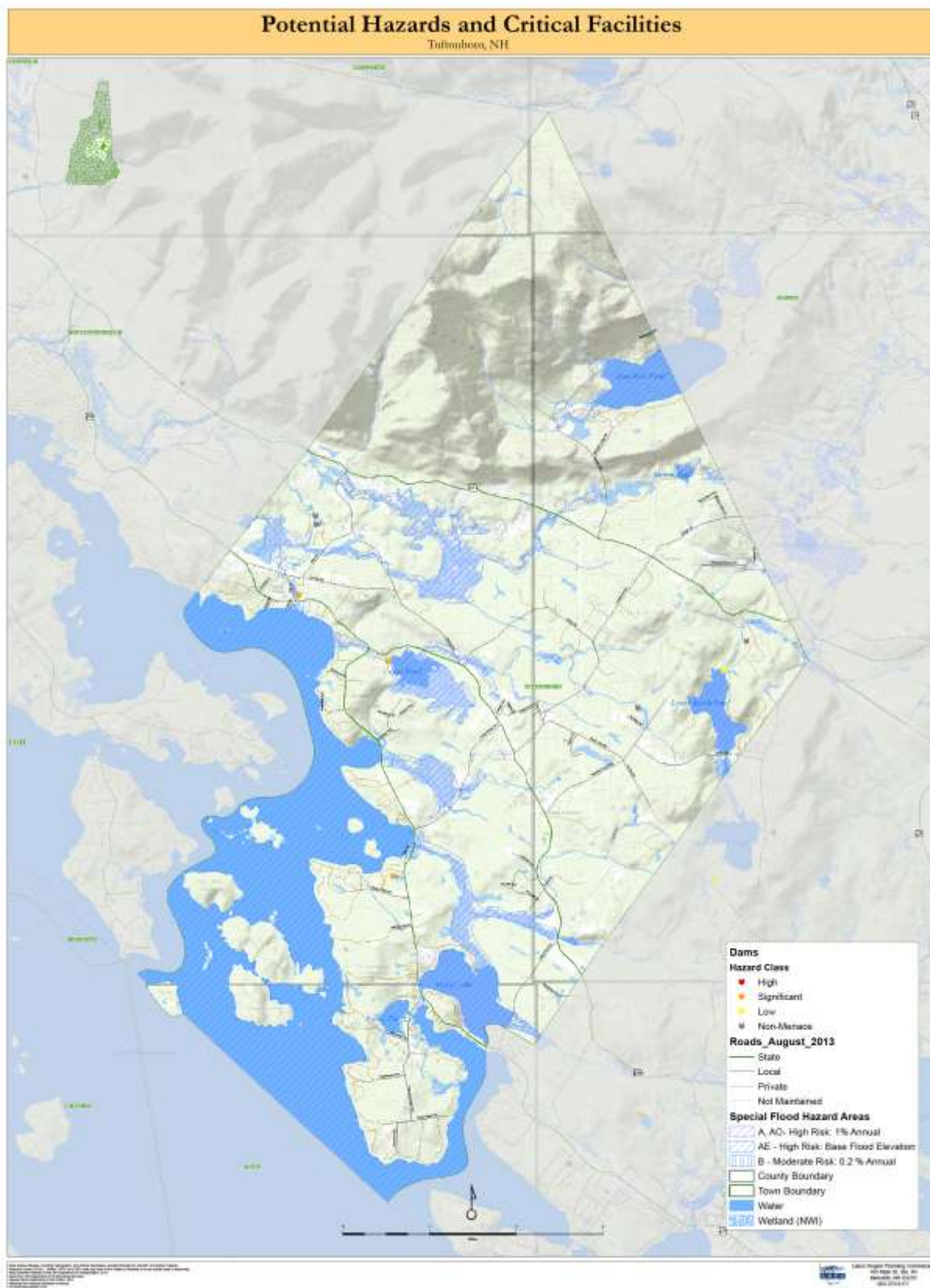
| Participant          | Position                                      | 10/28/13 | 1/28/14 | 2/10/14 | 2/24/14 | 3/10/14 |
|----------------------|---|----------|---------|---------|---------|---------|
| Carolyn Sundquist    | Tuftonboro Selectman                          | X        | X       | X       | X       | X       |
| Dan Duffy            | Tuftonboro Selectman                          | X        |         |         |         |         |
| Lloyd Wood           | Tuftonboro Selectman                          | X        |         |         |         |         |
| Adam Thompson        | Tuftonboro Fire Chief/EMD                     | X        | X       | X       | X       | X       |
| Jim Bean             | Tuftonboro Highway Dept.                      |          | X       |         |         |         |
| Andrew Shagoury      | Tuftonboro Police Chief                       |          | X       | X       | X       | X       |
| Aurthur Grupp        | Tuftonboro Central School                     |          | X       |         |         |         |
| Caleb Pike           | Tuftonboro Fire Rescue                        |          | X       | X       | X       | X       |
| Jack Parsons         | Tuftonboro PB/Code<br>Enf./Health             |          | X       | X       | X       | X       |
| Frank Tranchita, Jr. | Tuftonboro Business Owner -<br>Pier 19 Grocer |          | X       | X       |         | X       |
| Joe Kowalski         | Tuftonboro Citizen/video                      |          |         | X       |         |         |
| Heidi Lawton         | HSEM Field Rep                                |          | X       | X       | X       |         |
| Parker Moore         | HSEM Plan Reviewer                            |          |         |         |         | X       |
| David Jeffers        | LRPC Regional Planner                         | X        | X       | X       | X       | X       |

## APPENDIX E: HAZARD EVENTS PRIOR TO 2009

| Hazard     | Date                   | Location                   | Description  | Damages   | Source         |
|------------|------------------------|----------------------------|--|---|----------------|
| Drought    | 1947-1950              | State-wide                 | One of five multi-year, state-wide droughts (1929-36, 1939-44, 1960-69, 2001-2002, s   | Many private wells in Tuftonboro dried up.          | 2009 HMP       |
| Drought    | 2001-2002              | State-wide                 | Not as severe as 1947-1950 drought.  | Some private wells went dry.                        | 2009 HMP       |
| Earthquake | 12/20/1940             | Central NH                 | 5.5 on Richter scale   |   | NH OEM         |
| Earthquake | 12/24/1940             | Central NH                 | 5.5 on Richter scale   |   | NH OEM         |
| Flood      | March 11-21, 1936      | State-wide                 | Double flood. First due to rain and snowmelt, second due to large rainfall   |   | 2009 HMP       |
| Flood      | Sept. 21, 1938         | State-wide                 | Hurricane. Stream stages similar to those of March 1936 and exceeded 1936 stages in the Upper Contoocook River   |   | 2009 HMP       |
| Flood      | March 27, 1953         | Carroll County             | Peak flood stage of record for Saco and Ossipee Rivers   |   | 2009 HMP       |
| Flood      | July – August 1986     | State-wide                 | FEMA DR-771-NH: Severe summer storms with heavy rains, tornadoes, flash flood, and severe winds.   |   | 2009 HMP       |
| Flood      | March 31 – April, 1986 | State-wide                 | Caused by snowmelt and intense rain.   |   | 2009 HMP       |
| Flood      | August 7-11, 1990      | State-wide                 | FEMA-DR-876-NH: A series of storm events with moderate to heavy rains produced widespread flooding in New Hampshire.   |   | 2009 HMP       |
| Flood      | August 19, 1991        | State-wide                 | FEMA-DR-1144-NH: Hurricane Bob struck New Hampshire causing extensive damage in Rockingham and Stafford Counties but the effects were felt state-wide.   |   | 2009 HMP       |
| Flood      | October 29, 1996       | State-wide                 | FEMA-DR-1231-NH: Severe storms and flooding. Nothing substantial.  |   | 2009 HMP       |
| Flood      | 4/18/1997              | Carroll County             | Three to five inches of rain in 8 to 12 hours caused small rivers and streams to rise rapidly. Many roads were closed due to washouts and water over roadways, particularly near Somersworth and Rochester in Strafford County, Tamworth and Wolfeboro in southern Carroll County, and near Canaan in Grafton County. Some homes were evacuated. |   | NOAA           |
| Flood      | 4/1/1998               | Carroll County             | 3"- 8" of rain caused small rivers and streams to rise. Roads flooded and/or washed out.   |   | NOAA           |
| Flood      | 6/14/1998              | Carroll County             | 3"- 8" of rain caused small rivers and streams to rise.  |   | NOAA           |
| Flood      | June-July, 1998        | State-wide                 | FEMA-DR-1231-NH: Series of rainfall events. Declaration in Belknap, Carroll, Grafton, Merrimack, Sullivan, Rockingham  | 1 fatality  | 2009 HMP       |
| Flood      | October, 2005          | FEMA-DR-1610-NH            | Severe storms and flooding   |   | 2009 HMP       |
| Flood      | 5/13/2006              | Carroll County, Tuftonboro | FEMA-DR-1643-NH: Severe flooding events impacted many roads and culverts throughout Tuftonboro.  | Fire stations were impacted by this flooding event. | NOAA, 2009 HMP |
| Flood      | April 15-23, 2007      | Carroll County, Tuftonboro | FEMA-DR-1695-NH: Severe flooding events impacted many roads and culverts throughout Tuftonboro.  | Fire stations were impacted by this flooding event. | 2009 HMP       |
| Hail       | 7/16/1984              | Carroll County             | 1.75 inches in diameter  |   | NOAA           |
| Hail       | 6/24/1985              | Carroll County             | 0.75 inches in diameter  |   | NOAA           |
| Hail       | 6/8/1987               | Carroll County             | 0.75 inches in diameter  |   | NOAA           |
| Hail       | 6/13/1987              | Carroll County             | 1.00 inches is diameter  |   | NOAA           |
| Hail       | 7/26/1994              | Carroll County             | 0.75 in. hail accompanied by a very strong downburst from a thunderstorm. 150 other homes damaged and several cars crushed by felled trees. 140 acres of trees sustained damage. 1800 households lost power  | >1.5 million  | NOAA           |

| Hazard      | Date                | Location                                  | Description   | Damages  | Source           |
|-------------|---------------------|---|---|--|------------------|
| Hail        | 7/18/2000           | Moultonborough                            | 0.75 inches in diameter   |  | NOAA             |
| Heavy Snow  | January 1923        | Tuftonboro                                | Four storms within a week left 30 inches of snow  |  | 2009 HMP         |
| Heavy Snow  | Winter of 1952      | Tuftonboro                                | Large amounts of snow left the town damaged for a week.   |  | 2009 HMP         |
| Heavy Snow  | 2/14/1958           | Carroll County                            | More than a foot of snow  |  | NH OEM           |
| Heavy Snow  | 3/2/1960            | Carroll County                            | Upwards of 2' of snow; high winds   |  | NH OEM           |
| Heavy Snow  | 1/18/1961           | Carroll County                            | Up to 25" of snow   |  | NH OEM           |
| Heavy Snow  | February 8-10, 1969 | State-wide                                | Event accumulations up to 27" in SE New Hampshire, 42" in northeastern part of state.   |  | 2009 HMP         |
| Heavy Snow  | 2/22-28/1969        | Statewide                                 | 98" in Western Central New Hampshire, 2' to 3' across New Hampshire   |  | NH OEM           |
| Heavy Snow  | 2/5/1978            | Carroll County                            | More than 2' of snow - "Blizzard of '78". Hurricane-force winds and record-breaking snowfall made this one of the more intense events of the century in northeastern US.  |  | NH OEM, 2009 HMP |
| Heavy Snow  | 1/31/1993           | Carroll County                            | Up to 13 inches of snow. Communities experienced electrical power failures.   |  | NOAA             |
| Heavy Snow  | 1/17/1994           | Statewide                                 | 75,000 Residents lost power   |  | NOAA             |
| Heavy Snow  | March 2001          | Statewide                                 | Near record snowfall led to a presidential declaration in seven counties.   |  | 2009 HMP         |
| Heavy Snow  | February, 2003      | Statewide                                 | Near record snowfall led to a presidential declaration in five counties.  |  | 2009 HMP         |
| Heavy Snow  | January, 2004       | Statewide                                 | Near record snowfall led to a presidential declaration in eight counties.   |  | 2009 HMP         |
| Hurricane   | 9/21/1938           | Statewide                                 | 13 Deaths, 2 Billion feet of marketable lumber blown down, flooding throughout the State, total Direct Losses - \$12,337,643 (1938 Dollars)   | \$12,337,643.00  | NH OEM           |
| Ice         | 1/5/1979            | Statewide                                 | Power and Transportation disruptions  |  | NH OEM           |
| Ice         | January 7-9, 1998   | Statewide                                 | Most damage between 1,000 and 2,000 ft. elevation. Additional snow, ice, and rain while power was out.  | State-wide 125,000 people without power. >\$17 million | NH OEM           |
| Lightning   | 5/28/2001           | Tuftonboro                                | Three alarm structure fire at Winner Circle Farm Drive  | \$200,000  | HMP Committee    |
| Lightning   | 6/10/2005           | Moultonborough                            | Lightning sparked a fire that destroyed a summer cottage on Lake Winnepesaukee's Badger Island. The lightning struck a nearby pine tree and ignited a ground fire as it traveled along the ground. The ground fire quickly spread to the cottage. | \$30,000.00  | NOAA             |
| Lightning   | 8/1/2005            | Moultonborough                            | Lightning struck a two-story home that was under construction and ignited a fire that heavily damaged the structure. The lightning apparently struck a nearby 70-ft tall pine tree behind the home and traveled into the building.                | \$150,000.00   | NOAA             |
| Lightning   | 8/2/2005            | Moultonborough                            | For the second night in a row, lightning struck a two-story home in Moultonborough. Fire flared up about 4 hours after the initial strike and caused considerable damage to the kitchen and a new addition.                                       | \$50,000.00  | NOAA             |
| Lightning   | 2007                | Tuftonboro                                | Northwoods Camp   | \$40,000   | HMP Committee    |
| Severe Wind | July 18, 1963       | Tuftonboro                                | Reports of an F2 tornado touching down in the Tuftonboro area.  | No damages reported                                    | NCDC, 2009 HMP   |
| Severe Wind | August 7, 1986      | Tuftonboro                                | An F1 tornado touched down in Tuftonboro.   | Several buildings damaged.                             | NCDC, 2009 HMP   |
| Severe Wind | August 2, 1998      | Meredith, Center Harbor, Tuftonboro       | Severe thunderstorm winds with speeds estimated to be in excess of 58 mph.  | Downed trees. Power outages.                           | NCDC, 2009 HMP   |
| Severe Wind | August 25, 1998     | Tuftonboro, Camp Northwoods, NH Route 109 | High winds from a severe thunderstorm. Wind speeds estimated at more than 58 mph based on damage to trees.  | Downed trees blocked roads. Stranded 400 campers.      | NCDC, 2009 HMP   |

| Hazard                  | Date          | Location       | Description  | Damages                 | Source         |
|-------------------------|---------------|----------------|--|-------------------------|----------------|
| Severe Wind             | July 18, 2008 | Region         | Tuftonboro experienced severe winds that impacted the entire region.   | Downed trees and wires. | NCDC, 2009 HMP |
| Thunderstorm            | 7/26/1994     | Carroll County | Thunderstorm Winds gusted as high as 82 mph near Moultonborough  |                         | NOAA           |
| Thunderstorm            | 7/26/1994     | Carroll County | \$5 million in total cost.   | \$5,000,000.00          | NOAA           |
| Thunderstorm            | 7/6/1999      | Moultonborough | Thunderstorm Winds gusted as high as 60 knots near Moultonborough  |                         | NOAA           |
| Thunderstorm /Lightning | 7/30/1999     | Moultonborough | Lightning struck a tree in Moultonboro and followed an underground wire to a nearby historic post and beam barn where it ignited a fire. The fire caused moderate damage to the structure. |                         | NOAA           |
| Thunderstorm            | 6/20/2006     | Moultonborough | Winds 50 knots, trees down   |                         | NOAA           |
| Tornado                 | 7/18/1963     | Carroll County | F2 - \$25,000 in damage  | \$25,000.00             | NOAA           |
| Tornado                 | 8/7/1986      | Carroll County | F1 - \$250,000 in damage   | \$250,000.00            | NOAA           |
| Tornado                 | 8/7/2001      | Carroll County | F1 - \$2.5 million in damage   | \$2,500,000.00          | NOAA           |

**APPENDIX F: CRITICAL FACILITIES & POTENTIAL HAZARDS MAP**

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## APPENDIX G: HAZARDS – SUPPLEMENTARY HAZARD INFORMATION

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This section provides statewide or regional information regarding hazards. Some information is about hazards mentioned in the NH Hazard Mitigation Plan. Other information either provides context or extra detail which supplements the locally important information addressed in Chapter III.

### **Flooding**

Historically, the state's two largest floods occurred in 1936 and 1938. The 1936 flood was associated with snow melt and heavy precipitation. The 1938 flooding was caused by the Great New England Hurricane of 1938. Those floods prompted the construction of a series of flood control dams throughout New England, built in the 1950s and '60s. They continue to be operated by the US Army Corps of Engineers.<sup>23</sup>

A series of floods in New Hampshire began in October 2005 with a flood that primarily affected the southwest corner of the state and devastated the town of Alstead. The flood killed seven people. It was followed by floods in May 2006 and April 2007 and a series of floods during the late summer and early fall of 2008. Recent flooding in the region was associated with Tropical Storm Irene in September 2011 and Tropical Storm Sandy in October 2012.

Flooding in the Lakes Region is most commonly associated with structures and properties located within a floodplain. There are numerous rivers and streams within the region and significant changes in elevation, leading to some fast-moving water. The region also has a great deal of shoreline, making it exposed to rising water levels as well. Although historically, there have not been many instances of shoreline flooding, the potential always exists for a major flood event to occur.

Recent rain events have proven this is becoming an increasing concern as additional development is contributing to flood hazards. As areas are covered with impervious surfaces, less water is allowed to infiltrate, evaporate, or be transpired by vegetative growth and more of it runs off directly into surface drainages and water bodies. This increases the likelihood of flash floods and substantial overland flow. Of greatest concern are the waterfront properties on the lakes, ponds, and associated tributaries.

Culvert improvements and roadwork have been conducted throughout the region as a result of localized flooding events. Of particular concern in the region are areas of steep slopes and soils with limited capacity to accept rapid volumes of rainwater. Roads and culverts in close proximity to these conditions are most at risk of localized flooding.

### **Flooding due to Dam Failure**

Dam failure results in rapid loss of water that is normally held back by a dam. These types of floods can be extremely dangerous and pose a threat to both life and property. Dam classifications in New Hampshire are based on the degree of potential damages that a failure or disoperation of the dam is expected to cause. The classifications are designated as non-menace, low hazard, significant hazard, and high hazard and are summarized in greater detail in Table G-1.

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<sup>23</sup> <http://www.nh.gov/safety/divisions/hsem/NaturalHazards/index.html> date visited: January 18, 2011

The designations for these dams relate to damage that would occur if a dam were to break, not the structural integrity of the dam itself. In the Lakes Region, the Town of Alton was impacted by an earthen dam failure on March 12, 1996. Although listed in the NH Hazard Mitigation Plan as a significant hazard, it did result in the loss of one life.

**Table G-1: New Hampshire Dam Classifications<sup>24</sup>**

| Classification     | Description   |
|--------------------|---|
| Non-Menace         | <p>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, provided the dam is:</p> <ul style="list-style-type: none"> <li>• Less than six feet in height if it has a storage capacity greater than 50 acre-feet; or</li> <li>• Less than 25 feet in height if it has a storage capacity of 15 to 50 acre-feet.</li> </ul>  |
| Low Hazard         | <p>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 any of the following:</p> <ul style="list-style-type: none"> <li>• No possible loss of life.</li> <li>• Low economic loss to structures or property.</li> <li>• 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.</li> <li>• The release of liquid industrial, agricultural, or commercial wastes, septage, or contaminated sediment if the storage capacity is less than two-acre-feet and is located more than 250 feet from a water body or water course.</li> <li>• Reversible environmental losses to environmentally-sensitive sites.</li> </ul>   |
| Significant Hazard | <p>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 any of the following:</p> <ul style="list-style-type: none"> <li>• No probable loss of lives.</li> <li>• Major economic loss to structures or property.</li> <li>• Structural damage to a Class I or Class II road that could render the road impassable or otherwise interrupt public safety services.</li> <li>• Major environmental or public health losses, including one or more of the following:</li> <li>• Damage to a public water system, as defined by RSA 485:1-a, XV, which will take longer than 48 hours to repair.</li> <li>• The release of liquid industrial, agricultural, or commercial wastes, septage, sewage, or contaminated sediments if the storage capacity is 2 acre-feet or more.</li> <li>• Damage to an environmentally-sensitive site that does not meet the definition of reversible environmental losses.</li> </ul>   |
| High Hazard        | <p>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 a result of:</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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 dam failure is greater than one foot.</li> <li>• Structural damage to an interstate highway, which could render the roadway impassable or otherwise interrupt public safety services.</li> <li>• The release of a quantity and concentration of material, which qualify as "hazardous waste" as defined by RSA 147-A:2 VII.</li> <li>• Any other circumstance that would more likely than not cause one or more deaths.</li> </ul> |

<sup>24</sup> NH DES Fact Sheet WD-DB-15 "Classification of Dams in New Hampshire", <http://des.nh.gov/organization/commissioner/pip/factsheets/db/documents/db-15.pdf>. Accessed October 1, 2012.



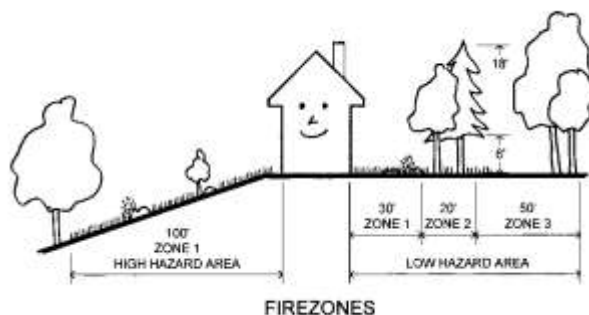
## Wildfire

Several areas in the region are relatively remote in terms of access and fire-fighting abilities. Of greatest concern are those areas characterized by steep slopes and vast woodlands, with limited vehicular access. These areas include the Ossipee, Squam, Belknap, and Sandwich Mountain Ranges. The islands in the region also pose a unique fire safety concern given that access is limited and most of the islands are predominately wooded with residential development. Most of the residential development on the islands is situated on the shores, and inland fire-fighting capabilities are often limited.

As these once remote areas begin to see more development (the urban wildfire interface), care should be taken to ensure that adequate fire protection and buffers are established. Techniques include increased buffers between wooded areas and residential buildings, requirements for cisterns or fire ponds, a restriction on the types of allowable building materials such as shake roofs, and special considerations for landscaping. While historically massive wildfires have been western phenomena, each year hundreds of woodland acres burn in New Hampshire. The greatest risk exists in the spring when the snow has melted and before the tree canopy has developed, and in the late summer – early fall. Appropriate planning can significantly reduce a community's vulnerability for woodland fires. There are four-zone suggestions from the Firewise community program that could be potentially helpful homeowners in Tuftonboro.<sup>25</sup>

**ZONE 4** is a natural zone of native or naturalized vegetation. In this area, use selective thinning to reduce the volume of fuel. Removing highly flammable plant species offers further protection while maintaining a natural appearance.

**ZONE 3** is a low fuel volume zone. Here selected plantings of mostly low-growing and fire-resistant plants provide a decreased fuel volume area. A few well-spaced, fire resistant trees in this zone can further retard a fire's progress.



**ZONE 2** establishes a vegetation area consisting of plants that are fire resistant and low growing. An irrigation system will help keep this protection zone green and healthy.

**ZONE 1** is the protection area immediately surrounding the house. Here vegetation should be especially fire resistant, well irrigated and carefully spaced to minimize the threat from intense flames and sparks.

## Drought

Drought occurs when less than the normal amount of water is available for extended periods of time. Effects may include decreased soil moisture, groundwater levels, streamflow, and lake, pond, and well levels may drop. Factors that may contribute to drought include reduced rain/snowfall, increased rates of evaporation, and increased water usage.



<sup>25</sup> <http://www.firewise.org> accessed November 2014.



New Hampshire generally receives adequate rainfall; it is rare that the state experiences extended periods of below normal water supplies.

Since 1990 New Hampshire has had a state Drought Emergency Plan, which identifies four levels of action indicating the severity of the drought: Alert, Warning, Severe, and Emergency. There have been five extended droughts in New Hampshire in the past century: 1929 – 1936, 1939 – 1944, 1947 – 1950, 1960 – 1969, and 2001 – 2002.<sup>26</sup> While much of the country experienced drought conditions in 2012, New Hampshire received adequate precipitation.<sup>27</sup>

### Earthquake

An earthquake is a series of vibrations induced in the Earth's crust by the abrupt rupture and rebound of rocks in which elastic strain has been slowly accumulating. Earthquakes are commonly measured using *magnitude*, or the amount of seismic energy released at the epicenter of the earthquake. The Richter magnitude scale is a mathematical device used to compare the size of earthquakes, shown in Table G-2.<sup>28</sup>

**Table G-2: Richter Magnitude Scale**

| Magnitude      | Earthquake Effects  |
|----------------|---|
| 2.5 or less    | Usually not felt, but can be recorded by seismograph.                 |
| 2.5 to 5.4     | Often felt, but only causes minor damage.                             |
| 5.5 to 6.0     | Slight damage to buildings and other structures.                      |
| 6.1 to 6.9     | May cause a lot of damage in very populated areas.                    |
| 7.0 to 7.9     | Major earthquake. Serious damage.                                     |
| 8.0 or greater | Great earthquake. Can totally destroy communities near the epicenter. |

New Hampshire is considered to be in an area of moderate seismic activity with respect to other regions of the country. This means the state could experience large (6.5-7.0 magnitude) earthquakes, but they are not likely to occur as frequently as in a high hazard area like the Pacific coast. There is the potential for nearby earthquakes to register 5.5 on the Richter Scale, causing slight damage to buildings and structures. Due to the unique geology of New Hampshire, earthquake propagation waves travel up to 40 times further than they do in the western United States, possibly enlarging the area of damage.<sup>29</sup> The strongest earthquakes to strike New Hampshire occurred December 20 and 24, 1940 in the town of Ossipee. Both earthquakes had a magnitude of 5.5 and were felt over an area of 400,000 square miles.

<sup>26</sup> <http://des.nh.gov/organization/divisions/water/dam/drought/documents/historical.pdf> visited February 8, 2011.

<sup>27</sup> US Drought Monitor <http://droughtmonitor.unl.edu/>. Accessed October 9, 2012.

<sup>28</sup> <http://pubs.usgs.gov/gip/earthq4/severitygip.html>, visited February 8, 2011.

<sup>29</sup> <http://www.nh.gov/safety/divisions/hsem/NaturalHazards/index.html> visited February 8, 2011.

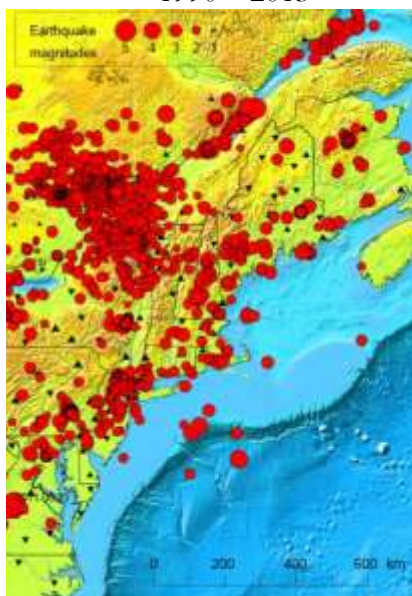
Notable New Hampshire earthquakes are listed in Table G-3 with the extent of the hazard expressed in the Modified Mercalli Intensity scale and the Richter Magnitude.<sup>30</sup>

**Table G-3: NH Earthquakes of magnitude or intensity 4 or greater (1638-2007).**

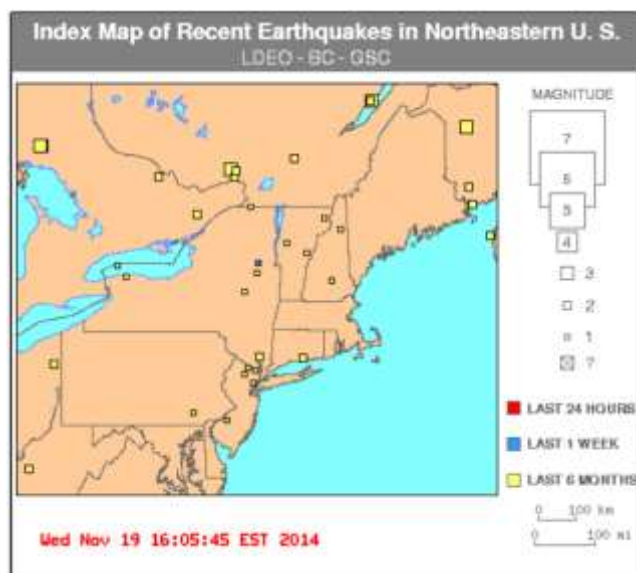
| Location          | Date              | MMIntensity | Magnitude |
|-------------------|-------------------|-------------|-----------|
| Ossipee           | December 24, 1940 | 7           | 5.5       |
| Ossipee           | December 20, 1940 | 7           | 5.5       |
| Ossipee           | October 9, 1925   | 6           | 4         |
| Laconia           | November 10, 1936 | 5           | -         |
| New Ipswich       | March 18, 1926    | 5           | -         |
| Lebanon           | March 5, 1905     | 5           | -         |
| Rockingham County | August 30, 1905   | 5           | -         |
| Concord           | December 19, 1882 | 5           | -         |
| Exeter            | November 28, 1852 | 5           | -         |
| Portsmouth        | November 10, 1810 | 5           | 4         |
| Off Hampton       | July 23, 1823     | 4           | 4.1       |
| 15km SE of Berlin | April 6, 1989     | -           | 4.1       |
| 5km NE of Berlin  | October 20, 1988  | -           | 4         |
| W. of Laconia     | January 19, 1982  | -           | 4.7       |
| Central NH        | June 11, 1638     | -           | 6.5       |

### Earthquakes in the Northeast<sup>31</sup>

1990 – 2013



During the last six months



<sup>30</sup> [http://earthquake.usgs.gov/learn/topics/mag\\_vs\\_int.php](http://earthquake.usgs.gov/learn/topics/mag_vs_int.php), visited June 8, 2012.

<sup>31</sup> Lamont-Doherty Cooperative Seismic Network <http://www.ldeo.columbia.edu/LCSN/index.php>, accessed November 2014

Damage from an earthquake generally falls into two types; Structural and Nonstructural.

- **Structural Damage** is considered any damage to the load bearing components of a building or other structure.
- **Nonstructural Damage** is considered any portion not connected to the superstructure. This includes anything added after the frame is complete.

According to the NH Division of Homeland Security and Emergency Management, some of the issues likely to be encountered after a damaging earthquake could be:

- Total or partial collapse of buildings, especially un-reinforced masonry structures and those not built to seismic codes.
- Damage to roads and bridges from ground settlement and structural damage.
- Mass Casualties.
- Loss of electric power.
- Loss of telecommunication systems.
- Fires from gas line ruptures and chimney failures.
- Total or partial loss of potable and fire-fighting water systems from pipe ruptures.
- Hazardous Material incidences.
- Loss of critical capabilities from structural and nonstructural damages.
- Lack of mutual aid support.

The NH HSEM also notes that a “cascade of disasters” typically occurs after a damaging earthquake. For example:

- Damage to gas lines and chimneys result in fires that are difficult to extinguish due to damage to the road, water systems, fire and police stations.
- Structural and Nonstructural damage cause many injuries, but because of damage to health care facilities and emergency response facilities, there is a slow or nonexistent response.
- Responders are slowed in their response because of Hazardous Material incidents.
- Flooding due to dam failures.

Damage from the 1940 earthquakes in Ossipee included some damage to most of the chimneys in the epicenter region of Ossipee, ranging from cosmetic cracks to total collapse. Sections of several foundations collapsed and at least one house rotated on its foundation. In the town of Conway, 15 miles from the epicenter, one house was lost by fire when sparks in a cracked chimney started the blaze. Splits found in the rafters and trusses temporarily closed Ossipee High School. No damages were associated with the October 2012 earthquake in Maine but the potential does exist for some damages to occur.<sup>32</sup>

On average, every other year the Lakes Region experiences an earthquake, though these earthquakes are mild and go mostly undetected by people. Sanbornton (Gaza) and Tamworth are identified as a major epicenters in the region.<sup>33</sup> A search of the USGS National Earthquake Information Center database shows that since 2006 there have been two earthquakes with a magnitude of at least 3.0 within a 100 km (62 mi.) radius of Tuftonboro; a 3.4 event in 2010 centered in Penacook, NH and a 4.0 quake in southern Maine shook the region on October 16, 2012.

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<sup>32</sup> USGS <http://earthquake.usgs.gov/earthquakes/eventpage/usb000d75b#pager>, accessed October 17, 2012.

<sup>33</sup> <http://des.nh.gov/organization/commissioner/pip/factsheets/geo/documents/geo-3.pdf>, pg. 3, visited January 25, 2011.

## **Landslide**

A landslide is the downward or outward movement of slope-forming materials reacting to the force of gravity, including mudflows, mudslides, debris flows, rockslides, debris avalanches, debris slides and earth flows. Landslides may be formed when a layer of soil atop a slope becomes saturated by significant precipitation and slides along a more cohesive layer of soil or rock. Seismic activity may play a role in the mass movement of landforms also. Although New Hampshire is mountainous, it consists largely of relatively old geologic formations that have been worn by the forces of nature for eons. Consequently, much of the landscape is relatively stable and the exposure to this hazard type is generally limited to areas in the north and north central portion of the state. Formations of sedimentary deposits and along the Connecticut and Merrimack Rivers also create potential landslide conditions.

Although the overall vulnerability for landslides in the state is low, there is considerable terrain susceptible to landslide action. This was exemplified in May of 2003 when the Old Man of the Mountain collapsed. The continuous action of freezing and thawing of moisture in rock fissures causes it to split and separate. This action occurs frequently on the steeply sloped areas of the state, increasing the risk of landslides. In addition to being susceptible to this freeze/thaw process, the Ossipee Mountain Range, Squam Range, and other mountains throughout the Lakes Region are also close to seismic faults and at risk to increased pressure to development. Consideration must be given to the vulnerability of man-made structures in these areas due to seismic- and/or soils saturation-induced landslide activity. Landslide activities are also often attributed to other hazard events. For example, during a recent flood event, a death occurred when a mass of saturated soil collapsed. This death was attributed to the declared flood event.<sup>34</sup> Also, during the 2007 Nor'easter a landslide occurred in Milton, NH resulting in the temporary closure of NH Route 101.

## **Tornado/Downburst/Hurricane**

The Lakes Region is at risk of several types of natural events associated with high winds, including nor'easters, downbursts, hurricanes and tornadoes. The northeast is located in a zone that should be built to withstand 160 mile an hour wind gusts. A large portion of the northeast, including the Lakes Region, is in a designated hurricane susceptible region.

An F2 tornado ripped through a 50-mile section of central NH in July of 2008 from Epsom to Ossipee leading to requests for federal disaster declarations in several counties.<sup>35</sup>

The major damage from downbursts come from falling trees, which may take down power lines, block roads, or damage structures and vehicles. New Hampshire experienced three such events in the 1990s. One event occurred in Moultonborough on July 26, 1994 and was classified as a macroburst. It affected an area one-half mile wide by 4-6 miles in length.

The tornado/downburst risk for an individual community in New Hampshire is relatively low compared to many other parts of the country. Though the danger that these storms present may be high, the frequency of these storms is relatively low to moderate.

Hurricanes are severe tropical storms that have winds at least 74 miles per hour. In the Lakes Region they could produce heavy rain and strong winds that could cause flooding or damage buildings,

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<sup>34</sup> <http://www.nh.gov/safety/divisions/hsem/NaturalHazards/index.html> visited February 8, 2011.

<sup>35</sup> <http://www.fema.gov/news/newsrelease.fema?id=45525> visited March 8, 2011.

trees, power lines, and cars.<sup>36</sup> Hurricanes are measured by the Saffir-Simpson Hurricane Scale: a 1-5 rating based on a hurricane's intensity using wind speed as the determining factor (Table G-4). The scale is used to give an estimate of the potential property damage and flooding expected from a hurricane landfall.

**Table G-4: Saffir-Simpson Hurricane Scale**

| Category | Characteristics   |
|----------|---|
| <b>1</b> | Winds 74-95 mph (64-82 kts or 119-153 km/hr). Storm surge generally 4-5 ft above normal. No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Some damage to poorly constructed signs. Also, some coastal road flooding and minor pier damage.   |
| <b>2</b> | Winds 96-110 mph (83-95 kts or 154-177 km/hr). Storm surge generally 6-8 feet above normal. Some roofing material, door, and window damage of buildings. Considerable damage to shrubbery and trees with some trees blown down. Considerable damage to mobile homes, poorly constructed signs, and piers. Coastal and low-lying escape routes flood 2-4 hours before arrival of the hurricane center. Small craft in unprotected anchorages break moorings.   |
| <b>3</b> | Winds 111-129 mph (96-113 kts or 178-209 km/hr). Storm surge generally 9-12 ft above normal. Some structural damage to small residences and utility buildings with a minor amount of curtainwall failures. Damage to shrubbery and trees with foliage blown off trees and large trees blown down. Mobile homes and poorly constructed signs are destroyed. Low-lying escape routes are cut by rising water 3-5 hours before arrival of the center of the hurricane. Flooding near the coast destroys smaller structures with larger structures damaged by battering from floating debris. Terrain continuously lower than 5 ft above mean sea level may be flooded inland 8 miles (13 km) or more. Evacuation of low-lying residences with several blocks of the shoreline may be required. |
| <b>4</b> | Winds 130-156 mph (114-135 kts or 210-249 km/hr). Storm surge generally 13-18 ft above normal. More extensive curtainwall failures with some complete roof structure failures on small residences. Shrubs, trees, and all signs are blown down. Complete destruction of mobile homes. Extensive damage to doors and windows. Low-lying escape routes may be cut by rising water 3-5 hours before arrival of the center of the hurricane. Major damage to lower floors of structures near the shore. Terrain lower than 10 ft above sea level may be flooded requiring massive evacuation of residential areas as far inland as 6 miles (10 km).   |
| <b>5</b> | Winds greater than 156 mph (135 kts or 249 km/hr). Storm surge generally greater than 18 ft above normal. Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. All shrubs, trees, and signs blown down. Complete destruction of mobile homes. Severe and extensive window and door damage. Low-lying escape routes are cut by rising water 3-5 hours before arrival of the center of the hurricane. Major damage to lower floors of all structures located less than 15 ft above sea level and within 500 yards of the shoreline. Massive evacuation of residential areas on low ground within 5-10 miles (8-16 km) of the shoreline may be required.  |

Source: <http://www.nhc.noaa.gov/aboutshs.shtml>

According to NOAA, while 2010 was one of the busiest hurricane seasons on record, 2013 was one of the least active hurricane seasons.<sup>37</sup>

New Hampshire has not experienced a severe hurricane since 1938. On September 21, 1938, a Category 3 hurricane claimed 13 lives in New Hampshire and many more throughout New England. Official records at the Weather Bureau in Concord show sustained winds of 56 miles per hour, but around the state, gusts around 100 miles per hour were reported, mostly due to topographical acceleration. The Merrimack River rose nearly 11 feet above its flood stage, *The Hanover Gazette* reported that in New Hampshire, 60,000 people were homeless and many areas were without power.

<sup>36</sup> [http://www.fema.gov/hazard/hurricane/hu\\_about.shtm](http://www.fema.gov/hazard/hurricane/hu_about.shtm), visited January 25, 2011.

<sup>37</sup> [http://www.noaa.gov/stories/2010/20101129\\_hurricane\\_season.html](http://www.noaa.gov/stories/2010/20101129_hurricane_season.html) visited January 25, 2011 and [http://www.noaa.gov/stories/2013/20131125\\_end\\_of\\_hurricane\\_season.html](http://www.noaa.gov/stories/2013/20131125_end_of_hurricane_season.html).



Damages were estimated at \$22 million.<sup>38</sup> Hurricane Bob, a category 2 storm, in 1991, was declared a major federal disaster in New Hampshire and is recorded as a severe storm in the state's history.<sup>39</sup>

In the past five years no hurricanes have hit the region. By the time that a hurricane reaches central New Hampshire, it is rare that it retains the characteristics of a hurricane. Much of the damages caused by hurricanes in coastal areas result from extreme tidal surges. Intense wind speeds usually dissipate but they can still bring a great deal of wind and rainfall to the region. That was the case with the remnants of Hurricane Irene, which hit the area in August 2011 as a tropical depression (see Flooding) and Hurricane Sandy in October 2012 (see Severe Wind).

## Hail

Hail can cause damage to crops and structural damage to vehicles. Hail is measured by the TORRO intensity scale, shown in Table G-5. Although hailstorms are not particularly common in the Lakes Region, which averages fewer than two hailstorms per year, several have occurred in New Hampshire in the last decade. In 2007 and 2008 nearby Laconia experienced hail storms with no resulting damage, though reported hail sizes were as large as 1.25 inches (H4).

**Table G-5: TORRO Hailstorm Intensity Scale**

| Code | Diameter  | Description   | Typical Damage  |
|------|-----------|---------------|---|
| H0   | 5-9 mm*   | Pea           | No damage   |
| H1   | 10-15 mm  | Mothball      | Slight damage to plants, crops  |
| H2   | 16-20 mm  | Marble, grape | Significant damage to fruit, crops, vegetation  |
| H3   | 21-30 mm  | Walnut        | Severe damage to fruit/crops, damage to glass/plastic structures, paint & wood scored |
| H4   | 31-40 mm  | Pigeon's egg  | Widespread glass damage, vehicle bodywork damage                                      |
| H5   | 41-50 mm  | Golf ball     | Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries   |
| H6   | 51-60 mm  | Hen's egg     | Aircraft bodywork dented, brick walls pitted  |
| H7   | 61-75 mm  | Tennis ball   | Severe roof damage, risk of serious injuries  |
| H8   | 76-90 mm  | Large orange  | Severe damage to aircraft bodywork  |
| H9   | 91-100 mm | Grapefruit    | Extensive structural damage. Risk of severe or fatal injuries to exposed persons      |
| H10  | >100 mm   | Melon         | Extensive structural damage. Risk of severe or fatal injuries to exposed persons      |

\*mm = millimeters (Approximate range since other factors (e.g. number, density of hailstones, hail fall speed, surface wind speed) affect severity  
Source: <http://www.torro.org.uk/torro/severeweather/hailscale.php>

## EPIDEMIC

Over the past ten years, two strains of influenza viruses have become concerns across the country. The Lakes Region of New Hampshire has a large influx of seasonal visitors, which could make viral containment very difficult. Between 2005 and 2006, the Avian Influenza H5N1 virus infected 81 people and killed 52 in 10 countries in Asia and Africa. Most of the H5N1 cases were a result of human contact with infected poultry and the spread of the virus has not continued beyond that person. Although no human-to-human cases have been reported, viruses have the ability to mutate. The significance of the H5N1 pandemic is that it brought local, state, and federal attention to the need for pandemic emergency preparedness plans.

In 2009, the WHO declared a global H1N1 pandemic.<sup>40</sup> H1N1 is an influenza virus that can spread "human to human" through respiratory droplets from coughs or sneezes.<sup>41</sup> Many of the planning systems developed out of the H5N1 pandemic were useful during this pandemic.<sup>42</sup>

<sup>38</sup> <http://www.nh.gov/safety/divisions/hsem/NaturalHazards/index.html>, visited January 25, 2011.

<sup>39</sup> <http://www.fema.gov/news/event.fema?id=2118> visited January 25, 2011

<sup>40</sup> [http://c3ph.org/Files/vaccine\\_fact.pdf](http://c3ph.org/Files/vaccine_fact.pdf), visited February 15, 2011.

The 2012-13 flu season was much more severe in New Hampshire than any of the previous decade; 35 deaths occurred statewide, the most since 1997.<sup>43</sup> The community does partner with Carroll County Coalition for Public Health (<http://www.c3ph.org/>) for resources and training.

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<sup>41</sup> <http://c3ph.org/Files/H1N1FAQ.pdf>, visited February 15, 2011.

<sup>42</sup> <http://www.cdc.gov/h1n1flu/cdcresponse.htm>, visited February 8, 2011.

<sup>43</sup> NH Department of Health and Human Services <http://www.dhhs.nh.gov/media/pr/2013/01-jan/01112013flu.htm>, visited January 17, 2013.

## APPENDIX H: PRIORITIZATION DETAILS

As the Committee began the process of prioritizing these actions, the group considered the standard tool for project prioritization, the STAPLEE Method (which was utilized in 2009) and agreed to use an expanded tool to more accurately reflect the priorities of the town. In addition to the standard STAPLEE categories (Social, Technical, Administrative, Political, Economic, and Environmental), the committee considered whether a particular action impacted Life Safety and Protected Property within Tuftonboro, as well as whether there was a Local Champion for the project and whether the action augmented other Local Objectives. The STAPLEE term “Economic” was changed to “Cost”.

This section contains a summary of rankings for each of the proposed Mitigation Actions by the Tuftonboro Hazard Mitigation Committee. For each action, the benefits and costs of implementing the action (under each of the eleven categories) was considered and scored -1, 0, 1 with a ‘minus one’ indicating that the costs outweighed the benefits in a particular category, a ‘one’ meant that the benefits were greater than the costs, and a ‘zero’ meant that while there are costs associated with the project, they are balanced out by the benefits. The eleven category scores were summed for an overall project total. A maximum total score is 11, the minimum is -11. Actual results ranged from 10 to 0. These ratings were arrived at through committee discussion and group consensus.

| Only score in those categories that you feel are pertinent and those that you feel comfortable giving input. |     |   | Life Safety | Property Protection | Technical | Political | Legal | Environmental | Social | Administrative | Local Champion | Other Objectives | Cost | Total |
|--|-----|---|-------------|---------------------|-----------|-----------|-------|---------------|--------|----------------|----------------|------------------|------|-------|
| Scoring:<br>1 = Highly effective of feasible, 0 = Neutral, -1 = Ineffective or not feasible                  |     |   |             |                     |           |           |       |               |        |                |                |                  |      |       |
| Hazard   | ID  | Tuftonboro: Proposed Actions  |             |                     |           |           |       |               |        |                |                |                  |      |       |
| Under \$10,000 or under 200 hours  |     |   |             |                     |           |           |       |               |        |                |                |                  |      |       |
| Wind, Light, Winter, Hurricane   | 1A  | Identify the best solution to improve emergency response communications coverage. This may involve a new repeater, upgraded technology, and partnering with Carroll County. | 1           | 1                   | 1         | 0         | 1     | 1             | 1      | 1              | 1              | 1                | 0    | 9     |
| Flood  | 9   | Establish wetlands setback regulations and a method of enforcement.   | 0           | 1                   | 1         | -1        | 1     | 1             | -1     | 1              | 0              | 1                | 1    | 5     |
| Fire, Drought  | 10A | Install cisterns/dry hydrants as indicated in the Tuftonboro Water Resources Plan for Rural Fire Protection.  | 1           | 1                   | 1         | 1         | 1     | 1             | 1      | 1              | 1              | 1                | 0    | 10    |
| Fire, Drought  | 10B | Develop and fund a Capital Reserve Program for cisterns and Dry Hydrants  | 1           | 1                   | 1         | -1        | 1     | 1             | 1      | 1              | 1              | 1                | 0    | 8     |



|   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |
|---|----|--|---|---|---|---|---|---|---|---|---|---|----|---|
| Lightning   | 13 | Add surge protection and lightning rods to critical facilities.  | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | -1 | 6 |
| Severe Winter Weather                             | 14 | Conduct more public education regarding home renovations and the impacts of changes (such as improved insulation leading to greater snow loads). | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0  | 5 |
| <b>\$10,000 - \$99,999 or 200 - 2,000 hours</b>   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |
| Wind, Light, Winter, Hurricane                    | 1B | Once the best solution has been identified to improve emergency response communications coverage (technology, location, partner), implement it.  | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0  | 9 |
| Flood, Hurricane                                  | 3A | Study downstream impacts on Sodom Road drainage  | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0  | 7 |
| Flood, Hurricane                                  | 3B | Implement the recommendations of the Sodom Road study to enhance drainage.   | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | -1 | 6 |
| Flood, Hurricane                                  | 4  | Upgrade the culverts on Canaan Rd.   | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | -1 | 6 |
| Flood, Hurricane                                  | 11 | Upgrade two culverts along Union Wharf Rd. to reduce flooding.   | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | -1 | 6 |
| <b>\$100,000 or more or more than 2,000 hours</b> |    |  |   |   |   |   |   |   |   |   |   |   |    |   |
| Flood, Hurricane                                  | 5  | Replace culverts and conduct ditchwork along the Lang Pond Road.   | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | -1 | 6 |
| Flood, Hurricane                                  | 6  | Raise the roadbed on Brown Rd. to accommodate larger culverts  | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | -1 | 6 |
| Flood, Hurricane                                  | 7  | Raise the roadbed on Curtis Rd. to accommodate larger culverts   | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | -1 | 6 |
| Flood, Hurricane                                  | 12 | Repair or replace the municipal red-listed bridge on New Road over the Melvin River.   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0 |
| Flood, Hurricane                                  | 15 | Repair or replace the municipal red-listed bridge on Sodom Road over the Melvin River.   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0 |

## **APPENDIX I: EXISTING PLANS, STUDIES, REPORTS, AND TECHNICAL INFORMATION**

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Tuftonboro Hazard Mitigation Plan, 2009

Tuftonboro Master Plan, 2006

Tuftonboro Zoning Ordinance, 2013

Tuftonboro Subdivision Regulations, 2011

Tuftonboro Site Plan Regulations, 2011

“Development Activity in the Lakes Region, 2012 Annual Report”, Lakes Region Planning Commission.

FEMA Community Information System

Tuftonboro Assessor Database, 2013

State of New Hampshire Multi-Hazard Mitigation Plan, Update 2013

National Oceanic and Atmospheric Administration website, <http://www.ncdc.noaa.gov/>

NH Division of Forests and Lands <http://www.nhdf.org/fire-control-and-law-enforcement/fire-statistics.aspx>

NH Department of Transportation Traffic Volume Reports,  
<http://www.nh.gov/dot/org/operations/traffic/tvr/locations/index.htm>

## APPENDIX J: MONITOR, EVALUATE, & UPDATE

**Table A: Periodic Hazard Mitigation Plan Review Record**

| Meeting Schedule<br>(dates) | Tasks Accomplished | How well (or not-so-well) is implementation progressing? | Lead Parties | Public Involvement<br>(citizens, neighboring communities) |
|-----------------------------|--------------------|--|--------------|---|
|                             |                    |  |              |   |
|                             |                    |  |              |   |
|                             |                    |  |              |   |
|                             |                    |  |              |   |

There is a new tool called “Action Tracker” for Mitigation Actions. The Action Tracker is a new data system FEMA is using to document mitigation ideas and progress for all communities. Check this link to obtain and set up a profile to follow and maintain your community’s selected mitigation actions/projects: <http://fema.starr-team.com/Account/Login.aspx?ReturnUrl=%2f> or <http://fema.starr-team.com>.

**Table B: Project Implementation Checklist**

| Hazard                         | ID  | Tuftonboro: Actions   | Potential Funding          | Responsible Party  | Time Frame | Status 2015 | Status 2016 | Status 2017 | Status 2018 |
|--------------------------------|-----|---|----------------------------|--------------------|------------|-------------|-------------|-------------|-------------|
| Flood, Hurricane               | 11  | Upgrade two culverts along Union Wharf Rd. to reduce flooding.  | Highway Dept. budget, FEMA | Road Agent         | 1 year     |             |             |             |             |
| Fire, Drought                  | 10A | Install cisterns/dry hydrants as indicated in the Tuftonboro Water Resources Plan for Rural Fire Protection.  | Developer                  | Planning Board, FD | Ongoing*   |             |             |             |             |
| Lightning                      | 13  | Add surge protection and lightning rods to critical facilities.   | FEMA, Town Warrant         | Code Enforcement   | 1-2 years  |             |             |             |             |
| Wind, Light, Winter, Hurricane | 1A  | Identify the best solution to improve emergency response communications coverage. This may involve a new repeater, upgraded technology, and partnering with Carroll County. | Operating Budget           | EMD                | 1-2 years  |             |             |             |             |
| Wind, Light, Winter, Hurricane | 1B  | Once the best solution has been identified to improve emergency response communications coverage (technology, location, and partner), implement it.                         | Town                       | EMD                | 1-2 years  |             |             |             |             |
| Severe Winter Weather          | 14  | Conduct more public education regarding home renovations and the impacts of changes (such as improved insulation leading to greater snow loads).                            | Operating Budget           | Code Enforcement   | Ongoing*   |             |             |             |             |
| Fire, Drought                  | 10B | Develop and fund a Capital Reserve Program for cisterns and Dry Hydrants  | Town Warrant               | FD                 | Ongoing*   |             |             |             |             |
| Flood, Hurricane               | 3A  | Study downstream impacts on Sodom Road drainage   | Highway Dept. budget       | Road Agent         | 2-3 years  |             |             |             |             |
| Flood, Hurricane               | 3B  | Implement the recommendations of the Sodom Road study to enhance drainage.  | Highway Dept. budget, FEMA | Road Agent         | 3-4 years  |             |             |             |             |

| <b>Hazard</b>    | <b>ID</b> | <b>Tuftonboro: Actions</b>   | <b>Potential Funding</b>   | <b>Responsible Party</b>         | <b>Time Frame</b> | <b>Status 2015</b> | <b>Status 2016</b> | <b>Status 2017</b> | <b>Status 2018</b> |
|------------------|-----------|--|----------------------------|----------------------------------|-------------------|--------------------|--------------------|--------------------|--------------------|
| Flood, Hurricane | 4         | Upgrade the culverts on Canaan Rd.   | Highway Dept. budget, FEMA | Road Agent                       | 4-5 years         |                    |                    |                    |                    |
| Flood, Hurricane | 5         | Replace culverts and conduct ditchwork along the Lang Pond Road.                     | Highway Dept. budget, FEMA | Road Agent                       | 4-5 years         |                    |                    |                    |                    |
| Flood, Hurricane | 6         | Raise the roadbed on Brown Rd. to accommodate larger culverts                        | Highway Dept. budget, FEMA | Road Agent                       | 4-5 years         |                    |                    |                    |                    |
| Flood, Hurricane | 7         | Raise the roadbed on Curtis Rd. to accommodate larger culverts                       | Highway Dept. budget, FEMA | Road Agent                       | 4-5 years         |                    |                    |                    |                    |
| Flood            | 9         | Establish wetlands setback regulations and a method of enforcement.                  | Operating Budget           | Planning Board, Code Enforcement | 4-5 years         |                    |                    |                    |                    |
| Flood, Hurricane | 12        | Repair or replace the municipal red-listed bridge on New Road over the Melvin River. | Town Warrant               | Road Agent                       | 4-5 years         |                    |                    |                    |                    |
| Flood, Hurricane | 15        | Repair or replace the municipal red-listed bridge on Tuftonboro Neck Rd. bridge.     | Town Warrant               | Road Agent                       | 4-5 years         |                    |                    |                    |                    |

\*This action will be completed on an ongoing basis throughout the life of the plan.

## APPENDIX K: FEMA WEBLIOGRAPHY

For the most current version of the FEMA webliography, visit <http://www.fema.gov/about-region-i/about-region-i/hazard-mitigation-planning-webliography>.

### DISASTERS AND NATURAL HAZARDS INFORMATION

|  |   |
|--|---|
| FEMA-How to deal with specific hazards   | <a href="http://www.ready.gov/natural-disasters">http://www.ready.gov/natural-disasters</a>   |
| Natural Hazards Center at the University of Colorado   | <a href="http://www.colorado.edu/hazards">http://www.colorado.edu/hazards</a>   |
| National Oceanic and Atmospheric Administration (NOAA): Information on various projects and research on climate and weather. | <a href="http://www.websites.noaa.gov">http://www.websites.noaa.gov</a>   |
| National Climatic Data Center active archive of weather data.  | <a href="http://lwf.ncdc.noaa.gov/oa/ncdc.html">http://lwf.ncdc.noaa.gov/oa/ncdc.html</a>   |
| Northeast Snowfall Impact Scale  | <a href="http://www.erh.noaa.gov/rnk/Newsletter/Fall%202007/NESIS.htm">http://www.erh.noaa.gov/rnk/Newsletter/Fall%202007/NESIS.htm</a>                 |
| Weekend Snowstorm Strikes The Northeast Corridor Classified As A Category 3"Major"Storm                                      | <a href="http://www.publicaffairs.noaa.gov/releases2006/feb06/noaa06-023.html">http://www.publicaffairs.noaa.gov/releases2006/feb06/noaa06-023.html</a> |

### FLOOD RELATED HAZARDS

|   |   |
|---|---|
| FEMA Coastal Flood Hazard Analysis & Mapping                                    | <a href="http://www.fema.gov/national-flood-insurance-program-0/fema-coastal-flood-hazard-analyses-and-mapping-1">http://www.fema.gov/national-flood-insurance-program-0/fema-coastal-flood-hazard-analyses-and-mapping-1</a> |
| Floodsmart  | <a href="http://www.floodsmart.gov/floodsmart/">http://www.floodsmart.gov/floodsmart/</a>   |
| National Flood Insurance Program (NFIP)   | <a href="http://www.fema.gov/nfip">http://www.fema.gov/nfip</a>   |
| Digital quality Level 3 Flood Maps  | <a href="http://msc.fema.gov/MSD/statemap.htm">http://msc.fema.gov/MSD/statemap.htm</a>   |
| Flood Map Modernization   | <a href="http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/map-modernization">http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/map-modernization</a>                         |
| Reducing Damage from Localized Flooding: A Guide for Communities, 2005 FEMA 511 | <a href="http://www.fema.gov/library/viewRecord.do?id=1448">http://www.fema.gov/library/viewRecord.do?id=1448</a>   |

### FIRE RELATED HAZARDS

|                                      |   |
|--------------------------------------|---|
| Firewise                             | <a href="http://www.firewise.org">http://www.firewise.org</a>   |
| NOAA Fire Event Satellite Photos     | <a href="http://www.osei.noaa.gov/Events/Fires">http://www.osei.noaa.gov/Events/Fires</a>                     |
| U.S. Forest Service, USDA            | <a href="http://www.fs.fed.us/land/wfas/welcome.htm">http://www.fs.fed.us/land/wfas/welcome.htm</a>           |
| Wildfire Hazards - A National Threat | <a href="http://pubs.usgs.gov/fs/2006/3015/2006-3015.pdf">http://pubs.usgs.gov/fs/2006/3015/2006-3015.pdf</a> |

### GEOLOGIC RELATED HAZARDS

|  |   |
|--|---|
| USGS Topographic Maps  | <a href="http://topomaps.usgs.gov/">http://topomaps.usgs.gov/</a>   |
| Building Seismic Safety Council  | <a href="http://www.nibs.org/?page=bssc">http://www.nibs.org/?page=bssc</a>   |
| Earthquake hazard history by state   | <a href="http://earthquake.usgs.gov/earthquakes/states/">http://earthquake.usgs.gov/earthquakes/states/</a>   |
| USGS data on earthquakes   | <a href="http://earthquake.usgs.gov/monitoring/deformation/data/download/">http://earthquake.usgs.gov/monitoring/deformation/data/download/</a>   |
| USGS Earthquake homepage   | <a href="http://quake.wr.usgs.gov">http://quake.wr.usgs.gov</a>   |
| National Cooperative Geologic Mapping Program (NCGMP)  | <a href="http://ncgmp.usgs.gov/">http://ncgmp.usgs.gov/</a>   |
| Landslide Overview Map of the Conterminous United States   | <a href="http://landslides.usgs.gov/learning/nationalmap/">http://landslides.usgs.gov/learning/nationalmap/</a>   |
| Kafka, Alan L. 2008. Why Does the Earth Quake in New England? Boston College, Weston Observatory, Department of Geology and Geophysics | <a href="http://www2.bc.edu/~kafka/Why_Quakes/why_quakes.html">http://www2.bc.edu/~kafka/Why_Quakes/why_quakes.html</a>   |
| Map and Geographic Information Center, 2010, "Connecticut GIS Data", University of Connecticut   | <a href="http://magic.lib.uconn.edu/connecticut_data.html">http://magic.lib.uconn.edu/connecticut_data.html</a>   |
| 2012 Maine earthquake  | <a href="http://www.huffingtonpost.com/2012/10/17/mainearthquake-2012-new-england_n_1972555.html">http://www.huffingtonpost.com/2012/10/17/mainearthquake-2012-new-england_n_1972555.html</a> |

**WIND-RELATED HAZARDS**

|  |   |
|--|---|
| ATC Wind Speed Web Site                                    | <a href="http://www.atcouncil.org/windspeed/index.php">http://www.atcouncil.org/windspeed/index.php</a>                       |
| U.S. Wind Zone Maps  | <a href="http://www.fema.gov/safe-rooms/wind-zones-united-states">http://www.fema.gov/safe-rooms/wind-zones-united-states</a> |
| Tornado Project Online                                     | <a href="http://www.tornadoproject.com/">http://www.tornadoproject.com/</a>   |
| National Hurricane Center                                  | <a href="http://www.nhc.noaa.gov">http://www.nhc.noaa.gov</a>   |
| Community Hurricane Preparedness Tutorial                  | <a href="http://meted.ucar.edu/hurricane/chp/hp.htm">http://meted.ucar.edu/hurricane/chp/hp.htm</a>                           |
| National Severe Storms Laboratory, 2009, "Tornado Basics", | <a href="http://www.nssl.noaa.gov/primer/tornado/tor_basics.html">http://www.nssl.noaa.gov/primer/tornado/tor_basics.html</a> |

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

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|--|---|
| The National Spatial Data Infrastructure & Clearinghouse (NSDI) and Federal Geographic Data Committee (FGDC) Source for information on producing and sharing geographic data   | <a href="http://www.fgdc.gov">http://www.fgdc.gov</a>   |
| The OpenGIS Consortium Industry source for developing standards and specifications for GIS data  | <a href="http://www.opengis.org">http://www.opengis.org</a>   |
| Northeast States Emergency Consortium (NESEC): Provides information on various hazards, funding resources, and other information   | <a href="http://www.nesec.org">http://www.nesec.org</a>   |
| US Dept of the Interior Geospatial Emergency Management System (IGEMS) provides the public with both an overview and more specific information on current natural hazard events. It is supported by the Department of the Interior Office of Emergency Management. | <a href="http://igems.doi.gov/">http://igems.doi.gov/</a>   |
| FEMA GeoPlatform: Geospatial data and analytics in support of emergency management   | <a href="http://fema.maps.arcgis.com/home/index.html">http://fema.maps.arcgis.com/home/index.html</a> |

**DETERMINING RISK AND VULNERABILITY**

|   |   |
|---|---|
| HAZUS   | <a href="http://www.hazus.org">http://www.hazus.org</a>   |
| FEMA Hazus Average Annualized Loss Viewer   | <a href="http://fema.maps.arcgis.com/home/webmap/viewer.html?webmap=cb8228309e9d405ca6b4db6027df36d9&amp;extent=-139.0898,7.6266,-48.2109,62.6754">http://fema.maps.arcgis.com/home/webmap/viewer.html?webmap=cb8228309e9d405ca6b4db6027df36d9&amp;extent=-139.0898,7.6266,-48.2109,62.6754</a> |
| Vulnerability Assessment Tutorial: On-line tutorial for local risk and vulnerability assessment | <a href="http://www.csc.noaa.gov/products/nchaz/htm/mitigate.htm">http://www.csc.noaa.gov/products/nchaz/htm/mitigate.htm</a>   |
| Case Study: an example of a completed risk and vulnerability assessment                         | <a href="http://www.csc.noaa.gov/products/nchaz/htm/case.htm">http://www.csc.noaa.gov/products/nchaz/htm/case.htm</a>   |

**DATA GATHERING**

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|---|---|
| National Information Sharing Consortium (NISC): brings together data owners, custodians, and users in the fields of homeland security, public safety, and emergency management and response. Members leverage efforts related to the governance, development, and sharing of situational awareness and incident management resources, tools, and best practices | <a href="http://nisconsortium.org/">http://nisconsortium.org/</a>           |
| The Hydrologic Engineering Center (HEC), an organization within the Institute for Water Resources, is the designated Center of Expertise for the US Army Corps of Engineers   | <a href="http://www.hec.usace.army.mil/">http://www.hec.usace.army.mil/</a> |



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|---|---|
| National Water & Climate Center           | <a href="http://www.wcc.nrcs.usda.gov/">http://www.wcc.nrcs.usda.gov/</a>   |
| WinTR-55 Watershed Hydrology              | <a href="http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/?&amp;cid=stelprdb1042901">http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/?&amp;cid=stelprdb1042901</a> |
| USACE Hydrologic Engineering Center (HEC) | <a href="http://www.hec.usace.army.mil/software/">http://www.hec.usace.army.mil/software/</a>   |
| Stormwater Manager's Resource Center SMRC | <a href="http://www.stormwatercenter.net">http://www.stormwatercenter.net</a>   |
| USGS Current Water Data for the Nation    | <a href="http://waterdata.usgs.gov/nwis/rt">http://waterdata.usgs.gov/nwis/rt</a>   |
| USGS Water Data for the Nation            | <a href="http://waterdata.usgs.gov/nwis/">http://waterdata.usgs.gov/nwis/</a>   |
| Topography Maps and Aerial photos         | <a href="http://www.terraserver.com/view.asp?tid=142">http://www.terraserver.com/view.asp?tid=142</a>   |
| National Register of Historic Places      | <a href="http://www.nps.gov/nr/about.htm">http://www.nps.gov/nr/about.htm</a>   |
| National Wetlands Inventory               | <a href="http://www.fws.gov/wetlands/">http://www.fws.gov/wetlands/</a>   |
| ICLUS Data for Northeast Region           | <a href="http://www.epa.gov/ncea/global/iclus/inclus_nca_northeast.htm">http://www.epa.gov/ncea/global/iclus/inclus_nca_northeast.htm</a>   |

### **SUSTAINABILITY/ADAPTATION/CLIMATE CHANGE**

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|---|---|
| Planning for a Sustainable Future: the Link Between Hazard Mitigation and Livability  | <a href="http://www.fema.gov/media-library-data/20130726-1454-20490-3505/fema364.pdf">http://www.fema.gov/media-library-data/20130726-1454-20490-3505/fema364.pdf</a>   |
| Why the Emergency Management Community Should be Concerned about Climate Change: A discussion of the impact of climate change on selected natural hazards                                     | <a href="http://www.cna.org/sites/default/files/research/WEB%2007%2029%2010.1%20Climate%20Change%20and%20the%20Emergency%20Management%20Community.pdf">http://www.cna.org/sites/default/files/research/WEB%2007%2029%2010.1%20Climate%20Change%20and%20the%20Emergency%20Management%20Community.pdf</a> |
| NOAA RISA for the Northeast (Regional Integrated Sciences and Assessments)  | <a href="http://ccrun.org/home">http://ccrun.org/home</a>   |
| Resilient Sustainable Communities: Integrating Hazard Mitigation& Sustainability into Land Use  | <a href="http://www.earth.columbia.edu/sitefiles/file/education/documents/2013/Resilient-Sustainable-Communities-Report.pdf">http://www.earth.columbia.edu/sitefiles/file/education/documents/2013/Resilient-Sustainable-Communities-Report.pdf</a>   |
| U.S. EPA  | <a href="http://www.epa.gov/climatechange/">http://www.epa.gov/climatechange/</a>   |
| NOAA National Ocean Service (NOS)   | <a href="http://oceanservice.noaa.gov/">http://oceanservice.noaa.gov/</a>   |
| The Northeast Climate Research Center (NRCC) folks were heavily involved in climate data in the NCA, below. They have a wealth of historic climate data and weather information, trends, etc. | <a href="http://www.nrcc.cornell.edu/">http://www.nrcc.cornell.edu/</a>   |
| Community and Regional Resilience: Perspectives from hazards, disasters, and emergency management   | <a href="http://www.resilientus.org/library/FINAL_CUTTER_9-25-08_1223482309.pdf">http://www.resilientus.org/library/FINAL_CUTTER_9-25-08_1223482309.pdf</a>   |
| National Fish, Wildlife and Plants Climate Adaptation Strategy  | <a href="http://www.wildlifeadaptationstrategy.gov">www.wildlifeadaptationstrategy.gov</a>  |
| ICLEI Local Governments for Sustainability  | <a href="http://www.icleiusa.org/">http://www.icleiusa.org/</a>   |
| Kresge Foundation Survey  | <a href="http://www.kresge.org/news/survey-finds-communities-northeast-are-trying-plan-for-changes-climate-need-help-0">http://www.kresge.org/news/survey-finds-communities-northeast-are-trying-plan-for-changes-climate-need-help-0</a>   |
| New England's Sustainable Knowledge Corridor  | <a href="http://www.sustainableknowledgecorridor.org/site/">http://www.sustainableknowledgecorridor.org/site/</a>   |
| The Strategic Foresight Initiative (SFI)  | <a href="http://www.fema.gov/pdf/about/programs/oppa/findings_051111.pdf">http://www.fema.gov/pdf/about/programs/oppa/findings_051111.pdf</a>   |
| Northeast Climate Choices   | <a href="http://www.climatechoices.org/ne/resources_ne/nereport.html">http://www.climatechoices.org/ne/resources_ne/nereport.html</a>   |
| Northeast Climate Impacts Assessment  | <a href="http://www.northeastclimateimpacts.org/">http://www.northeastclimateimpacts.org/</a>   |
| Draft National Climate Assessment Northeast Chapter released early 2013   | <a href="http://ncadac.globalchange.gov/">http://ncadac.globalchange.gov/</a>   |
| Northeast Chapter of the National Climate Assessment of 2009:   | <a href="http://www.globalchange.gov/images/cir/pdf/northeast.pdf">http://www.globalchange.gov/images/cir/pdf/northeast.pdf</a>   |

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|---|---|
| NEclimateUS.org   | <a href="http://www.neclimateus.org">http://www.neclimateus.org</a>   |
| ClimateNE   | <a href="http://www.climate-northeast.com">www.climate-northeast.com</a>  |
| Scenarios for Climate Assessment and Adaptation         | <a href="http://scenarios.globalchange.gov/">http://scenarios.globalchange.gov/</a>   |
| Northeast Climate Science Center                        | <a href="http://necsc.umass.edu/">http://necsc.umass.edu/</a>   |
| FEMA Climate Change Adaptation and Emergency Management | <a href="https://www.llis.dhs.gov/content/climate-change-adaptation-and-emergency-management-0">https://www.llis.dhs.gov/content/climate-change-adaptation-and-emergency-management-0</a> |
| Climate Central   | <a href="http://www.climatecentral.org">http://www.climatecentral.org</a>   |
| EPA State and Local Climate and Energy Program          | <a href="http://www.epa.gov/statelocalclimate/index.html">http://www.epa.gov/statelocalclimate/index.html</a>   |

## PLANNING

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| American Planning Association                               | <a href="http://www.planning.org">http://www.planning.org</a>       |
| PlannersWeb - Provides city and regional planning resources | <a href="http://www.plannersweb.com">http://www.plannersweb.com</a> |

## OTHER FEDERAL RESOURCES

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| U.S. Army Corps of Engineers: Provides funding for floodplain management planning and technical assistance and other water resources issues.   | <a href="http://www.nae.usace.army.mil">www.nae.usace.army.mil</a>                     |
| Natural Resources Conservation Service: Technical assistance to individual land owners, groups of landowners, communities, and soil and water conservation districts.  | <a href="http://www.nrcs.usda.gov">www.nrcs.usda.gov</a>                               |
| NOAA Coastal Services Center   | <a href="http://www.csc.noaa.gov/">http://www.csc.noaa.gov/</a>                        |
| Rural Economic and Community Development: Technical assistance to rural areas and smaller communities in rural areas on financing public works projects.   | <a href="http://www.rurdev.usda.gov">www.rurdev.usda.gov</a>                           |
| Farm Service Agency: Manages the Wetlands Reserve Program (useful in open space or acquisition projects by purchasing easements on wetlands properties) and farmland set aside programs  | <a href="http://www.fsa.usda.gov">www.fsa.usda.gov</a>                                 |
| National Weather Service: Prepares and issues flood, severe weather and coastal storm warnings. Staff hydrologists can work with communities on flood warning issues; can give technical assistance in preparing flood-warning plans.  | <a href="http://www.weather.gov">www.weather.gov</a>                                   |
| Economic Development Administration (EDA): Assists communities with technical assistance for economic development planning   | <a href="http://www.osec.doc.gov/eda/default.htm">www.osec.doc.gov/eda/default.htm</a> |
| National Park Service: Technical assistance with open space preservation planning; can help facilitate meetings and identify non-structural options for floodplain redevelopment.  | <a href="http://www.nps.gov">www.nps.gov</a>   |
| Fish and Wildlife Services: Can provide technical and financial assistance to restore wetlands and riparian habitats.  | <a href="http://www.fws.gov">www.fws.gov</a>   |
| Department of Housing & Urban Development  | <a href="http://www.hud.gov">www.hud.gov</a>   |
| Small Business Administration: SBA can provide additional low-interest funds (up to 20% above what an eligible applicant would qualify for) to install mitigation measures. They can also loan the cost of bringing a damaged property up to state or local code requirements. | <a href="http://www.sba.gov/disaster">www.sba.gov/disaster</a>                         |
| Environmental Protection Agency  | <a href="http://www.epa.gov">www.epa.gov</a>   |

**OTHER RESOURCES**

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|---|---|
| New England States Emergency Consortium (NESEC): NESEC conducts public awareness and education programs on natural disaster and emergency management activities throughout New England. Resources are available on earthquake preparedness, mitigation, and hurricane safety. | <a href="http://www.nesec.org">www.nesec.org</a>        |
| Association of State Floodplain Managers (ASFPM): ASFPM has developed a series of technical and topical research papers, and a series of Proceedings from their annual conferences.   | <a href="http://www.floods.org">www.floods.org</a>      |
| National Voluntary Organizations Active in Disaster (VOAD) is a non-profit, nonpartisan membership organization that serves as the forum where organizations share knowledge and resources throughout the disaster cycle—preparation, response, recovery and mitigation.      | <a href="http://www.nvoad.org">http://www.nvoad.org</a> |

**FEMA RESOURCES**

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| Federal Emergency Management Agency (FEMA)   | <a href="http://www.fema.gov">www.fema.gov</a>  |
| National Mitigation Framework  | <a href="http://www.fema.gov/national-mitigation-framework">http://www.fema.gov/national-mitigation-framework</a>   |
| Federal Insurance and Mitigation Administration (FIMA)   | <a href="http://www.fema.gov/fima">http://www.fema.gov/fima</a>   |
| Community Rating System (CRS)  | <a href="http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-rating-system">http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-rating-system</a> |
| FEMA Building Science  | <a href="http://www.fema.gov/building-science">http://www.fema.gov/building-science</a>   |
| National Flood Insurance Program (NFIP)  | <a href="http://www.fema.gov/national-flood-insurance-program">http://www.fema.gov/national-flood-insurance-program</a>   |
| Floodplain Management & Community Assistance Program   | <a href="http://www.fema.gov/floodplain-management">http://www.fema.gov/floodplain-management</a>   |
| Increased Cost of Compliance (ICC): ICC coverage provides up to \$30,000 for elevation and design requirements to repeatedly or substantially damaged property.                          | <a href="http://www.fema.gov/national-flood-insurance-program-2/increased-cost-compliance-coverage">http://www.fema.gov/national-flood-insurance-program-2/increased-cost-compliance-coverage</a>   |
| National Disaster Recovery Framework   | <a href="http://www.fema.gov/national-disaster-recovery-framework">http://www.fema.gov/national-disaster-recovery-framework</a>   |
| Computer Sciences Corporation: contracted by FIMA as the NFIP Statistical Agent, CSC provides information and assistance on flood insurance to lenders, insurance agents and communities | <a href="http://www.csc.com">www.csc.com</a>  |
| Integrating the Local Natural Hazard Mitigation Plan into a Community's Comprehensive Plan: A Guidebook for Local Governments  | <a href="https://www.fema.gov/ar/media-library/assets/documents/89725">https://www.fema.gov/ar/media-library/assets/documents/89725</a>   |
| Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning   | <a href="http://www.fema.gov/media-library/assets/documents/4317">http://www.fema.gov/media-library/assets/documents/4317</a>   |

**Mitigation Best Practices Portfolio** <http://www.fema.gov/mitigation-best-practices-portfolio>

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|---|---|
| FEMA Multi-Hazard Mitigation Planning Website | <a href="http://www.fema.gov/multi-hazard-mitigation-planning">http://www.fema.gov/multi-hazard-mitigation-planning</a> |
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| FEMA Resources Page  | <a href="http://www.fema.gov/plan/mitplanning/resources.shtm">http://www.fema.gov/plan/mitplanning/resources.shtm</a>   |
| Local Mitigation Plan Review Guide   | <a href="http://www.fema.gov/library/viewRecord.do?id=4859">http://www.fema.gov/library/viewRecord.do?id=4859</a>       |
| Local Mitigation Planning Handbook complements and liberally references the Local Mitigation Plan Review Guide above | <a href="http://www.fema.gov/library/viewRecord.do?id=7209">http://www.fema.gov/library/viewRecord.do?id=7209</a>       |
| HAZUS  | <a href="http://www.fema.gov/protecting-our-communities/hazus">http://www.fema.gov/protecting-our-communities/hazus</a> |
| Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards  | <a href="http://www.fema.gov/library/viewRecord.do?id=6938">http://www.fema.gov/library/viewRecord.do?id=6938</a>       |
| Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials                    | <a href="http://www.fema.gov/library/viewRecord.do?id=7130">http://www.fema.gov/library/viewRecord.do?id=7130</a>       |
| IS-318<br>Mitigation Planning for Local and Tribal Communities<br>Independent Study Course                           | <a href="http://training.fema.gov/EMIWeb/IS/is318.asp">http://training.fema.gov/EMIWeb/IS/is318.asp</a>                 |

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