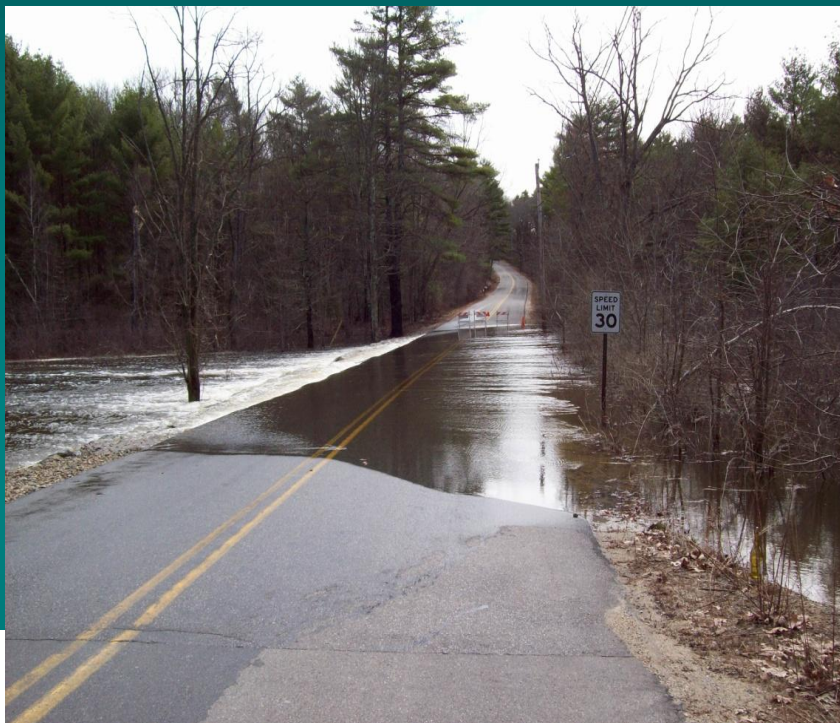


Durham Multi-Hazard Mitigation Plan 2012 Update



**Prepared for New Hampshire Homeland
Security & Emergency Management**

**By
Strafford Regional Planning Commission
Rochester, NH 03867**

**June 28, 2012
Final**

Multi-Hazard Mitigation Plan

Acknowledgements

This plan was created through a grant from New Hampshire Homeland Security Emergency Management (HSEM).

The following organizations have contributed invaluable assistance and support for this project:

The 2005 Durham Hazard Mitigation Committee
New Hampshire Homeland Security Emergency Management (HSEM)
Town of Durham

The 2012 Town of Durham Multi-Hazard Mitigation Planning Team

Seventeen people have attended meetings and/or been instrumental in completing this plan:

- Todd Selig Town Administrator/EMD
- Michael Lynch DPW Director
- Jason Cleary Assistant Fire Chief
- Tom Madden Library Director
- Corey Landry Fire Chief
- Rene Kelley Deputy Police Chief
- James Campbell Director of Planning and Community Development
- Dave Kurz Police Chief
- Gail Jablonski Business Manager
- Thomas Johnson Health Officer Code Enforcement
- Luke Vincent IT Manager
- Lorrie Pitt Town Clerk/Tax Collector
- April Talon Assistant Engineer
- Julia Chase Field Representative HSEM
- Lance Harbour Mitigation Planner HSEM
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Photo Credit: April Talon, Assistant Town Engineer

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Executive Summary

The first Durham Multi-Hazard Mitigation Plan was compiled to assist the Town of Durham in reducing and mitigating future losses from natural and man-made hazardous events. This revised plan, like the first plan, was developed by Strafford Regional Planning Commission (SRPC) and participants from the Town of Durham Hazard Mitigation Team. The Plan contains the tools necessary to identify specific hazards and aspects of existing and future mitigation efforts.

This plan addresses the following hazards that affect the Town:

- Flooding (River & Dam Breach)
- Wind (Hurricane, Tropical Storm, Tornado)
- Severe Winter Storms (Ice & Snow)
- Wildfire
- Severe Thunder and Lightning
- Earthquake/Landslide
- Drought
- Extreme Heat
- Radon
- Hazardous Material Threats
- Public Health Threats
- Extended Power Failure

This plan also provides a list of Critical Facilities and Key Resources (CF/KR) categorized as follows: Emergency Response Services (ERS), Non-Emergency Response Facilities (NERS), Facilities and Populations to Protect (FPP) and Potential Resources (PR). In addition, this plan addresses the Town's involvement in The National Flood Insurance Program (NFIP).

The planning process included reviewing other Town Hazard Plans, the 2005 Durham Hazard Mitigation Plan, technical manuals, federal and state laws as well as research data. Combining the elements from these plans, the Team was able to produce this integrated multi-hazard plan. The Durham Multi-Hazard Mitigation Plan is considered a work in progress. There are three situations, which will prompt revisiting this plan:

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

Public involvement was encouraged throughout this process and will continue to be stressed in future updates. In the pre-meeting, Town officials were given a recommended list of people to invite and participate in the process. A press release was issued which encouraged public involvement and it was also stressed that public attendance was recommended. Finally, once conditional approval for this plan had been received, a public hearing was held before the Select Board to formally adopt the Plan. The public will have the opportunity for future involvement as the Plan will be periodically reviewed and the public will be included in all future reviews/updates to this plan. The public notice was and will be given by such means as: press releases in local papers, posting meeting information on the Town website (if available), sending letters to federal, state, and local organizations impacted by the Plan, and posting notices in public places in the Town. There will also be a public hearing before the annual review and before the five year update is sent to FEMA to ensure that public comments and revisions will be considered.

Once final approval was met, copies of the Plan were distributed to the Town, HESM, and FEMA; the Plan was then distributed as these entities saw fit. Copies of the Plan remain on file at Strafford Regional Planning Commission (SRPC) in both digital and paper format.

Chapter 1: Multi-Hazard Planning Process

A. Authority and Funding

Durham's first Multi-Hazard Mitigation Plan was prepared in accordance with the Disaster Mitigation Act of 2000 (DMA), Section 322, and Mitigation Planning, signed into law by President Clinton on October 30, 2000. This revised multi-hazard plan will be referred to as the "Plan". Durham's Multi-Hazard Mitigation Plan was prepared by the Durham Hazard Mitigation Planning Team with the assistance and professional service of Strafford Regional Planning Commission (SRPC) under contract with New Hampshire Homeland Security Emergency Management (HSEM) operating under the guidance of Section 206.405 of 44 CFR Chapter 1 (10-1-97 Edition). This plan was funded, in part, by HSEM through grants from FEMA (Federal Emergency Management Administration). Funds from town dues and matching funds for team member's time were also part of the funding formula.

B. Purpose & History of the FEMA Mitigation Planning Process

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

- "establish a national disaster hazard mitigation program –
- Reduce the loss of life and property, human suffering, economic disruption and disaster assistance costs resulting from natural disasters; and
- Provide a source of pre-disaster hazard mitigation funding that will assist States and local governments (including Indian tribes) in implementing effective hazard mitigation measures that are designed to ensure the continued functionality of critical services and facilities after a natural disaster."¹

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

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

HSEM's goal is to have all New Hampshire communities complete a local multi-hazard plan as a means to reduce future losses from natural and man-made events before they occur. HSEM outlined a process whereby communities throughout the state may be eligible for grants and other assistance upon completion of this multi-hazard plan. The state's regional planning commissions are charged with providing assistance to selected communities to develop local plans.

¹ Disaster Mitigation Act (DMA) of 2000, Section 1, b1 & b2

² Disaster Mitigation Act (DMA) of 2000, Section 322a

Durham's Multi-Hazard Mitigation Plan is a planning tool for use into reducing future losses from natural and man-made disasters as required by the Disaster Mitigation Act of 2000; this plan will be adopted as an appendix to the master plan. The Multi-Hazard Mitigation planning process resulted in significant cross talk regarding all types of natural and man-made hazards by team members.

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

C. Jurisdiction

This plan addresses only one jurisdiction – the Town of Durham, NH. Once approved by the Planning Team, the Plan was forwarded to HSEM and FEMA for Conditional Approval. Upon review and conditional approval by HSEM and FEMA, the Board of Selectmen held a public hearing, to consider public comments and signed a Resolution to Adopt the Plan.

D. Scope of the Plan

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

E. Multi-Hazard Planning Process

The planning process consisted of ten specific steps. Many factors affected the ultimate sequence of the planning process: length of meetings, community preparation and attendance, and other community needs. All steps were included but not necessarily in the numerical sequence listed. The list of steps is as follows:

- Step 1: Establish and Orient a Hazard Mitigation Planning Team
- Step 2: Identify Past and Potential Hazards
- Step 3: Identification of Hazards and Critical Facilities
- Step 4: Assessing Vulnerability – Estimating Potential Losses
- Step 5: Analyze Development Trends
- Step 6: Existing Mitigation Strategies and Proposed Improvements
- Step 7: Develop Specific Mitigation Measures
- Step 8: Prioritized Mitigation Measures
- Step 9: Mitigation Action Plan
- Step 10: Adopt and Implement the Plan

F: Involvement

Public, Neighboring Communities, Agencies, Non-profits and other interested parties

Public involvement was stressed during the initial meeting and community officials were given a list of potential team members. Community officials were urged to contact as many people as they could to participate in the planning process. A public notice, stressing the public nature of the process, was also sent to area newspapers.

<p style="text-align: center;">Public Announcement Town of Durham Hazard Mitigation Planning Committee</p> <p>Strafford Regional Planning Commission has begun the update process for Durham’s Local Hazard Mitigation Plan and the first meeting of the Durham Hazard Mitigation Planning Committee has been scheduled for Tuesday, September 7th at 1:00 pm at the Town Hall. The first meeting will include: a brief background of the Hazard Mitigation Planning process, necessary updates for the current 2005 Durham Hazard Mitigation Plan, and first steps for reviewing recent natural hazard events, such as the 2006 flood. All citizens, businesses, officials and interested parties are invited. If you are unavailable to attend, please forward any ideas or concerns to: Kyle Pimental, Regional Planner, Strafford Regional Planning Commission, 742-2523 or kpimental@strafford.org or to Todd Selig, Emergency Management Director at 868-5571 or administrator@ci.durham.nh.us. This update of the 2005 Durham Hazard Mitigation Plan is funded by FEMA under contract to Strafford Regional Planning Commission, and is a collaborative planning process with the Town of Durham.</p>
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G: Narrative Description of the Process and Methodology

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

Meeting 1, September 7, 2010

Present at this meeting: Todd Selig (Town Administrator), Jason Cleary (Assistant Fire Chief), Dave Kurtz (Police Chief), Gail Jablonski (Business Manager), Michael Lynch (Director of Public Works), Thomas Johnson (Health Officer – Code Enforcement & Zoning Administration), Luke Vincent (IT Manager), Jim Campbell (Director of Planning and Community Development), Lorie Pitt (Town Clerk – Tax Collector), Julia Chase (Field Rep HSEM), Lance Harbour (Mitigation Planner – HSEM), Michelle Auen and Kyle Pimental (Strafford Regional Planning Commission).

Kyle explained the evolution of the Multi-Hazard Mitigation planning and the steps necessary to complete the process. Using a full-color Geographic Information (GIS) map

prepared by Kyle, the Town's boundaries, 100-year flood zone, and any development that has occurred over the past six years were identified and discussed. A packet of information was provided for each attendee that included: the agenda, a sign in sheet, and a copy of the new format for the Multi-Hazard Mitigation Plan for Durham.

The team went through the updated Hazard Mitigation Plan for suggestions, edits, and formatting. The team also filled in missing data on the Statistics of Interest table. The team identified a list of past disasters since 2000. The team also went over Chapter 3: Hazard Identification and identified new hazards. The team collaboratively ranked the hazards using past data reoccurrence. The team also updated new potential hazards in the Multi-Hazard Threat Analysis to include hazardous spills, extended power failure, and public health threats. In the new plan it was agreed that Chapter 3 would include the three new hazards addressed at the meeting.

The homework for the next meeting was to gather historic data and Town history. The team is also going to collect information regarding what mitigation strategies were completed since the original update.

The next meeting was set for October 5th at 1PM.

Meeting 2, October 5, 2010

Present at this meeting: Todd Selig (Town Administrator), April Talon (Assistant Town Engineer), Tom Madden (Library Director), Gail Jablonski (Business Manager), Thomas Johnson (Health Officer – Code Enforcement & Zoning Administration), Jim Campbell (Director of Planning and Community Development), Corey Landry (Fire Chief), Rene Kelley (Deputy Police Chief), Luke Vincent (IT Manager), Lorie Pitt (Town Clerk – Tax Collector), Michelle Auen and Kyle Pimental (Strafford Regional Planning Commission).

The team updated current and future development trends. The team identified critical facilities in the area and also identified essential emergency response facilities. The team also identified critical facilities that were considered vulnerable structures. The Town Clerk would figure out a number value for those structures, if available.

All hazards were reviewed and it was agreed that the ranking were discussed and adjusted accordingly. Edits were made to the frequency to the severe flooding events and ice storms.

It was agreed that through the process of updating the plan the goals or mitigation strategies would be conveyed. The group spent a lot of time updating Chapter 7: Mitigation Goals, Chapter 8: Mitigation Measures, and Chapter 9: Mitigation Action Implementation.

The homework for the next meeting was to brainstorm specific mitigation strategies and pick out projects in the Town's Capital Improvements Program to include in the Plan.

The next meeting was set for October 19th at 1PM.

Meeting 3, October 19, 2010

Present at this meeting: Gail Jablonski (Business Manager), Thomas Johnson (Health Officer – Code Enforcement & Zoning Administration), Corey Landry (Fire Chief), Luke Vincent (IT Manager), David Kurtz (Police Chief), Michael Lynch (Director of Public Works), Michelle Auen and Kyle Pimental (Strafford Regional Planning Commission).

The team identified major Mitigation Strategies for the updated plan. The group agreed to continue to prioritize transportation infrastructure and address problems. Missing edits were made to existing tables and the summary for recommended improvements was finalized.

The group worked on the STAPLEE method and assigned numbers to each new mitigation strategy. The strategies were ranked and suggestions were made to look to other plans for other possible actions to include. Actions were prioritized and were given an implementation time guideline.

Kyle agreed to come up with a draft document for their review before submitting the Plan to FEMA for initial approval.



Wiswall Bridge, May 2006 Flood

Meeting Agendas

Meeting 1 – September 7, 2010

1. Call to order. Introductions.
2. Go through updated Hazard Mitigation Plan. Formatting. Edits. Suggestions.
3. Look for information on Durham's History and Past Development Trends. Update Map.
4. Fill in missing blanks on Statistics of Interest Table.
5. Go over Chapter 3 and Identify/Hazard Identification
 - a. Fill out Multi-Hazard Threat Analysis/Re-rank Existing Hazards
 - b. Update Hazards. Man-made (hazardous material spill, acts of terrorism). Other Hazards (epidemic/pandemic, extended power failure).
6. Mark up Base-Map
 - a. Past Events/Past & Potential Events
7. Questions?
8. Adjournment

Meeting 2 – October 5, 2010

1. Call to order. Introductions.
2. Go over Past Hazard Events. Fill in table.
3. Go over Critical Facilities Table. Discuss what would like to be shown on the map.
4. Identify other critical facilities in town.
5. Look though Chapter 5, 6, and 7. Discuss what needs to be updated?
6. Brainstorm for new mitigation strategies
7. Questions?
8. Adjournment

Meeting 3 – October 19, 2010

1. Introductions.
2. Discuss mitigation strategies.
3. Finalize risk assessment and potential losses.
4. Fill out mitigation strategy table.
 - a) Rank strategies with STAPLEE method
5. Fill out summary of recommended improvements table.
6. Categorize each strategy by feasibility.
7. Discuss implementation schedule
8. Questions?
9. Adjournment.

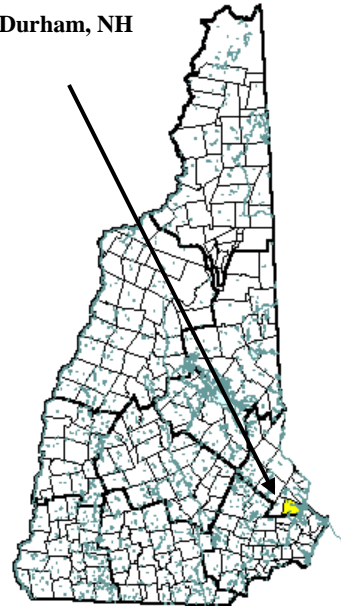
Chapter II: Community Profile

A. Introduction

The Town of Durham is located in southeastern NH within Strafford County. The towns bordering Durham are: Dover to the northeast, Madbury and Lee to the northwest, Newmarket to the south, and Newington to the southeast. Durham contains 22.4 square miles of land area and 2.4 square miles of inland water area.

Durham has only experienced minor natural hazards in the past; however, there is always the potential for natural hazards to occur, especially snow and ice storms and flooding due to the geographic area of Durham.

The Town of Durham, NH



Incorporated: 1732

Origin: Durham started as a parish of Dover called Oyster River Plantation, first settled in 1669. Durham was incorporated in 1732, probably to honor the first Puritan bishop, Richard Barnes, Bishop of Durham. Durham included what is now Lee until 1766, when that town was incorporated. Benjamin Thompson, descendent of an early settler, bequeathed the family estate, the Warner Farm, to be used for establishment of an agricultural college. The state agricultural school, originally set up in Hanover in 1866, was moved to Durham in 1890, becoming the University of New Hampshire in 1923.

Villages and Place Names: Oyster River

Population, Year of the First Census Taken: 1,247 residents in 1790

Population Trends: Population change for Durham, including resident students, totaled 7,914 over 50 years, from 4,770 in 1950 to 12,684 in 2000. The largest decennial percent change was a 61 percent increase between 1960 and 1970. The 2009 Census estimate for Durham was 14,435 residents, which ranked 19th among New Hampshire's incorporated cities and towns.

Population Density and Land Area, 2008 (*NH Office of Energy & Planning*): 646.5 persons per square mile of land area. Durham contains 22.4 square miles of land area and 2.4 square miles of inland water area.

Source: Economic & Labor Market Bureau, NH Employment Security, 2010.
<http://straftford.org/cmsAdmin/uploads/durham.pdf>

B. Durham's History & Past Development Trends

[Source: Durham's Master Plan, 2000. Chapter 10 – University Relations. Historical context.]

A portion of the geographic area now known as Durham was settled by the English in the second quarter of the 17th century and was known as the Oyster River Plantation. The area became a separate governmental entity when it received a charter in 1732 as the township of Durham. Prior to the college establishing a campus in Durham in 1893, the Town was a successful and flourishing community. Durham had a few mills and was somewhat of a transportation hub in that it was the first community on the turnpike from Portsmouth to Concord. However, due to destruction of the turnpike bridge over Little Bay in 1855 and the establishment of the railroad network throughout the U.S., Durham lost its transportation edge and the economy of the Town began to decline, as did its population. After 1855, Durham became primarily an agricultural village.

In 1893, the New Hampshire College of Agriculture and Mechanic Arts (now the University of New Hampshire), with 64 students and 11 faculty, moved from Hanover and established itself on Benjamin Thompson's Old Warner Farm in Durham. At this point the pendulum of change started for Durham. The main industry in Town became the College and the Town immediately started to change.

In 1893, Dean Pettee recognized that if the College were to grow, an adequate supply of drinking water would be needed. By 1895, Durham had three separate water systems: an artesian well at Red Tower on Church Hill that served that area of Durham residences, a series of wells on the College campus, and the Witcher Water Works which was primarily fed by the construction of what is now known as the "Old Reservoir" located in the northwest quadrant of the University campus.

In addition to an immediate need for water, the relatively large influx of population arriving in Durham in 1893 created a demand for housing. In response, the Town approved a development of housing designed for faculty on what is now Strafford Avenue. Student housing was not provided on campus and the demand was fulfilled primarily through Durham residents renting rooms to students.

In the years to follow, the University provided housing for new employees by purchasing land now known as Faculty Neighborhood. In the late 1970's and early 1980's, housing for students became more of a major impact on community and University relations. Although the University requested the legislature to approve bonding authority to build additional dorms to be paid for by student room fees, these requests repeatedly failed. As a direct result, more and more private homes were converted and/or sold to become student housing, others soon followed in a domino affect. This lead to dramatic changes in several of Durham's neighborhoods, such as Church Hill. In the 1980's, the University responded by adopting a resolution to house 60% of its students on campus, but funding for additional dorms continues to be a problem to this day.

C. Current & Future Development Trends

Durham comprises 15,851 total acres (24.8 square miles), including 14,232 acres of land (22.4 square miles) and 1,565 acres of water (2.44 square miles) (NH GRANIT System; NH OEP and Complex Systems Research Ctr., UNH). Durham is moderately developed. Most of the developed land falls into two categories: residential and UNH campus. UNH has been a nucleus for development for many decades, giving Durham the usual "college town" feel. The residential uses are predominantly single-family detached homes found throughout Durham, with some concentrations near UNH. The UNH campus development is mostly large, institutional masonry buildings (dormitories, academic halls, etc.), recreational and service buildings, and transportation infrastructure that support the UNH community. Some (but not many) residents of Durham are UNH employees, and many students live in surrounding communities as well as in Durham. Consequently, UNH is a major commuting destination, although UNH does run a local bus system.

A significant portion of the working population does not work for UNH, though, so commuting out of town to work is also clearly a necessity given the relatively small number of commercial/industrial land uses in Durham. Durham does have a typical university-oriented "downtown" that maintains a comfortable rural scale, but this mostly commercial retail concentration does not constitute a spatially consolidated town center. The Town Hall, Police Station, Library, and primary and secondary schools are relatively dispersed. There is municipal water and sewer service in the greater UNH-downtown area.

At this time future development is envisioned to be both residential and commercial/industrial and situated around eight different areas (1) the Spruce Woods retirement/assisted living complex in west-central Durham between the Lamprey River and Mill Road, (2) the Technology Drive commercial/industrial area in northern Durham between Beech Hill Road and the Route 4 By-Pass, (3) student housing and professor office development off Mast Road/Route 155A, (4) an undeveloped 12.8 ac lot (Map 10 Lot 7-0) on the northeast corner of the intersection of Bagdad and Canney Roads in northeast Durham, (5) the Stone Quarry Road area in the northeast corner of the Route 108-Route 4 interchange, (6) the planned Durham Business Park off of Route 4 on Walter Grant Circle and adjacent to the Durham Waste Treatment Facility, (7) infill, mixed-use, and commercial development in the commercial core area of Durham (downtown and surrounding areas), (8) the Capstone development located on Technology Drive, and (9) the Peter T. Paul College of Business and Economics building. According to the Durham Planning Department, the view is that development other than that listed above will be a relatively low amount of scattered, single-family units.

The Town has recently instituted revised zoning and subdivision regulations that have substantial requirement for open space subdivision and restrictions on new road cuts. Additionally, the Town is poised to ramp up land conservation efforts, especially in the southwest and southeast (Durham Point) quadrants of Town.

Hazard exposure of future development areas is low. The Spruce Woods development is situated in the middle of one of the ice storm damage areas that could have elevated wildfire risk, but the way the complex is being developed and landscaped, the fire risk would seem to be minimal. Both Spruce Woods and the Technology Drive areas have floodplain exposure, but development would likely avoid these areas. Finally, the future Durham Business Park off Route 4 and along the Oyster River estuary, has a significant amount of area within the coastal floodplain and coastal storm surge zones. Development of the Park should consider these hazard risks in the site design process.



Wiswall Dam, May 2006 Flood

Table 2.1 Statistics of Interest to Multi-Hazard Mitigation Planning

Table 2.1: Statistics of Interest to Multi-Hazard Planning					
Town of Durham		Phone 603-868-5571			
Todd Selig, Town Administrator		Fax 603-859-6644			
15 Newmarket Road		Email administrator@ci.durham.nh.us			
Durham, NH 03824		Website http://www.ci.durham.nh.us/			
Population	2008	2000	1990	1980	1970
Town of New Durham	13,667	12,684	11,816	10,652	8,869
Strafford County	121,914	112,676	104,348	85,324	70,431
Elderly Population (% over 65)	6.11%				
Median Age	21.2				
Regional Coordination					
County	Strafford				
Regional Planning Commission	Strafford Regional Planning Commission				
Watershed Planning Region(s)	Salmon Falls-Piscataqua Rivers				
Tourism Region	Seacoast				
Municipal Services & Government					
Town Manager or Administrator	Yes				
Select Board	Yes; Elected				
Planning Board	Yes; Elected				
Library Trustees	Yes; Elected				
Zoning Board	Yes; Appointed				
Health Officer	Yes; Appointed				
Master Plan	Yes; 2000				
Emergency Operation Plan (EOP)	Yes				
Zoning & Land Use Ordinances	Yes; 2010				
Subdivision Regulations	Yes; July 14, 2010				
Capital Improvements Plan	Yes; 2009 [updating]				
Building Permits Required	Yes				
Flood Ordinance	Yes				
Percent of Local Assessed Valuation by Property Type, 2008					
Residential Buildings	79.0%				
Commercial Land & Buildings	19.7%				
Other (including utilities)	1.3%				

Table 2.1: Statistics of Interest to Multi-Hazard Planning	
Emergency Services	
Emergency Warning System(s)	UNH = Yes, Durham does not
Police Department	Yes
Fire Department	Yes
Fire Stations	Yes; 1
Town Fire Insurance Rating	4/10
Emergency Medical Services	Municipal
Established EMD	Yes
Nearest Hospital	Wentworth Douglas (6 miles, 134 staffed beds)
Utilities	
Public Works Director	Yes
Water Works Director	Yes
Water Supplier	UNH/Durham Water System
Electric Supplier	PSNH; NH Electric Coop
Natural Gas Supplier	Unitil Northern
Cellular Telephone Access	Yes
High Speed Internet	Yes
Telephone Company	Fairpoint
Public Access Television Station	Yes
Pipeline(s)	Methane/Natural Gas
Transportation	
Evacuation Routes	No official routes
Nearest Interstate	I-95, Exit 5 (8 miles)
Railroad	Boston & Maine
Public Transportation	Yes
Nearest Airport	Pease International
Nearest Commercial Airport	Manchester-Boston Regional (40 miles)
Housing Statistics, 2008	
Total Housing Units	3,306
Single-Family Units	1,847
Residential Permits (Net change)	2
Multi-Family Units	1,455
Residential Permits (Net change)	55
Manufactured Housing Units	4

Table 2.1: Statistics of Interest to Multi-Hazard Planning	
Income (1999)	
Per capita Income	\$17,210
Median Household Income	\$51,697
Median Earnings Male	\$54,519
Median Earnings Female	\$31,548
Families below the poverty level	2.8%
Other	
Web site	http://www.ci.durham.nh.us/
Local Newspapers	The New Hampshire; Fosters
911 GIS data available	Yes
Assessed structure value 2009	599,868,311
National Flood Insurance Program	Yes; 10-01-75
Repetitive Losses	0
<i>Information found in Table 2.1 was derived from local input or the Economic & Labor Market Information Bureau, NH Employment Security, 2009.</i>	



Wiswall Bridge suffered a collapse of the center pier during the May 2006 Flood Event.

Chapter III: Hazard Identification

A. Hazard Rankings

The Durham Hazard Mitigation Committee considered what data was at hand and used its collective experience to formulate statements of recurrence potential. Each hazard type is assigned a general ranking of high (H), medium (M), or low (L) recurrence potential.

The first step in hazard mitigation is to identify hazards; the Team determined that the:

- 7 hazards ranked as having [high recurrence](#) in Durham are: Flooding, Nor'easter, Severe Thunderstorms, Ice and Snow Events, Radon, Hazardous Material Threats, and Extended Power Failure.
- 3 hazards ranked as having [medium recurrence](#) in Durham are: Hurricanes and Tropical Storms, Wildfire, Drought.
- 4 hazards ranked as having [low recurrence](#) in Durham are: Tornadoes, Earthquake/Landslide, Extreme Heat, and Public Health Threats.

B. Description of Hazards

This section describes the location and extent of hazards that could impact the Town of Durham, presents past hazard events in Durham or elsewhere in New Hampshire that have had effects in Durham, and discusses their recurrence potential. The Hazard Mitigation Committee investigated past and potential hazards using a variety of sources and techniques, including but not necessarily limited to interviewing Town historians and other citizens; researching historical records archived at the Town Library; scanning old newspapers; reading published Town histories; consulting various hazard experts; and extracting data from the NH Hazard Mitigation Plan and other state and federal databases. Where spatial data were available, past and potential hazards were mapped. Note that these potential hazard areas are ones that are site specific. Other hazards are town-wide in impact are so not depicted.

Flooding (H)

Second only to winter storms, riverine flooding is the most common natural disaster to impact New Hampshire. Floods are a common and costly hazard. They are most likely to occur in the spring due to the increase in rainfall and the melting of snow; however, floods can occur at any time of the year because of heavy rains, hurricane, or a nor'easter.

Based on extent of the floodplain, Durham has significant flooding potential along the Lamprey River and its tributaries in the southeast of town and along the Oyster River and its tributaries in the northwest of town above the Mill Pond Dam. Chronic road flooding occurs in one location along State Rte. 108 in south central Durham where the road runs closely by the Lamprey River. A significant amount of coastal floodplain also occurs in Durham along its Great Bay/Oyster River Estuary shoreline. Overall, Durham has approximately 9.9% (1,413.5 ac) of its land area in 100-yr. floodplain. Although flooding of the full extent of this floodplain by definition would require a 100-yr. storm, smaller

storms with a higher annual probability of occurrence could still flood significant portions of that floodplain. Some of the structures that would be impacted by a 100-yr. storm could also be affected by smaller, more frequent flooding.

In general, although 100-yr. floodplain is reasonably extensive, Durham has seen relatively little development in floodplain areas. One exception is in the case of the coastal floodplain. Many high-value private residences have been built in this shoreline area and could be susceptible to coastal flooding. The Durham shore is also susceptible to storm surge from hurricanes, which technically have roughly the same probability of occurrence as the 100-yr. storm (see below).

Causes of flooding other than a 100-yr. rainstorm—severe tropical storm (hurricane or tropical storm), rapid snow pack melt, river ice jams, erosion and mudslide, and dam breach or failure—all have some potential to affect Durham. Durham has between a 5% and a 12% probability of being impacted by a named tropical storm sometime in any June to November storm season (AOML 2005). These storms often bring torrential rainfall. Some hurricanes have been known to deliver rainfall well in excess of that from a 500-yr. storm. The 100-yr. floodplain data available for this analysis (FEMA D-FIRM) does not well account for the effects of such special weather events. Rapid snow melt in spring is always a significant potential flooding source, given the northern, relatively cold location and climate of Durham, and has occurred multiple times in the past. Ice jam events, though the possibility of their occurrence definitely exists, seem not to have been a problem in the past. The Army Corps of Engineers Ice Jam Database contains no record of ice jams in Durham, and the Committee did not encounter any record or reference to ice jamming in the Town. Erosion and mudslide in steep slope areas resulting from heavy rainfall theoretically could alter topology enough to cause flooding; however, steep slopes are not prevalent in the Town.

Finally, the potential for catastrophic flooding from dam breach or failure exists in Durham. The Oyster Reservoir Dam (# 071.07), the Mill Pond Dam (# 071.03), the Wiswall Dam (#071.04), the Durham Reservoir Dam (# 071.01), and the Beard's Creek Dam (# 071.08) are all Class B, Significant Hazard Dams. The dam inundation areas for the Oyster Reservoir and Mill Pond Dams have been delineated and digitized (breach during 100-yr. storm). In both cases, the inundation area is not extensive. Inundation information for the other three dams were not available. On visual inspection of digital orthophotography, several high-value structures on the University of New Hampshire (UNH) campus, for example the Whittemore Center and the Alumni Center, could be substantially impacted by a breach of the Durham Reservoir Dam, but nothing specific can be said for sure without inundation data. All five dams, however, have never breached, have been continually inspected, and are in excellent condition. The probability of this particular flooding hazard occurring is quite small. UNH representatives on the Hazard Mitigation Committee have, in fact, expressed an interest in evaluations of both the Durham Reservoir and Oyster Reservoirs Dams toward possible downgrading of their Class B hazard rating.

Overall, flooding potential in Durham is high. Flood conditions will continue to affect the Town of Durham. Both seasonal flooding and flooding due to extreme weather events have the potential to occur during all seasons.

Nor'easter (H)

Unlike the relatively infrequent hurricane, New Hampshire generally experiences at least 1 or 2 of these regional storms events each year with varying degrees of severity (NHOEM 2000). These storms have the potential to inflict more damage than many hurricanes, because the high storm surge and high winds can last from 12 hours to 3 days, while the duration of hurricanes ranges from 6 to 12 hours. Infrastructure, including critical facilities, may be impacted by these events, and power outages and transportation disruptions (i.e., snow and/or debris impacted roads, as well as hazards to navigation and aviation) are often associated with nor'easters.

In the winter months, the State may experience the additional coincidence of blizzard conditions with many of these events. The added impact of the masses of snow and/or ice upon infrastructure often affects transportation and the delivery of goods and services for extended periods. Negative impacts upon the economy may also result.

The probability of Durham experiencing at least one nor'easter in any given year is very high. Nor'easters surely do not occur every year but in most years. The Durham Hazard Mitigation Committee could not locate any comprehensive databases that classify nor'easters as such. Data about many storms from multiple databases would have to be combined and reclassified to identify nor'easters specifically, and the time—and in some cases the expertise—was not available to calculate a specific average probability.

Severe Thunderstorms (H)

Thunderstorm related hazards that could impact the Town of Durham include high winds and downburst, lightning, hail, and, torrential rainfall. Thunderstorms are common in New Hampshire but can be considered generally less severe than in other areas of the country, such as the Great Plains states. Severe thunderstorms do occur in New Hampshire, though. Thunderstorm data availability is scant and not at all comprehensive. The NCDC Storm Events database (NCDC 2005) lists 34 reports of severe thunderstorm winds in Strafford County from 1971 to 2004, more than 20 impacting county-wide (or regionally or state-wide) and one specifically impacting Durham, felling large trees that brought down power lines and closed roads between Durham and Lee. The latter had wind speeds of 50 knots (57 mph). One weather front in July 1996 produced thunderstorms experienced statewide, with winds up to 134 mph. Mt. Washington, during the height of the storms, had a 3-hr. average wind speed of 120 mph and a gust to 154 mph. Some snowfall was even reported at the summit.

Besides the regular, storm-wide high winds in thunderstorms, individual downburst wind events can also issue from any thunderstorm. Organized databases of downburst information are not available, but the NH state mitigation plan (NHOEM 2000) highlights three different downbursts recorded in New Hampshire (none in Strafford Co.), one of them a microburst in Rockingham Co. that resulted in \$ 2.5 million in damage, 11 injuries, and 5 deaths. Extreme damage is often done to structures and to electrical utility infrastructure. Aviation also has a history of severe impact from downburst.

Lightning can cause significant, sometimes severe, damage. Lightning strikes can cause direct damage to structures and serious injury or death to people and animals. Extensive

damage also commonly results from secondary effects of lightning, such as electrical power surges, wildfire, and shockwave. Where lightning databases exist, most are proprietary or otherwise unavailable for use by the Hazard Mitigation Committee. The NH state plan (NHOEM 2000) does present a list of facts about lightning, one of which is that New Hampshire has the 16th highest lightning casualty rate among the states; Maine is 8th.

Finally, hail is a fairly common part of thunderstorms in New Hampshire, but damaging hail is apparently not. The damage that can result is mostly to cars and windows. Other thunderstorm hazards are more threatening here. The NCDC Storm Events database lists 11 significant hailstorms over a 41-yr period, indicating a 27% average annual probability of occurrence. The data in those entries indicate hailstone size only up to 1 inch and accumulations of only a few inches or less. Hailstorm occurrence is probably considerably more common than would be indicated from these 11 records, but damage is probably not.

The annual recurrence probability of thunderstorms in general is effectively 100% with damaging ones occurring less often. Durham will continue to experience thunderstorms and should expect to sustain significant damage periodically. Overall the recurrence probability for thunderstorms is high.

Ice & Snow Events (H)

Winter snow and ice events are common in New Hampshire. The NCDC Storm Events database (NCDC 2005) lists, among large winter weather events from 1993 to 2005, 41 Heavy Snow events, 2 Ice Storms, and 8 Winter Storms (nor'easters). On average, then, the expectation is for three to four large events per winter season. Heavy snows typically bring significant snow removal costs and costly delays in transportation schedules. Heavy, wet snows can also result in significant damage from high snow loads. The most severe damage, though, often comes from ice storms and winter nor'easters. The NCDC data indicate average annual recurrence probabilities of 18% and 73% respectively. Two events of those listed in the NCDC database are of particular note for their severity. The ice storm of January 7-9, 1998 had near statewide impact and resulted in a FEMA emergency declaration (#1199) for all but Rockingham Co. The nor'easter of December 7, 1996 was especially damaging to power systems and is described in the NCDC database as "the most extensive and costliest weather related power outage in the state's history," at least until 1996 when that database entry was made. The 1998 ice storm probably surpassed this storm in power systems impact. This storm is thought to have been of the same magnitude as the one that occurred in the region in 1929, indicating a return period of approximately 70 years (CRREL 1998). Durham will continue regularly to receive impacts from severe, regional winter weather events. Due to its heavily forested nature, the Town is most highly exposed in terms of damage to forest resources and the secondary impacts of those damages.

Radon (H)

Radon exposure is a significant hazard in New Hampshire. According to a NH Bureau of Environmental & Occupational Health (BEOH) study looking at >15,000 indoor radon test results in single-family dwellings, households in northern, eastern, and southeastern regions of New Hampshire especially tend to have nominally high concentrations of

radon in air or water (BEOH 2004); however, values in excess of the US Environmental Protection Agency's 4.0 picocurie per liter (pCi/L) action guideline have been found in nearly every community in New Hampshire. Values exceeding 100 pCi/L have been recorded in at least eight of New Hampshire's ten counties. The highest indoor radon reading in New Hampshire known to NHDES is greater than 1200 pCi/L; higher values probably exist. In the BEOH study, 44.0% of tests in Strafford Co. exceeded the 4.0 pCi/L action level and 13.0% even exceeded 12.0 pCi/L. Similarly, in Durham between 40% and 50% of tests exceeded the 4.0 pCi/L action level. The probability of significant radon exposure is apparently quite high.

Hazardous Material Threats (H)

Hazardous materials in various forms can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. Many products containing hazardous chemicals are used and stored in homes routinely. These products are also shipped daily on the nation's highways, railroads, waterways, and pipelines. Chemical manufacturers are one source of hazardous materials, but there are many others, including service stations, hospitals, and hazardous materials waste sites. The Team identified Route 4 as an east/west corridor that often has trucks carrying bio-diesel fuel and other harmful chemicals through the town. A major concern is the Lee traffic circle at Route 4 west. Any spill there would directly affect the drinking water supply for Durham downstream. There is also a concern for hazardous compounds that are produced within the labs on UNH's campus.

Extended Power Failure (H)

When discussing extended power failure in this plan, it is referring to power failure that can last for a period of days or weeks. Many things can cause power failure: downed power lines (due to storm, wind, accident, etc); failure of public utilities to operate or failure of the national grid. Extended power failure can present not only lighting difficulties but also heating, water supply and emergency services. In Durham, extended power failure is particularly hazardous in remote areas and for elderly populations at Bagdad and Spruce Wood assisted living.

Hurricanes and Tropical Storms (M)

These severe tropical storms may occur anytime from early spring to late fall, and in general are less common than other storms, e.g. nor'easters. As wind events, historically hurricanes have caused damage in Durham, most notably in 1938 and 1954. Quite a few other hurricanes have impacted the Town with high winds but relatively little damage. The NOAA National Climatic Data Center's Storm Events database (NCDC 2005) indeed does not list any Hurricanes or tropical storms as directly affecting Strafford County. Other analyses show that Durham has between a 5% and a 12% probability of being impacted by a named tropical storm sometime in any June to November storm season and between a 2% and 4% probability of a hurricane specifically during the same period (AOML 2005). Because Durham is not directly on the ocean-front of the New Hampshire coast, wind speeds may be somewhat diminished from their coastal strength, and significant impact on the Town would be dependent on the exact track of these concentrated storms. FEMA has published a "wind zone" rating scheme and map that places most of New Hampshire within Zone 2 and a special Hurricane Susceptible Region (FEMA 2001a; FEMA 2001c). Zones are based on Design Wind Speed (3-second

gusts, consistent with ASCE 7-95), and Zone 2 has top winds of 160 mph. In application, this designation means that structures should be designed and built to withstand winds up to 160 mph for three seconds.

Recurrence potential of hurricane and tropical storm hazards in Durham is, therefore, moderate. Hurricanes and tropical storms will continue to affect the Town of Durham. As many as 10 significant Hurricanes have impacted Durham and the surrounding region. It is likely that the region will be impacted by a significant storm of tropical origin within the foreseeable future.

Wildfire (M)

Though developing quickly, Durham is still a fairly rural town, and a fair amount of the land cover of the Town is unfragmented woodland and grassland. Exposure to natural factors, such as lightning, that start wildfires is consequently high. Wildfires in New Hampshire historically have tended to run in 50-yr cycles (NHOEM 2000). The peak in wildfires in the late 1940's and early 1950's is thought to be related to the increased fuel load from trees downed in the 1938 hurricane. Here, 50 years later, New Hampshire officials are again concerned about the high fuel load created by the 1998 ice storm that hit New Hampshire. That ice storm did considerable damage to forestland in the Town, and local fire authorities are moderately concerned about the resulting fuel load. Anecdotally, Durham has experienced wildfires but few of much consequence. Local fire officials could accurately locate one 1990's fire but could not recall in which year exactly that it occurred. The probability of occurrence of wildfires in the future is effectively impossible for the Hazard Mitigation Committee to predict due to the dependence of wildfire on the occurrence of the causal hazards and the variability of numerous factors that affect the severity of a wildland fire. In general, though, the likelihood of wildfire seems moderate.

Drought (M)

Periods of drought have occurred historically in New Hampshire. From the 1920's through the 1960's, four drought periods occurred: 1929-36, 1939-44, 1947-50, and 1960-69 (USGS 1998). These events have a return period of 10 to more than 25 years. The longest recorded continuous spell of less than normal precipitation occurred in 1960-69 interval. In more recent years, drought has again become a problem in New Hampshire. In 1999, a drought warning was issued by the Governor's Office. In March 2002, all counties in New Hampshire with the exception of Coos County were declared in Drought Emergency. This was the first time that low-water conditions had progressed beyond the Level Two, Drought Warning stage. With extreme variation in environmental conditions due to global warming possibly on the rise, drought probability may grow in the future. Currently, drought possibility seems moderate. The large amount of water resources and relatively sparse population in New Hampshire have tended to minimize the impacts of drought events in the region, but this regional protection may be endangered in the future with increases in drought frequency or severity. The National Drought Mitigation Center website (NDMC 2004) emphasizes that reliable drought prediction for regions above 30°N latitude is effectively impossible. The Town of Durham also has a Water Conservation Plan in place to help with maintaining an adequate water supply.

Tornadoes (L)

Tornadoes are rare in New Hampshire. The NCDC Storm Events database (NCDC 2005) lists only six tornadoes that have impacted Strafford County since 1950. One was an F0 event (40-72 mph), one was an F1 event (73-112 mph), and the other four were F2 events (113-157 mph). These tornadoes also occurred one in each decade from 1953 through the 1999, with two in the 1990's. The average annual probability of recurrence, therefore, is 13% (6/47 x 100). The probability would be slightly higher if local reports of tornadoes were considered; however, this 13% probability is for all of Strafford Co., not just Durham. The actual probability for Durham should be much lower, considering the great dependence of impact upon the actual track of any tornado. The tornado recurrence probability for Durham, therefore, is low.

Earthquake/Landslide (L)

Earthquake is a common event in New Hampshire, but significantly damaging earthquake is uncommon. The Northeast States Emergency Consortium (NESEC) website presents a history of earthquake in the Northeast (NESEC 2004) and documents that New Hampshire is an area of high earthquake probability. Two hundred seventy (270) earthquakes occurred in New Hampshire from 1728 to 1989. Only four of significant magnitude (Richter Magnitude 4.2 or more), however has occurred. Three of these quakes' epicenters were in the Lakes Region, and the fourth was on the NH-Quebec border. These data would suggest, then, that earthquakes are on average an annual occurrence but that significant quakes have an annual probability of occurrence (based on the 1728-1989 period) of about 2%. USGS earthquake data (NSHMP 2004) puts all of Strafford Co. in an area with a 10% probability of exceeding in 50 years a peak ground acceleration (pga) of 5-6 %g. Furthermore, with similar probability the Lakes Region is in a 6-7 %g area. FEMA mitigation planning guidelines (FEMA 2001a) indicate that any community with a pga (%g) of 3% or greater (10%-50yr exceedance probability) should consider earthquake a potentially significant hazard and should profile this hazard.

Extreme Heat (L)

For this hazard, data specifically for Durham—or even the State of New Hampshire, for that matter—is not available, at least in a form that is readily usable by other than climatologic experts. Heat waves certainly have occurred regularly in the past, but the Hazard Mitigation Committee did not perform the very time-consuming task of compiling heat wave data from the typically daily temperature records to which one can normally gain access. Most compiled records seem to be proprietary with fee-based access. No records of deaths due to extreme heat were found for Durham during the preparation of this plan. Anecdotally, the recurrence probability for extreme heat seems to be low. The region seems to experience none to several official heat waves each year, but these events are apparently mostly of minimal duration. The proximity of the region to the North Atlantic probably provides a significant moderating effect to such events. Given more time and expertise during plan updates in the future, the Hazard Mitigation Committee will attempt to address this hazard more carefully. The New Hampshire State Mitigation Plan (NHOEM 2000) indicates that the data and analysis for this hazard is being sought at the state level, as well.

Public Health Threats (L)

The CDC's official definition of an epidemic is: "The occurrence of more cases of disease than expected in a given area or among a specific group of people over a particular period of time."³ Durham is home to New Hampshire's state university and has a large number of students who travel from all over the country (all over the world) to receive an education. Because of the influx of student residents from other states, there is a threat of enabling infection and viruses to be transmitted from outside the town borders. In case of such an emergency, the Whittemore Center acts as a quarantine shelter for students and residents.



Oyster River Dam by Mill Pond, May 2006 Flood Event

³ Slate; <http://www.slate.com/id/2092969/>

C. Durham Flood Insurance Program (NFIP) Status

Durham has been a member of the National Flood Insurance Program (NFIP) since October 1, 1975. The Town does have significant portions of land in the 100-year floodplain; along Bunker Creek, Johnson Creek, Beards Creek, Littlehole Creek, Crommet Creek, Woodman Brook, La Roche Brook, Folletts Brook, and parts of the Oyster River along the Durham and Lee border. Also, as reported in FEMA’s Biennial Flood Report (last submitted on 05/28/2009), Durham is listed as only having 70 structures in the floodplain and has had no repetitive loss claims⁴.

As noted in the Town of Durham Flood Hazard Overlay District, dated September 2010, Article 15, the “Flood Hazard Overlay District...shall apply to all lands designated as special flood hazard areas by the Federal Emergency Management Agency (FEMA) in its Flood Insurance Study for Strafford County, New Hampshire, dated May 17, 2005...” In general, the Flood Hazard Overlay District states that “all proposed development in special flood hazard areas shall require a permit (includes water and sewer systems)” and outlines the necessary building requirements and standards for “new construction or substantial improvements to determine whether proposed building sites will be reasonably safe from flooding.”

The Town has worked with elected officials and FEMA to correct existing compliance issues. Durham has continued communication with FEMA to discuss NFIP compliance issues and continues to monitor designated flood areas throughout the town. The Town continues to evaluate their flood hazard overlay district and will look to improve floodplain management in the community. Durham also was home to a pilot project that assessed the Oyster River watershed to identify road culverts that are subject to failure during extreme storm events.

D. Probability of Future Potential Disasters

Geographically, because Durham is located in New Hampshire, it will always be highly susceptible to severe snow and ice storms. Further, because of the considerable surface water area and number of streams and in Durham and the Town's coastal exposure, one can see that Durham is also quite susceptible to flooding and should take appropriate precautions. Lastly, hurricanes, tornadoes, and forest fires are less common in Durham, however could recur in the future.

Table 3.1 provides more information on past and potential hazards in Durham.

⁴ FEMA Biennial Flood Report; from September 2010 email, Jennifer Gilbert, NH Office of Energy & Planning

Table 3.1: Historic Hazard Identification

Blue = Past Events

Red = Recent & Potential Hazards

Hazard	Date	Location	Remarks	Source
<p>Past or Potential Flooding Hazards: Riverine flooding is the most common disaster event in the State of New Hampshire (aside from frequent inconveniences from rather predictable moderate winter storms). Significant riverine flooding impacts upon some areas in the State in less than ten year intervals. The entire State of New Hampshire has a high flood risk.</p>				
Flooding	March 1936	State-wide	Worst flooding in NH history. In Durham roads were repaired due to flood damage (10 workers).	“Raging Rivers and the WPA” by William P. Fahey. New Hampshire Administrator. October 1936.
Flooding	Recurrent	Route 108 where Lamprey River runs along road	Regularly floods during large rainfall events; state road, so is NHDOT's responsibility to fix it	Durham Hazard Mitigation Committee
Flooding	May 12-15, 2006	Belknap, Carroll, Hillsborough, Merrimack, Rockingham, and Strafford Counties.	Roads were flooded and damaged which resulted in many closures. The two roads that most affected daily travel of residents were Bennett Road and Longmarsh Road; these residents were either stranded or utilized detours. There were 120 residents stranded in the Bennett Rd Cold Spring Road area, this included of 52 grade school children who may or may not have access to school on these days. Both Bennett and Longmarsh Road stayed closed to travel longer than all other roads affected in Durham.	FEMA Disaster Declaration #1643 (Individual Assistance) & Local Knowledge
Flooding	April 16-27, 2007	Grafton, Hillsborough, Merrimack, Rockingham, and Strafford Counties.	During this event, which lasted approximately 6 days, many roads in Durham were closed or damaged by flooding. The roads that most affected residents and travel were Bennett Road and Longmarsh Road. These closures affect travel times for residents and due to various detours may increase the number of people traveling on these roads to around 17,000. We are assuming using previous (2006) data that approximately 120 residents were stranded in the Bennett Road in the Cold Springs area	FEMA Disaster Declaration #1695 (Individual and Public Assistance) & Local Knowledge
Flooding	March 14-16, 2010	Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan Counties.	Flooding started on March 14, 2010 and continued for a number of days. The Hamel Brook rose substantially resulting in the flooding and closure of Route 108, parts of Bennett Road and Longmarsh Road. This 100-year storm was not declared.	FEMA Disaster Declaration #1892 (Public Assistance) & Local Knowledge

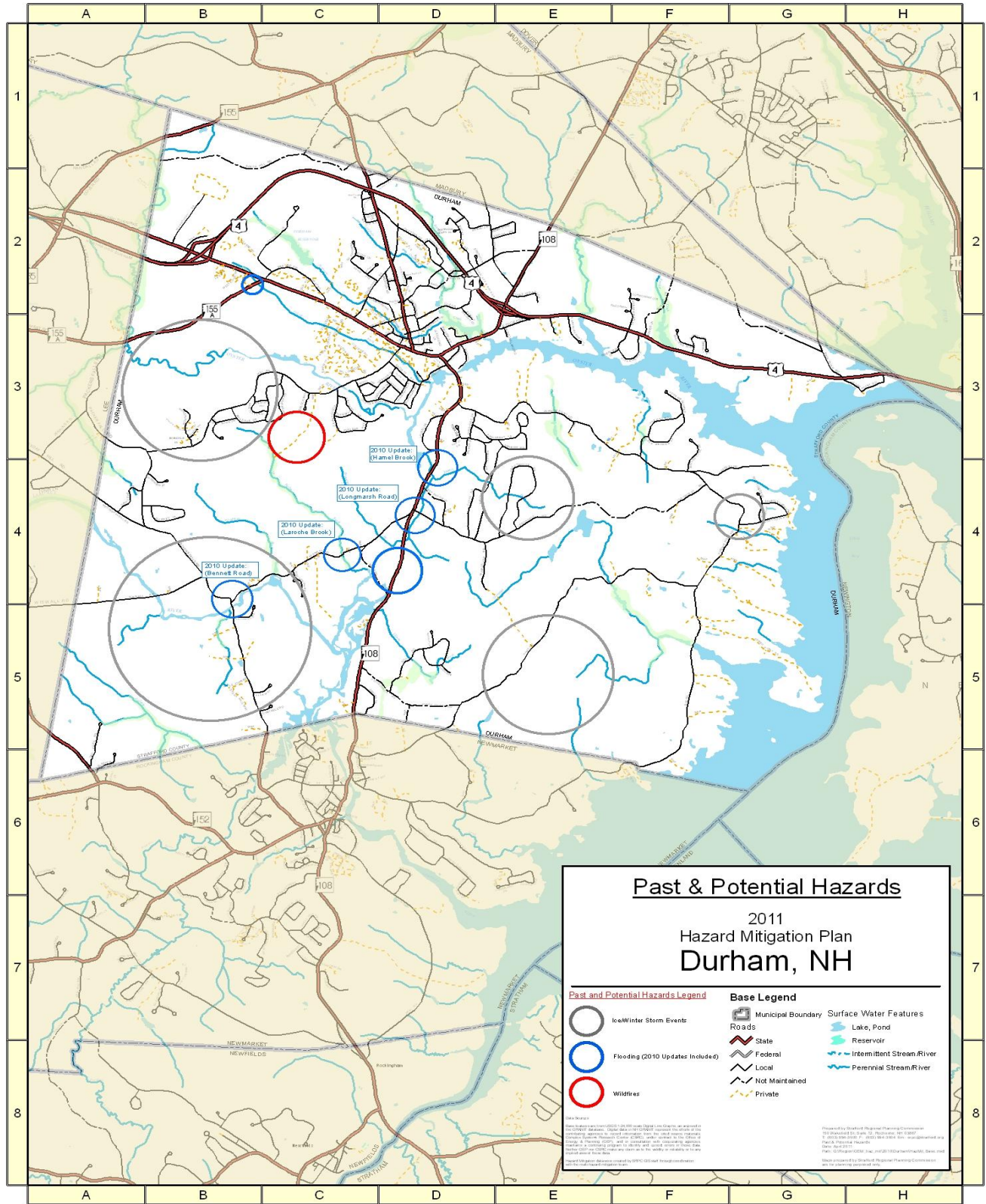
Multi-Hazard Mitigation Plan 2012

Hazard	Date	Location	Remarks	Source
Past or Potential Wildfire Hazards: New Hampshire is heavily forested and is therefore vulnerable to wildfire, particularly during periods of drought. The proximity of many populated areas to the state's forested lands exposes these areas their populations to the potential impact of Wildfire.				
Forest Fire	1990's	Open land along south edge of Woodridge development, west-central Durham	No structural losses, only forest damage	Durham Hazard Mitigation Committee
Past or Potential Tornado, Downburst (Wind Shear) & Hurricane Hazards: Tornadoes are spawned by thunderstorms and, occasionally by hurricanes, and may occur singularly or in multiples. A downburst is a severe localized wind blasting down from a thunderstorm. Downburst activity is very prevalent throughout the State, yet most go unrecognized unless significant damage occurs. Hurricanes develop from tropical depressions, which form off the coast of Africa. New Hampshire's exposure to direct and indirect impacts from hurricanes is real, but modest, as compared to other states in New England.				
Hurricane	September 1938	Town-Wide	Winds blow down trees closing roads, loss of electricity.	Durham Hazard Mitigation Committee
Hurricane Carol	November 1954	Town-Wide	Winds blow down trees closing roads.	Durham Hazard Mitigation Committee
Thunder Storm/Wind	June 2001	Western Durham	Brought down power lines and felled large trees, closing roads between Durham and Lee	National Climatic Data Center website (NCDC 2005)
Wind Storm	February 2010	Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan Counties.	Power outages in some areas. Property damage. Schools were closed for a few days.	FEMA Disaster Declaration #1892 (Public Assistance) & Local Knowledge
Past and Potential Severe Winter Weather Hazards: Severe weather in New Hampshire may include heavy snowstorms, blizzards, Nor'easters, and ice storms. Generally speaking, New Hampshire will experience at least one of these hazards during any winter season. Most New Hampshire communities are well prepared for such hazards.				
Snowstorm	March 1993	New England	Snow removal.	FEMA Emergency Declaration # 3101,
Ice Storm	January 1998	NH – Statewide; Durham – various locations	Major tree damage, electric power interrupted for many days. Schools were closed. Extensive damage to trees.	Committee and FEMA Disaster Declaration # 1199
Snowstorm	March 2001	Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, and Strafford Counties, NH.	Incident Period: March 5 th – 7 th . Public Assistance. (Assistance to State and local governments and certain private nonprofit organizations for emergency work and the repair or replacement of disaster-damaged facilities).	FEMA Emergency Declaration #3166.

Multi-Hazard Mitigation Plan 2012

Hazard	Date	Location	Remarks	Source
Winter Storm	February 2003	Cheshire, Hillsborough, Merrimack, Rockingham, and Strafford Counties, NH.	Incident Period: February 17 th – 18 th . Public Assistance. (Assistance to State and local governments and certain private nonprofit organizations for emergency work and the repair or replacement of disaster-damaged facilities).	FEMA Emergency Declaration # 3177.
Snowstorm	January 2005	Belknap, Carroll, Cheshire, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan Counties, NH.	Incident Period: January 22 nd – 23 rd . Public Assistance. (Assistance to State and local governments and certain private nonprofit organizations for emergency work and the repair or replacement of disaster-damaged facilities).	FEMA Emergency Declaration # 3207.
Snowstorm	March 2005	Belknap, Carroll, Cheshire, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan	Incident Period: January 22 nd – 23 rd . Public Assistance for 48 hours. Minor Impact.	FEMA Emergency Declaration #3207 (Public Assistance)
Ice Storm	December 11-16, 2008	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan Counties.	Durham received over 3/4 inch of ice, multiple hours of rainfall/freezing rain and snow during the December ice storm. Durham had to close fourteen roads, some multiple times, for several days due to falling tree limbs and downed utility wires, which created public safety issues during this disaster.	FEMA Disaster Declaration #1812 (Public Assistance) & Local Knowledge
Snowstorm	December 2008	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan	Incident Period: December 11 th . Public Assistance for 48 hours. Minor Impact.	FEMA Emergency Declaration #3297 (Public Assistance)
Ice Storm	December 25-28, 2010	Town-Wide	Multiple hours of freezing rain and ice.	Durham Hazard Mitigation Committee

Map 1: Historic & Potential Hazards



Chapter IV: Critical Facilities & Key Resources (CF/KR)

With team discussion and brainstorming, Critical Facilities and Key Resources (CI/KR) within Durham were identified and mapped for the multi-hazard plan. The “ID” number in the following list is also represented in the CI/KR map located in the Map Documents in the Appendix. Facilities located in adjacent towns were not mapped.

Emergency Response Facilities (ERF)		
ERF's are primary facilities and resources that may be needed during an emergency response		
ID	Facility Name	Type of Facility
	Town Hall	Town Hall
	Fire Station	Emergency Operations Center - Shelter
	Durham Police Station	Police Station
	UNH Police Station	Police Station
	Strafford County Dispatch Center	Dispatch Center
	Sprague Energy – Newington, NH	Energy Suppliers
	Highway Department	Public Works
	State Fuel Dump	Emergency Fuel
	Durham Dispatch	Dispatch (Fire Station)
	Durham Ambulance	Ambulance (Fire Station)
	Durham Rail Station	Transportation/Rail Station
Telephone and Radio/Broadcast Facilities		
	Switching Station – McDaniel & Williamson	Telephone (Fairpoint)
	Switching Station – UNH telecommunications	Telephone (UNH)
	Cell Tower – landfill	Telephone
	Backup Dispatch – Newmarket Police	Telephone
	Ham Radio Tower – Tall Pine Rd	Telephone (Private)
	WUNH Radio Station	Telephone
	Radio Tower – Foss Farm	Telephone
	Radio Tower – Strafford Ave/Edgewood	Telephone
Bridges		
	Bridge (Other# 150/065)	Durham Point Road over Crommet Creek (15 tons)
	Bridge (Other# 080/070)	Packers Falls Road over Lamprey River
	Bridge (Other# 093/080) (REDLIST)	Bennett Road over BMRR (10 tons)
	Bridge (Other# 070/072)	Wiswall Road over Lamprey River
	Bridge (State# 110/095)	NH108 over Long Marsh Brook
	Bridge (Other# 097/109)	Mill Road over Oyster River
	Bridge (Other# 092/107)	Mill Road over BMRR
	Bridge (State# 114/111)	NH108 over NH108
	Bridge (State# 145/116)	US4 over Bunker Hill
	Bridge (State# 063/115)	NH155A over Oyster River
	Bridge (Other# 107/110)	Mill Road over College Brook
	Bridge (State# 074/130)	US4 over NH155A
	Bridge (State# 065/130)	US4 over Oyster River
	Bridge (State# 114/128)	Bagdad Road over US4
	Bridge (State# 095/121)	Old Us4 over BMRR (Pedestrian)
	Bridge (State# 120/122)	US4 over NH108

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	Bridge (State# 133/120)	US4 over Johnson Creek
	Bridge (State# 097/141)	US4 over BMRR
	Bridge (State# 100/143)	Madbury Road over BMRR

Non-Emergency Response Facilities (NERF)

NERF's are facilities that although critical, not necessary for the immediate emergency response effort; hazardous material facilities also included

Power Station/ Hazardous Materials Facilities

	Facility Name	Type of Facility
	UNH Generation Plant	Power Station/Substation
	Substation (Mill Road)	Power Station/Substation
	Jackson's Landing Ice Rink	Hazardous Materials
	Durham Transfer Station	Hazardous Materials
	Whittemore Center – UNH	Hazardous Materials
	UNH Hazardous Waste Accumulation Facility	Hazardous Materials

Facilities and Populations to Protect (FPP)

FPP's are facilities that need to be protected because of their importance to the Town and to residents who may need help during a hazardous event

Schools, Churches, and Daycare Facilities

ID	Facility Name	Type of Facility
	Oyster River Middle/High School	School/Shelter
	Whittemore Center	Shelter
	Dimond Library	Day Shelter
	Growing Places – Woodside	Daycare Facility
	Spinney Lane – UNH Daycare	Daycare Facility

Historic Facilities

	Thompson Hall	Historic
	Chapel on Mill Road	Historic
	Durham Historical Association	Historic

Commercial/Economic Impact Area

	Goss Manufacturing	Commercial/Economic Area
	Downtown Business District	Commercial/Economic Area

Potential Resources (PR)

PRs are potential resources that could be helpful for emergency response in case of a hazardous event

Food/Water/Retail

ID	Facility Name	Type of Facility
	Bed/Breakfast – Stage Coach Rd.	Lodging
	Three Chimneys Inn	Lodging
	Hotel New Hampshire Holiday Inn/Motel	Lodging
	Pines Guesthouse – Dover Road	Lodging
	Island House – Bennett Road	Lodging
	Dewey's Hannah House – Packers Falls	Lodging
	Irving Gas Station	Services
	Phillips 66 Gas Station	Services
	LNG Filling Station – Gables Way	Services

Potential Resources (PR)		
Airport/Helipad		
	Goss Manufacturing	Helipad
Recreational Facilities (Indoor and Outdoor)		
	UNH Field House Complex	Indoor
	Whittemore Center	Indoor
	Jackson's Landing Ice Rink	Outdoor
	Woodridge Fields	Outdoor
	Outdoor Pool	Outdoor
	Wagon Hill	Outdoor
Nursing Homes/Elderly Housing & Special Needs		
	Spruce Woods – Assisted Living – Worthen Rd	Nursing Home
	Church Hill Apartments – Mill Pond Rd	Elderly Housing
	Brookside Condominiums – Mill Rd	Elderly Housing
	Bagdad Wood – Madbury Rd	Elderly Housing
	Fellows Lane	Elderly Housing
	Perley Lane	Elderly Housing
	Fitz Farm Drive	Elderly Housing
*Dams		
	Oyster River Reservoir Dam	Significant Hazard Class
	Durham Reservoir Dam	Significant Hazard Class
	Mill Pond Dam	Low Hazard Class
	Beard's Creek Dam	Significant Hazard Class
	Wiswall Dam	Significant Hazard Class
	Littlehale Dam	Non-Menace Hazard Class
	Hickory Pond Dam	Non-Menace Hazard Class

* Every dam is categorized into one of four classifications, by the degree of potential damages that a failure of the dam is expected to cause; non-menace, low hazard, significant hazard and high hazard. A detailed breakdown of the classifications can be found on the [Dam Bureau Fact Sheet](#).

Water Resources (WR)		
Auxiliary Fire Aid		
ID	Facility Name	Type of Facility
	Dry Hydrant – Bennett Road	Fire Aid
	Dry Hydrant – Fox Hill Road	Fire Aid
	Dry Hydrant – Ross Road	Fire Aid
	Dry Hydrant – 220 Newmarket Road	Fire Aid
	Dry Hydrant – 300 Durham Point Road	Fire Aid
	Dry Hydrant – Little John Road	Fire Aid
	Cistern - Pine Crest	Fire Aid
Water-Related and Sewage Facilities		
	Durham Water Treatment Plant	Water Facility
	Pump Station – Lamprey River	Water Facility
	Water Tower – Foss Farm	Water Tower
	Water Tower – Edgewood Road	Water Tower
	Water Tank – Beech Hill	Water Tank
	Primary Sewer Lift Station	Sewage Pump Station
	Secondary Lift Station (Main Street)	Sewage Pump Station
	Secondary Lift Station (Oyster River Road)	Sewage Pump Station

Chapter V. Multi-Hazard Effects in Durham

A. Identifying Vulnerable Structures

It is important to identify the critical facilities and other structures that are most likely to be damaged by hazards. In Durham, there were eight CR/KR within the potential and past flood areas (PPFA) that were identified in the risk assessment for a potential loss value estimate of \$13,413,500 at 100%.

<u>Critical Facilities & Key Resources in PPFA</u>	100 % of Structure Value
Water Resources/Auxiliary Fire Aid	
1) Dry Hydrant – Bennett Road	0.00
2) Dry Hydrant – Newmarket Road	0.00
3) Draft at Culvert – Old Durham Reservoir	0.00
4) Primary Sewer Lift Station	\$194,100.00
Food/Water/Retail	
5) LNG Filling Station – Gables Way	Could not be determined.
Essential Facilities	
6) Highway Department/Public Works	\$773,500.00
7) Cell Tower – Landfill	Could not be determined.
Nursing Homes/Elderly Housing & Special Needs	
8) Spruce Woods – Worthen Road	<u>\$12,445,900.00</u>
Total	\$13,413,500.00

Flooding is most likely to affect the LNG filling station on the UNH campus. The facility is barely in the floodplain, though, and, given the spatial uncertainty in the digital floodplain data, it may not actually be. The two dry hydrants and a firefighting water draft location potentially affected by flooding are almost by definition going to be in the floodplain, if a floodplain exists in their general location. These facilities are firefighting water sources that practically must be in close proximity to water.

A similar argument applies to the dry hydrants being in the storm surge area. Damage due to scour from moving water would seem to be the most likely scenario for hazard impact. Storm surge affecting the primary sewer lift station might possibly warrant a bit more concern. Lift stations near topographic low points—and therefore often near water—are a common occurrence, though, due to facilitation of sewage collection by gravity feed.

Landslide exposure was investigated here only through overlay of steep slopes. Hydric soils do not co-occur with steep slopes in the locations of the three affected critical

facilities. Also, field inspection of the facilities would seem to indicate that other necessary conditions for landslide are not present.

Finally, wildfire would most likely affect the Spruce Woods facility. Forest clearing and landscaping, however, may reduce the risk considerably. In the case of the dry hydrant, wildfire is not likely to do severe damage to the facility, because it is constructed primarily of cast metal. Dam breach was investigated for its potential impact on critical facilities, but no facilities were within the spatial extent of the hazard (at least for the two dams for which inundation data was available).

B. Calculating the Potential Loss

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

Assessed Value of All Structures (only)			
	2009	1% damage	5% damage
Residential	483,888,600	4,838,886	24,194,430
Manufactured	113,800	1,138	5,690
Commercial	114,302,900	1,143,029	5,715,145
Tax Exempt	1,563,011	15,660	7,8150
Total	599,868,311	5,998,683	29,993,415

Source: Department of Revenue Administration; 2009 Report

Based on this assumption, the potential loss from any of the identified hazards would range from **\$0 to \$5,998,683** or **\$5,998,683 to \$29,993,415** based on the 2009 Durham town valuation, which lists the assessed value of all structures in Durham to be **\$599,868,311** (see chart above).

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

The Hazards

Flood (Heavy Rains).....\$0 to \$5,998,683

Flooding is most likely to occur in the spring due to the increase in rainfall and melting of snow; however floods can occur at any time of year. Flooding in Durham often results from the overflow of the Oyster River and many of its tributaries. The estimate above represents potential damage to roads, culverts, and nearby structures and is based on 0% to 1% of the total structure value.

Flood (Dam Breach)..... \$0 to \$5,998,683

All of the dams in Durham have a low or significant (Class AA or B) hazard classification, which means they have a relatively low hazard potential because of the size and location. The Team identified the Oyster River Reservoir, Durham Reservoir, Mill Pond, and Wiswall Dam as their biggest concerns. The Team discussed if an event were ever to take place where one of these dams failed or was breached it would have an effect and possible economic loss to structures and property but no probable loss of life. The estimate above represents the potential damage based on 0% and 1% of the total structure value.

Severe Winter Storms (Ice Storms & Nor'easters).....\$0 to \$5,998,683

Heavy snowstorms typically occur from December through April. New England usually experiences at least one or two heavy snowstorms with varying degrees of severity each year. Power outages, extreme cold and impacts to infrastructure are all effects of winter storms that have been felt in Durham in the past. All of these impacts are a risk to the community, including isolation, especially of the elderly, and increased traffic accidents. Damage caused as a result of this type of hazard varies according to wind velocity, snow accumulation, duration and moisture content. Seasonal accumulation can also be as significant as an individual snowstorm.

The December 2008 ice storm knocked out power for as many as 400,000 customers throughout the State (five times larger than those who lost power in the ice storm of 1998, which was previously the most devastating storm on record). Ice storms in Durham could be expected to cause damage ranging from a few thousand dollars to several million, depending on the severity of the storm. Due to the widespread nature of an event of this kind, the potential loss value is estimated to be between 0% and 1% of the total assessed value of all structures in town.

Severe Thunderstorms & Lightning.....\$0 to \$5,998,683

Severe lightning as a result of summer storms or as a residual effect from hurricanes has occurred in Durham. Due to the possibility of trees being toppled by lightning onto power lines and creating sparks and the fact that many of the buildings in Durham are considerably old, lightning is a significant disaster threat. Lightning could do damage to specific structures, (including campus facilities) injure or kill an individual but the direct damage would not be widespread.

Although lightning is a potential problem, the Town reports few occurrences, none of which were severe. Based on this factor and the localized nature of lightning strikes, the potential loss value was determined to be 0-1% of the total assessed structure value.

Radon.....Structure Loss Value Cannot Be Estimated

A naturally occurring radioactive gas with carcinogenic properties, radon is a common problem in many states. New Hampshire is one of them, specifically areas with shallow depth to granite bedrock. New Hampshire tends to have a particular problem with radon in drinking water, but airborne radon is also a significant hazard. There have been reports by the EPA that lung cancer deaths nationwide can be attributed to radon exposure, but nothing inclusive has been determined at this point.

Extended Power Outages.....\$0 to \$5,998,683

Extended power outages have occurred in Durham, both as a result of local line damage from high winds and severe storms. If a major and/or extended power outage occurs and lasts for more than a week, a significant hardship on students and individual residents could result, particularly those citizens who are elderly or handicapped (Bagdad and Spruce Woods). Over the past few years, as many as 50 stand by generators have been purchased for residential use.

Due to the localized and individual nature of the affects of an extended power failure, the potential loss value is estimated to be between 0% - 1% of the total value of all structures.

Hurricanes and Tropical Storms.....\$0 to \$5,998,683

The Hurricane of 1938, Hurricane Carol, and Hurricane Diane all caused considerable damage to Durham. These storms caused major power outages, significant damage to residential and commercial structures from high winds, and heavy rain. Although hurricanes could fit into several different categories (wind and flooding), the Team considered hurricanes to be separate events. Hurricanes are rare in New Hampshire, but they should not be ruled out as a potential hazard. Due to the infrequency of hurricanes in this part of the state, the potential loss value due to hurricanes was determined to be between 0% and 1% of the total assessed structure value.

Wildfires.....\$0 to \$5,998,683

Wildfire is defined as an uncontrolled and rapidly spreading fire. They often occur during drought and when woody debris on the forest floor is readily available to fuel the fire. Due to the windstorms in recent years, there is an abundance of limbs and branches on the forest floor. In addition, the recreational use of woods-trails and other outdoor enthusiasts creates an opportunity for sparks and out-of-control fires to ignite in Durham's forested areas. The estimate above represents potential damage based on 0% to 1% of the total structure value.

Earthquakes/Landslide.....\$5,998,683 to \$29,993,415

An earthquake is a rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Earthquakes can cause buildings and bridges to collapse,

disrupt gas, electric and phone lines, and often cause landslides, flash floods, fires, and avalanches. There have been just two earthquakes that registered a 5.50 or higher on the Richter scale in New Hampshire's history. They took place just four days apart from each other in December 1940, near Ossipee Lake⁵. It is well documented that there are fault lines running throughout New Hampshire, but high magnitude earthquakes have not been frequent in New Hampshire history. Although there has not been a major earthquake in this region, because of the multi-million dollar university facilities in the Town the potential damage is based on 1% to 5% of the total structure value.

Drought.....\$0 to \$5,998,683

A drought is defined as a long period of abnormally low precipitation, especially one that adversely affects growing or living conditions. They generally are not as damaging and disruptive as floods and are more difficult to define. An extended period without precipitation could elevate the risk for wildfire and with an extreme drought, the water supply and aquifer levels could be threatened. Fortunately, significant droughts rarely occur in New Hampshire and the Town of Durham has a Water Conservation Plan in place to help if such an event should occur.

The cost of drought is difficult to calculate, as any cost would primarily result from an associated fire risk and diminished water supply. Therefore, the potential loss value due to drought was determined to be between 0% and 1% of the total assessed structure value.

Hazardous Material Threat.....\$0 to \$5,998,683

The possibility of vehicular accidents involving hazardous materials is identified as a serious hazard in Durham. Route 4 and 108 are both major thoroughfare and are very heavily traveled, both by large and small vehicles. Small delivery vehicles, often traveling at fast speeds, and carrying materials to residents use these highways; the contents of these vehicles are rarely known. Tractor-trailers hauling fuel, propane and other hazardous materials also travel through Durham on a constant basis. The Lee traffic circle is a particular high concern in terms of a hazardous spill taking place because of the close proximity of the Oyster River, which is the drinking water source for the town. The Committee also expressed concerns with possible hazardous compounds that are produced within the science labs on the UNH campus.

The potential loss value is estimated at 0% and 1% of the assessed value, based on the premise that a hazardous material vehicular accident could occur but it would be localized by nature.

⁵ USGS: Earthquakes; http://earthquake.usgs.gov/earthquakes/states/events/1940_12_20.php

Tornados.....\$5,998,683 to \$29,993,415

Tornadoes are relatively uncommon natural hazards in New Hampshire; on average, about six touch down each year. Damage largely depends on where the tornado strikes. If it were to strike an inhabited area, the impact could be severe. In the State of New Hampshire, the total cost of tornadoes between 1950 and 1995 was \$9,071,389⁶.

The likelihood of a tornado occurring in Durham is low, however, because of the university there are a number of multi-million dollar facilities that could sustain significant damage. Therefore the potential loss value is estimated at 1% to 5% of the assessed value.

Extreme Heat.....\$0 to \$5,998,683

In New England, temperature extremes are quite common. Winter temperatures can fall well below freezing and summer temperatures, laden with high humidity can soar to nearly 100°F. In the past, there was more concern about extreme cold temperatures, but with improved heating systems and local communications, most New Hampshire residents are able to cope with extreme cold. Extreme cold temperatures that can last for extended periods of time have had an adverse effect on some residential housing units due to the age of the buildings and the inability to retain heat. Both town officials and the community as a whole should be concerned and should look after its citizens to ensure that extreme temperatures do not create a life or property threatening disaster.

Public Health Threat.....Structure Loss Value Cannot Be Estimated

Durham is unique because the University of New Hampshire (UNH) exists in the center of town. Every year there are students from all over the country (all over the world) who travel to Durham to receive an education from UNH. Many of these students reside in the town during the summer months and many end up staying long after graduation. Because of the influx of students/residents from neighboring towns and states, there is a threat of enabling infection and viruses to be transmitted from outside the town borders.

Because of these factors, an epidemic or pandemic could present a possible threat to Durham. With the occurrence of worldwide pandemics such as SARS, H1N1 and Avian Flu, Durham could be susceptible to an epidemic and subsequent quarantine.

⁶ The Disaster Center (NH); <http://www.disastercenter.com/newhamp/tornado.html>

Chapter VI: Multi-Hazard Goals and Existing Mitigation Strategies

A. Multi-Hazard Mitigation Goals

Before identifying new mitigation actions to be implemented, the Team reviewed and adopted the following multi-hazard goals. These goals were based on the State of New Hampshire Natural Hazards Mitigation Plan that was prepared and is maintained by HSEM.

- *To improve upon the protection of the general population, the citizens of Durham and visitors, from all natural and man-made hazards.*
- *Protect especially vulnerable populations, e.g. the very young and the elderly from particularly extreme hazards, e.g. extreme heat or cold.*
- *To improve communication between all emergency response personnel, including Fire, Police, and the Highway Department, as well as with private citizens.*
- *To have an adequate Emergency Response Center(s) to be prepared for natural hazards.*
- *To increase public awareness on important information during natural hazard events, such as evacuation routes, location of shelters, and the radio station that provides emergency information, etc.*
- *To provide adequate shelters for Town residents containing the proper equipment.*
- *To continue the effort on flood prevention.*

B. Mitigation Strategies Currently Underway in Durham

The Hazard Mitigation Committee established an initial list of mitigation actions by conducting a brainstorming session. The Committee reviewed these objectives and concluded that, with some modification, the objectives would constitute a usable framework for identifying and categorizing potential mitigation actions. At this time, the Town of Durham believes that the existing measures in place are sufficient. Protection against flooding and general preparedness for natural hazards, are an ongoing effort.

Existing Protection Matrix

The Durham Hazard Mitigation Planning Committee has developed the summary matrix of existing hazard mitigation strategies presented on the following pages. This matrix, a summary of the preceding information, includes the type of existing protection (Column 1), a description of the existing protection (Column 2), the area of town affected (Column 3), the effectiveness and or enforcement of the strategy (Column 4), the identified improvements or changes needed (Column 5), and the 2010 Update (Column 6).

Table 6.1: Existing Mitigation Strategies Matrix and Proposed Improvements

Existing Program/Activity	Description	Type of Hazard	Type of Activity	Area of Town Covered	Effectiveness/ Enforcement	Improvements or Changes	2012 update
Building Code / Permits	Requires builder to obtain all permits prior to action.	Multi-Hazard	Prevention	Town-wide	Building Official and Code Enforcement Officer.	Will continue to obtain permits prior to action.	All development will continue in accordance with the building codes adopted in the Town.
Elevation Certificates	A land surveyor would have to provide the Town with an elevation certificate.	Flooding	Prevention	Potential Flood Areas	Code Enforcement	New FIRM maps published May 17, 2005.	This program continues to be administered and maintained by the code enforcement officer to ensure that elevation certificates are properly filed, certified, and implemented.
Emergency Action Plan	Emergency response procedures	Multi-Hazard	Emergency Preparedness	Town-wide	Emergency Mgt. Officer, Fire Chief; Tested on tabletop.	Tested yearly.	Not tested yearly, but would like to see the response procedures tested yearly.
Storm Drain Maintenance	Open/closed channel/culvert year round maintenance.	Flooding	Town Planning	Town-wide, culverts not mandated.	Building Inspector, Public Works, Planning and Zoning Board. Zoning to permit driveway variances granted, exiting of drainage wetland.	1/3 of catch basins updated yearly. Follows road maintenance schedule.	Will continue to follow road maintenance schedule in the future.
Road Design Standards	Above State minimum regulations.	Multi-Hazard	Prevention	Town-wide	Planning Board or Public Works; Durham Town Council for existing roads.	Update road regulations.	There have been continuous discussions by town officials.
B and C Dam EAP	Emergency Action Plan for all Dams classified B & C.	Multi-Hazard	Prevention	Town-wide	State	Town dams updated 2002, will be updated again in 2006.	Completed for 2006 and 2010.

Multi-Hazard Mitigation Plan 2012

Existing Program/Activity	Description	Type of Hazard	Type of Activity	Area of Town Covered	Effectiveness/ Enforcement	Improvements or Changes	2012 update
Tree Maintenance	PSNH, Public Works Dept., and NHCOOP	Multi-Hazard	Prevention	Town-wide	PSNH, DPW, after event, Verizon	Will continue as needed.	PSNH will continue the cutting this year (2010).
Evacuation and Notification	Radio station notification, Community TV, Email	Multi-Hazard	Emergency Preparedness	Town-wide	Emergency Mgt. Director	Will continue to pursue new actions for public safety.	Roam Secure in 2008 allows UNH Police to send text messages to students, faculty, and staff during an emergency. Durham's website. Multi-alert system with a siren at two locations: MUB & the Horse Farm.
Emergency Back-up Power	Limited	Multi-Hazard	Emergency Preparedness	Selected buildings in Town	Emergency Management Director, department heads.	Monthly tests.	Residential generators (60 – 100) have been installed.
Shoreland Protection Act	Referenced in ordinances	Multi-Hazard	Prevention	Town-wide	Planning Board, all town boards/departments	Will continue to be monitored for changes from the State.	Completed. New regulations from the state.
BMPs	Required by State	Multi-Hazard	Town Planning	Town-wide	DPW, Building Inspector, CEO	In place and will be monitored.	Continue to pursue best management practices.
State Dam Program	Inspected by State	Multi-Hazard	Prevention	A (Town dam), B, and C	NH DES	Will continue to work with the State Dam Program when needed.	Completed.
Hazardous Materials Response Team	Mutual response system with mutual area within southern New Hampshire	Hazardous Materials	Emergency Preparedness	Town-wide	Fire Dept. and Emergency Mgt.	Continue to work with response team within southern New Hampshire.	Continue to pursue training for response team as needed.

Multi-Hazard Mitigation Plan 2012

Existing Program/Activity	Description	Type of Hazard	Type of Activity	Area of Town Covered	Effectiveness/ Enforcement	Improvements or Changes	2012 update
Mutual Aid	Mutual Aid System with Police.	Multi-Hazard	Emergency Preparedness	Most of Strafford County	Police Departments	System is in place and will continue to operate.	Mutual Aid System is in place and will be monitored as needed.
Mutual Aid	Mutual Aid System with Fire.	Multi-Hazard	Emergency Preparedness	Strafford, part of Rockingham Counties, Seacoast area, MA, ME	Fire Departments	In place and will be monitored,	Mutual Aid System is in place and will be monitored as needed.
Mutual Aid	Not part of a mutual Aid System. Responds as needed.	Multi-Hazard	Emergency Preparedness	State-wide	Highway Departments	Radio Conversion	Radios still using analog radios.
Floodplain Management Ordinance	Land Use Ordinance	Flooding	Town Planning	Town-wide	All town boards, CEO	Will continue to adopt and revise ordinance as needed.	Completed. Updates in the most recent zoning ordinance (2007).

Chapter VII: Prior Mitigation Plan(s)

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

Durham participated in a prior mitigation plan that was developed by the Durham Hazard Mitigation Planning Committee and adopted by the Durham Town Administrator in 2005. This Plan, the “Multi-Hazard Mitigation Plan, Durham, NH” is an updated version.

All Committee members agreed that the ranking of the actions as presented below was valid as far as it went; however, they felt that this scoring scheme does not consider the practicality, relative cost, immediacy of need, or potential mitigation gain associated with each of the actions very well.

Table 7.1: Accomplishments since Prior Plan(s) Approval

Rank	Proposed Mitigation Action	Update 2012
1	Purchase dry suits for Fire Department.	Completed. There are at least 4 new suits.
2	Install back-up generator in Town Hall	Not completed. Current lack of funding.
3	Undergo a Table Top Run annually	Completed. Although not done annually. Continues as funding allows.
4	Upgrade drainage system	State funds to fix area along Hamel Brook. Durham will be applying for FEMA mitigation money to have work done on Longmarsh and Bennett Road.
5	Upgrade the radio station that is used for information during emergency and educate community on what station to tune into during emergency.	Not completed. Current lack of funding and questions with the digital radios.
6	Create of a stockpile of sands bags to help reduce flooding.	Replenished by Public Works on a consistent basis.
7	Update Contractor/Operator List once per year.	Not completed. Current lack of funding and staff personnel.
8	Entire EOP needs to be tested annually.	Tested. But not annually. Completed as funding allows.
9	Improve Wiswall Dam.	Bridge & spillway improvements.
10	Create pamphlet and posters with information on shelters, evacuation routes, contacts, etc. during an emergency. Posters would be displayed in library, post office, etc.	Completed on a storm-to-storm basis.
11	Inventory critical facilities within the town.	Completed during Hazard Mitigation Update.
12	Develop list of things people should have in their home in case of an emergency.	A list serve is set up (Friday Updates) to provide residents the appropriate websites that contains important information during an emergency.
13	Library of emergency information located in one facility (EOC). Information would include maps, evacuation routes, contacts, etc.	Emergency information has been compiled and located at the Fire Station (EOC).

Chapter VIII: New Mitigation Strategies & STAPLEE

A. Feasibility and Prioritization

Table 8.1 reflects the newly identified potential multi-hazard mitigation strategies as well as the results of the STAPLEE Evaluation as explained below. It should also be noted that although some areas are identified as “Multi-Hazard”, many of these potential mitigation strategies overlap.

The goal of each proposed mitigation strategy is reduction or prevention of damage from a multi-hazard event. To determine their effectiveness in accomplishing this goal, a set of criteria was applied to each proposed strategy that was developed by the FEMA. The STAPLEE method analyzes the Social, Technical, Aministrative, Political, Legal, Economic and Environmental aspects of a project and is commonly used by public administration officials and planners for making planning decisions. The following questions were asked about the proposed mitigation strategies discussed in Table 8.1.

Social: Is the proposed strategy socially acceptable to the community? Is there an equity issue involved that would result in one segment of the community being treated unfairly?

Technical: Will the proposed strategy work? Will it create more problems than it solves?

Administrative: Can the community implement the strategy? Is there someone to coordinate and lead the effort?

Political: Is the strategy politically acceptable? Is there public support both to implement and to maintain the project?

Legal: Is the community authorized to implement the proposed strategy? Is there a clear legal basis or precedent for this activity?

Economic: What are the costs and benefits of this strategy? Does the cost seem reasonable for the size of the problem and the likely benefits?

Environmental: How will the strategy impact the environment? Will it need environmental regulatory approvals?

Each proposed mitigation strategy was then evaluated and assigned a score based on the above criteria. Each of the STAPLEE categories were discussed and were awarded the following scores: Good = 3; Average = 2; Poor = 1. An evaluation chart with total scores for each new strategy is shown in Table 8.1.

The ranking of strategies with the scores displayed in the following pages was merely a guideline for further prioritizing. The team then prioritized the strategies and prepared the action plan using additional criteria:

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

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

B. The Team's Understanding of Multi-Hazard Mitigation Strategies

The Team determined that any strategy designed to reduce personal injury or damage to property that could be done prior to an actual disaster would be listed as a potential mitigation strategy. This decision was made even though not all projects listed in Tables 8.1 and 9.1 (Implementation Plan) are fundable under FEMA pre-mitigation guidelines. The Team determined that this Plan was in large part a management document designed to assist the Town Administrator and other town officials in all aspects of managing and tracking potential emergency planning strategies. For instance, the team was aware that some of these strategies are more properly identified as readiness issues. The Team did not want to "lose" any of the ideas discussed during these planning sessions and thought this method was the best way to achieve that objective.

Table 8.1: Potential Mitigation Strategies & STAPLEE

New Mitigation Project	Type of Hazard	Affected Location	Type of Activity	S	T	A	P	L	E	E	Total
* 1) This project will install either a 36-foot long bridge or five 60" concrete culverts on Longmarsh Road. This project will also raise the grade along 200 feet of Longmarsh Road by 14".	Flooding	Longmarsh Road	Construction	3	3	3	3	3	3	3	21
Operating Budget Impact											
This project will eliminate hours of staff time when it is completed. DPW has applied for FEMA Mitigation Funding through the Department of Emergency Management. If accepted this program can contribute up to 80% reimbursement. With the FEMA Mitigation Program the Town must finance and complete engineering plans for FEMA review before acceptance by FEMA. The estimated cost for this project is \$41,000 in design and \$765,000 for construction, with a total of \$806,000 over the course of fiscal years 2012 and 2013.											
* 2) Interior and exterior painting of the 3,000,000-gallon Foss Farm water storage tank and the interior and exterior of the 650,000 gallon Beech Hill water storage tank.	Multi-Hazard	Foss Farm & Beech Hill	Upgrade Equipment	3	3	3	3	3	3	3	21
Operating Budget Impact											
The interior of the Foss Farm tank has not been painted in 17 years and the exterior is showing wear and tear from the elements. The interior of the Beech Hill tank has not been painted in 25 years. The estimated cost for this project is \$600,000 over the course of fiscal year 2013.											

New Mitigation Project	Type of Hazard	Affected Location	Type of Activity	S	T	A	P	L	E	E	Total
* 3) The 8" College Brook Interceptor runs along College Brook from Rudman Pump Station to the Memorial Union Building and is in a very environmentally sensitive area. It is 1,645 feet of old clay pipe with cracks and tree root problems and needs to be repaired.	Multi-Hazard	College Brook Interceptor	Upgrade Equipment	3	3	3	3	3	3	3	21
Operating Budget Impact											
This should correct both collection and environmental issues in this sensitive corridor, which will reduce staff time maintaining this collection line. The estimated cost for this project is \$50,000 in design and \$400,000 for construction, with a total of \$450,000 over the course of fiscal year 2012.											
* 4) This 18-inch diameter wastewater force main pipe carries all of the Town's wastewater (up to 2.4 million gallons per day) under pressure from the Dover Road Wastewater Pump Station to Durham's Wastewater Treatment Plant. This pipe was constructed of asbestos cement in the mid-1960s and is approaching the end of its useful life. It is anticipated that the pipe will be replaced along a similar alignment using modern methods and materials that are longer lasting.	Multi-Hazard	Wastewater Treatment Plant	Upgrade Equipment	3	3	3	3	3	3	3	21
Operating Budget Impact											
An investigation of pipe in 2008 revealed signs of diminished pipe capacity. The estimated cost for this project is \$2,200,000 in fiscal year 2014.											

New Mitigation Project	Type of Hazard	Affected Location	Type of Activity	S	T	A	P	L	E	E	Total
* 5) Installation of three 60" culverts to relieve flooding conditions along LaRoche Brook on Bennett Road, as well as the installation of two 60" concrete culverts downstream of Bennett Road on the LaRoche Farm. In addition this project will raise the grade of 175 feet of Bennett Road by 18 inches.	Flooding	Bennett Road	Construction	3	3	3	3	3	3	3	21
Operating Budget Impact											
<p>The budget should be less affected by reducing the amount of emergency triggered staff time and material upon completion of this project. Preliminary engineering is estimated at \$43,000. Construction for this project is estimated at \$800,000. DPW has applied for FEMA Mitigation Funding through the Department of Emergency Management. If accepted this program can contribute up to 80% reimbursement. With the FEMA Mitigation Program the Town must finance and complete engineering plans for FEMA review before acceptance by FEMA.</p>											
* 6) Repairs to Crommets Creek Bridge, which will improve the safety of this structure and increase the load limit. Currently this bridge is on the NH DOT Red List of deficient bridges in NH.	Multi-Hazard	Durham Point Road & Bay Road	Upgrade Equipment	3	3	3	3	3	3	3	21
Operating Budget Impact											
<p>Because of its 15 ton posted load limit (on red list), age, and increasing usage, repair is recommended. The estimated cost for this project is \$49,000 in design (fiscal year 2012) and \$359,000 (fiscal year 2013) for construction, with a total of \$408,000 over the course of fiscal years 2012 and 2013.</p>											

New Mitigation Project	Type of Hazard	Affected Location	Type of Activity	S	T	A	P	L	E	E	Total
* 7) Design and construct new culverts and nearby outfalls on Coe Drive at Littlehale Brook crossing on Oyster River Road near Garden Lane, on Dame Road at Crommets Creek crossing, on Longmarsh Road at Longmarsh crossing. These projects are assumed to include some degree of stream bank restoration and possible off-site erosion control measures.	Flooding	Town-wide	Construction	3	3	3	3	3	3	3	21
Operating Budget Impact											
The overall impact to the operating budget is assumed to be minimal since it will result in less repeat repairs and reduced unanticipated maintenance costs. The estimated cost for this project is \$43,000 in design and \$75,000 for construction, with a total of \$118,000 for fiscal year 2012. Continuation of undefined culvert and outfall repair/replacement projects are carried forward beyond 2015.											
* 8) Replacement of Wastewater diesel generator. Runs the Wastewater Treatment Plant,	Multi-Hazard	Wastewater Treatment Plant	Equipment Purchase	3	3	3	3	3	3	3	21
Operating Budget Impact											
No future impact on maintenance costs. The estimated cost for this project is \$125,000 in purchasing and installation costs for fiscal year 2014.											
* 9) The Old Concord Road Wastewater pump station was constructed in 1984 and is currently in need of substantial renovations and upgrades.	Multi-Hazard	Old Concord Road	Upgrade Equipment	3	3	3	3	3	3	3	21
Operating Budget Impact											
Normal future maintenance costs. The estimated cost for this project is \$750,000 in construction costs for fiscal years 2012.											

New Mitigation Project	Type of Hazard	Affected Location	Type of Activity	S	T	A	P	L	E	E	Total
10) Obtain NFIP brochures from FEMA and have them available at the Town Offices for new developers and current homeowners.	Flood	Town-wide	Education & Awareness	3	3	3	3	3	3		21
Operating Budget Impact											
No operational impact. NFIP brochures are free and would not cost the Town anything.											
11) Continue to provide outreach assistance to elderly and special needs populations by organizing staff and coordinating within Town departments.	Multi-Hazard	Town-wide	Education & Awareness	3	3	3	3	3	3		21
Operating Budget Impact											
<p>In order to estimate an expected yearly cost, the group averaged the expended outreach/assistance for special needs population's funds for Durham in 2009, 2010, 2011 and included the allocated fiscal year 2012 funds as reported in their 2012 approved budget expenses spreadsheet. It was determined that the estimated yearly cost for continued assistance for elderly and special needs populations was \$5,223.25. The average expended funds for each service was established by adding the total amount of allocated funds each year and dividing that by the total number of subject years. They are summarized as follows: Community Action Partnership of Strafford County - \$2,000.00; Lamprey Healthcare - \$3,575.00; Sexual Assault Support Services - \$1,700.00; My Friends Place - \$1,625.00; ARS -Aids Response - \$1,500.00 (<i>In 2009 \$0.00 was allocated</i>); Home Makers Healthcare Services - \$4,356.00; Cross Roads House - \$750.00; Homeless Center of Strafford County - \$625.00; Strafford County Child Advocacy – \$812.50 (<i>In 2011 \$0.00 was allocated</i>); Goodwin Community Health Center - \$2,500.00; American Red Cross Great Bay Chapter - \$950.00; CASA Court Appointed Special Advocate – \$500.00 (<i>In 2009, 2010 & 2011 \$0.00 was allocated</i>).</p>											

New Mitigation Project	Type of Hazard	Affected Location	Type of Activity	S	T	A	P	L	E	E	Total
12) Maintain transportation infrastructure by identifying potential areas of concern recognized in this plan.	Multi-Hazard	Town-wide	Prevention	3	3	3	3	3	2	3	20
											Budgetary Constraints

Operating Budget Impacts

In order to estimate an expected yearly cost, the group averaged the expended roadway maintenance funds for Durham in 2009, 2010, 2011 and included the allocated fiscal year 2012 funds as reported in their 2012 approved budget expenses spreadsheet. It was determined that the estimated yearly cost to maintain transportation infrastructure was \$135,813.00.

[*Note: These mitigation strategies were developed from referencing Durham’s 2011 – 2020 Capital Improvements Plan, thus resulting in such a high ranking for each.]



Route 108, April 2006 Flood Event

Chapter IX: Implementation Schedule for Prioritized Strategies

After reviewing the finalized STAPLEE numerical ratings, the Team prepared to develop the Implementation Plan (Table 9.1). To do this, team members created four categories into which they would place all the potential mitigation strategies.

- **Category 0** was to include those items that are being done and will continue to be done in the future.
- **Category 1** was to include those items under the direct control of town officials, within the financial capability of the Town using only town funding, those already being done or planned, and those that could generally be completed within one year.
- **Category 2** was to include those items that the Town did not have sole authority to act upon, those for which funding might be beyond the Town's capability, and those that would generally take between 13—24 months.
- **Category 3** was to include those items that would take a major funding effort, those that the Town had little control over the final decision, and those that would take in excess of 24 months to complete.

Each potential mitigation strategy was placed in one of the three categories and then those strategies were prioritized within each category.

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

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

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

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

In addition to the prioritized mitigation projects, Table 9.1, Implementation Plan, includes the responsible party (WHO), how the project will be supported (HOW), and what the timeframe is for implementation of the project (WHEN).

Table 9.1: Implementation Plan

Rank	New Mitigation Project	Responsibility or Oversight	Funding and/or Support	Cost Effectiveness	Timeframe	STAPLEE Score (21 being the highest)
0-1	Obtain NFIP brochures from FEMA and have them available at the Town Offices for new developers and current homeowners.	Emergency Management Director	No charge	NFIP brochures are free and would not cost the Town anything. Residents and homeowners would highly benefit from the information provided.	FY2011	21
0-2	Maintain transportation infrastructure by identifying potential areas of concern recognized in this plan.	Public Works - Engineering	Local & Grants	Transportation infrastructure will be identified with the coordination of this plan. This action would highly benefit the Town.	FY2011	20
0-3	Continue to provide outreach assistance to elderly and special needs populations by organizing staff and coordinating within Town departments.	Emergency Management Director	Local & Grants	Outreach strategies have already taken place and will continue to do so. This action will highly benefit elderly and special needs populations at a low cost.	FY2011	21
1-1	Design and construct new culverts and nearby outfalls on Coe Drive at Littlehale Brook crossing on Oyster River Road near Garden Lane, on Dame Road at Crommets Creek crossing, on Longmarsh Road at Longmarsh crossing. These projects are assumed to include some degree of stream bank restoration and possible off-site erosion control measures.	Public Works – Engineering	Town Funds	These culverts and outfalls are in serious disrepair and/or undersized which have required numerous repeat maintenance efforts and cause impact to nearby habitat from erosion and sedimentation.	FY2011	21
1-2	The Old Concord Road Wastewater pump station was constructed in 1984 and is currently in need of substantial renovations and upgrades.	Public Works – Wastewater	Town Funds	The Old Concord Road pump station pumps wastewater from the west end of town into the College Road and College Brook Interceptor. This wooden structure was built in 1984 and is in need of significant exterior renovations including siding, roofing and doors, as well as interior renovations to the wet well and new electrical components.	FY2011	21

Multi-Hazard Mitigation Plan 2012

Rank	New Mitigation Project	Responsibility or Oversight	Funding and/or Support	Cost Effectiveness	Timeframe	STAPLEE Score (21 being the highest)
1-3	Installation of three 60" culverts to relieve flooding conditions along LaRoche Brook on Bennett Road, as well as the installation of two 60" concrete culverts downstream of Bennett Road on the LaRoche Farm. In addition this project will raise the grade of 175 feet of Bennett Road by 18 inches.	Public Works – Operations	FEMA Mitigation Funding	The DPW has been working with the NHDOT to correct flooding along Route 108 (Newmarket Road). The State is currently developing plans for a new 70 foot long bridge crossing at Hamel Brook. The Bennett Road culvert project will help with stranded residents on Cold Spring Road and Bennett Road. Currently there are two 36" concrete culverts which do not allow enough water to flow when there are more than 5"-6" of stormwater.	FY2011; 2012	21
2-1	The 8" College Brook Interceptor runs along College Brook from Rudman Pump Station to the Memorial Union Building and is in a very environmentally sensitive area. It is 1,645 feet of old clay pipe with cracks and tree root problems and needs to be repaired.	Public Works - Wastewater	Town/UNH Funds	Due to location of this interceptor nontraditional methods of repair such as Directional Boring should be explored versus the traditional open trench methods. UNH will participate monetarily with 66% of this upgrade.	FY2012	21
2-2	Repairs to Crommets Creek Bridge, which will improve the safety of this structure and increase the load limit. Currently this bridge is on the NH DOT Red List of deficient bridges in NH.	Public Works – Operations	Bridge Aid Program	Located on Durham Point Road/Bay Road, a narrow (21') single span structure with poor approach alignment in both directions. Because of its 15 ton posted load limit (on red list), age, and increasing usage, repair is recommended. The Department recommends a modified repair to strengthen the load limit; however, no realignment or reconfiguration of the present bridge will be done. This work might be eligible for 80% Federal/State funding via the Bridge Aid Program. Construction estimate will likely change following preliminary engineering and additional funds may be required. Recommend maintaining the existing bridge "appearance" to fit in with the rural setting. Durham Public Works has recommended engineering in 2011 and construction in 2012.	FY2012; 2013	21

Multi-Hazard Mitigation Plan 2012

Rank	New Mitigation Project	Responsibility or Oversight	Funding and/or Support	Cost Effectiveness	Timeframe	STAPLEE Score (21 being the highest)
2-3	This project will install either a 36-foot long bridge or five 60" concrete culverts on Longmarsh Road. This project will also raise the grade along 200 feet of Longmarsh Road by 14".	Public Works – Operations	Flood Mitigation Program	Currently there are two 48" culverts in this location. This area typically floods over Longmarsh Road at 6" of stormwater, resulting in the closure to one of only two entrances/exits to the Sunnyside Drive & Sandy Brook Drive neighborhoods. This closure increases traffic within the neighborhoods and congestion at the remaining entrance/exit. This project is part of the LaRoche Brook and Hamel Brook Flood Mitigation Program.	FY2012; 2013	21
2-4	Interior and exterior painting of the 3,000,000-gallon Foss Farm water storage tank and the interior and exterior of the 650,000 gallon Beech Hill water storage tank.	Public Works - Water	Town Funds	The interior of the Foss Farm tank has not been painted in 17 years and the exterior is showing wear and tear from the elements. The interior of the Beech Hill tank has not been painted in 25 years.	FY2013	21
3-1	Replacement of Wastewater diesel generator. Runs the Wastewater Treatment	Public Works – Wastewater	Town Funds	Emergency generator to run the Wastewater Treatment Plant in a power failure. Current unit is a 1995 model and has a 15 year life expectancy.	FY2014	21
3-2	This 18-inch diameter wastewater force main pipe carries all of the Town's wastewater (up to 2.4 million gallons per day) under pressure from the Dover Road Wastewater Pump Station to Durham's Wastewater Treatment Plant. This pipe was constructed of asbestos cement in the mid-1960s and is approaching the end of its useful life. It is anticipated that the pipe will be replaced along a similar alignment using modern methods and materials that are longer lasting.	Public Works – Wastewater	Town Funds	An investigation of pipe in 2008 revealed signs of diminished pipe capacity. Asbestos cement piping is no longer used in the industry because of its tendency to deteriorate over time, which is particularly a problem with piping that is under pressure.	FY2014	21

Chapter X: Monitoring, Evaluation and Updating the Plan

A. Introduction

A good mitigation plan must allow for updates where and when necessary, particularly since communities may suffer budget cuts or experience personnel turnover during both the planning and implementation states. A good plan will incorporate periodic monitoring and evaluation mechanisms to allow for review of successes and failures or even just simple updates.

B. Multi-Hazard Plan Monitoring, Evaluation and Updates

To track programs and update the mitigation strategies identified through this process, the Town will review the multi-hazard mitigation plan annually or after a hazard event. Additionally, the Plan will undergo a formal review and update at least every five years and obtain FEMA approval for this update or any other major changes done in the Plan at any time. The Emergency Management Director is responsible for initiating the review and will consult with members of the multi-hazard mitigation planning team identified in this plan. The public will be encouraged to participate in any updates. Public announcements will be made through advertisements in local papers, postings on the town website, and posters disseminated in town. A formal public hearing will be held before reviews and updates are official.

Changes will be made to the Plan to accommodate projects that have failed or are not considered feasible after a review for their consistency with STAPLEE, the timeframe, the community's priorities or funding resources. Priorities that were not ranked high, but identified as potential mitigation strategies, will be reviewed as well during the monitoring and update of the plan to determine feasibility of future implementation. In keeping with the process of adopting this multi-hazard mitigation plan, a public hearing to receive public comment on plan maintenance and updating will be held during the annual review period and before the final product is adopted by the Town Administrator. Chapter XI contains a representation of a draft resolution for Dover to use once a conditional approval is received from FEMA.

C. Integration with Other Plans

This multi-hazard plan will only enhance mitigation if balanced with all other town plans. Durham will take the necessary steps to incorporate the mitigation strategies and other information contained in this plan with other town activities, plans and mechanisms, such as comprehensive land use planning, capital improvements planning, site plan regulations, and building codes to guide and control development in the Town of Durham, when appropriate. The local government will refer to this Plan and the strategies identified when updating the Town's Master Plan, Capital Improvements Program, Zoning Ordinances and Regulations, and Emergency Action Plan; this Plan will become a section of the Durham Emergency Management Plan. The Town Administrator and the Hazard Mitigation Committee will work with town officials to incorporate elements of

this Plan into other planning mechanisms, when appropriate. The Emergency Management Director along with other members of the Hazard Mitigation Committee may work with the Planning Board to include the updated Hazard Mitigation Plan as a chapter in the Town's Master Plan. In addition, the Town will review and make note of instances when this has been done and include it as part of their annual review of the Plan.

Chapter XI: Signed Community Documents and Approval Letters

A. Conditional Approval Letter from FEMA

Email received on April 9, 2012

Congratulations!

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

These items should be provided to your state's mitigation planning point of contact who will ensure they are forwarded to FEMA. Acceptable electronic formats include a *.doc* or *.pdf* file and may be submitted on a CD. Upon FEMA's receipt of these documents, a formal letter of approval will be issued, along with the final FEMA Checklist.

The FEMA letter of formal approval will confirm the jurisdiction's eligibility to apply for Mitigation grants administered by FEMA and identify related issues affecting eligibility, if any. If the plan is not adopted within one calendar year of FEMA's Approval Pending Adoption, the jurisdiction must update the entire plan and resubmit it for FEMA review. If you have questions or wish to discuss this determination further, please contact me at marilyn.hilliard@fema.gov or 617-956-7536.

Thank you for submitting Durham's Multi-Hazard Mitigation Plan and congratulations again on your successful community planning efforts.

B. Signed Certificate of Adoption



TOWN OF DURHAM
15 NEWMARKET ROAD
DURHAM, NH 03824-2898
Tel: 603/868-5571
Fax: 603/868-5572

CERTIFICATE OF ADOPTION

Town of Durham, New Hampshire
Durham Town Administrator
A Resolution Adopting the Durham Multi-Hazard Mitigation Plan 2012 Update
April 10, 2012

WHEREAS, the Town of Durham received funding from the NH Office of Emergency Management under a Flood Mitigation Assistance Project Grant and assistance from Strafford Regional Planning Commission in the preparation of the Durham Multi-Hazard Mitigation Plan 2012 Update; and

WHEREAS, several public planning meetings were held between September 7, 2010 and October 19, 2012 regarding the development and review of the Durham Multi-Hazard Mitigation Plan 2012 Update; and

WHEREAS, the Durham Multi-Hazard Mitigation Plan 2012 Update contains several potential future projects to mitigate hazard damage in the Town of Durham; and

WHEREAS, the Town Administrator of the Town of Durham is charged by municipal charter with the preservation of the health, safety, and welfare of persons and property and shall see to the enforcement of the ordinances of the Town, the Town Charter, and the laws of the State of New Hampshire; and

WHEREAS, Section 4.5 of the Durham Town Charter confers upon the Town Administrator such other powers and duties as may be conferred upon Mayors of cities and Selectmen of towns by general laws;

NOW, THEREFORE BE IT RESOLVED that the Durham Town Administrator adopts the Durham Hazard Mitigation Plan.

ADOPTED AND SIGNED this 17th day of May, 2012.



Todd I. Selig, Administrator

ATTEST:



Lorrie Pitt, Town Clerk-Tax Collector

C. Final Approval Letter from FEMA

U.S. Department of Homeland Security
FEMA Region I
99 High Street
Boston, MA 02110



FEMA

June 22, 2012

Diana Carroll, Chair
Durham Town Council
15 Newmarket Road
Durham, NH 03824

Dear Ms. Carroll:

Thank you for the opportunity to review the Town of Durham, NH Hazard Mitigation Plan. The Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA) Region I has evaluated the plan for compliance with 44 CFR Part 201. The plan satisfactorily meets all of the mandatory requirements set forth by the regulations. Congratulations on this achievement!

With this plan approval, the Town is eligible to apply for Mitigation grants administered by FEMA. Requests for mitigation funding will be evaluated individually according to the specific eligibility and requirements of each of these programs. Furthermore, a specific mitigation activity or project identified in your community's plan may not meet the eligibility requirements for FEMA funding, and even eligible mitigation activities are not automatically approved for FEMA funding under the programs referenced above.

The Town's Hazard Mitigation Plan must be reviewed, revised as appropriate, and resubmitted to FEMA for approval within **five years of the plan approval date of June 19, 2012** in order to maintain eligibility as an applicant for mitigation grants. Over the next five years, we encourage the town to continue updating the plan's assessment of vulnerability, adhere to its maintenance schedule, and begin implementing, when possible, the mitigation actions proposed in the plan.

Once again, thank you for your continued dedication to public service demonstrated by preparing and adopting a strategy for reducing future disaster losses. Should you have any questions, please do not hesitate to contact Marilyn Hilliard at (617) 956-7536.

Sincerely,

A handwritten signature in black ink, appearing to read "Don R. Boyce".

Don R. Boyce
Regional Administrator

DRB:mh

cc: Lance Harbour, Acting State Hazard Mitigation Officer
Beth Peck, NH Homeland Security and Emergency Management Planner
Kyle Pimental, Planner, Strafford Regional Planning Commission
Jennifer Gilbert, NFIP Coordinator

Enclosure

Appendices

Appendix A: Bibliography

Appendix B: Summary of Possible Multi-Hazard Mitigation Strategies

Appendix C: List of Contacts

Appendix D: Technical and Financial Assistance for Multi-Hazard Mitigation

Hazard Mitigation Grant Program (HMGP)

Pre-Disaster Mitigation (PDM)

Flood Mitigation Assistance (FMA)

Repetitive Flood Claims (RFC)

Severe Repetitive Loss (SRL)

Appendix A: Bibliography

Documents

- Local Multi-Hazard Mitigation Planning Guide, FEMA, July 1, 2008
- Multi-Hazard Mitigation Plans
 - Town of Albany, 2010
 - Town of Goffstown, 2009
 - New Durham Hazard Mitigation Plan 2010
 - Barrington Hazard Mitigation Plan 2010
 - Durham Hazard Mitigation Plan 2005
- Natural Hazard Mitigation Plan, 2004, State Hazard Mitigation Goals
http://www.nh.gov/safety/divisions/hsem/HazardMitigation/documents/guide/APPENDIX_D.pdf
- Disaster Mitigation Act (DMA) of 2000, Section 101, b1 & b2 and Section 322a
<http://www.fema.gov/library/viewRecord.do?id=1935>
- Economic & Labor Market Information Bureau, NH Employment Security, 2009; Census 2000 and Revenue Information derived from this site;
<http://www.nh.gov/nhes/elmi/htmlprofiles/durham.html>
- NCDC [National Climatic Data Center, National Oceanic and Atmospheric Administration]. 2010. *Storm Events*
- The Town of Durham, Master Plan.

Photos

- April Talon, Assistant Town Engineer
- Strafford Regional Planning Commission Archive

Appendix B: Summary of Possible Multi-Hazard Mitigation Strategies

I. RIVERINE MITIGATION

A. Prevention

Prevention measures are intended to keep the problem from occurring in the first place, and/or keep it from getting worse. Future development should not increase flood damage. Building, zoning, planning, and/or code enforcement personnel usually administer preventative measures.

- 1. Planning and Zoning** - Land use plans are put in place to guide future development, recommending where - and where not - development should occur and where it should not. Sensitive and vulnerable lands can be designated for uses that would not be incompatible with occasional flood events - such as parks or wildlife refuges. A Capital Improvements Program (CIP) can recommend the setting aside of funds for public acquisition of these designated lands. The zoning ordinance can regulate development in these sensitive areas by limiting or preventing some or all development - for example, by designating floodplain overlay, conservation, or agricultural districts.
- 2. Open Space Preservation** - Preserving open space is the best way to prevent flooding and flood damage. Open space preservation should not, however, be limited to the floodplain, since other areas within the watershed may contribute to controlling the runoff that exacerbates flooding. Land Use and Capital Improvement Plans should identify areas to be preserved by acquisition and other means, such as purchasing easements. Aside from outright purchase, open space can also be protected through maintenance agreements with the landowners, or by requiring developers to dedicate land for flood flow, drainage and storage.
- 3. Floodplain Development Regulations** - Floodplain development regulations typically do not prohibit development in the special flood hazard area, but they do impose construction standards on what is built there. The intent is to protect roads and structures from flood damage and to prevent the development from aggravating the flood potential. Floodplain development regulations are generally incorporated into subdivision regulations, building codes, and floodplain ordinances.

Subdivision Regulations: These regulations govern how land will be divided into separate lots or sites. They should require that any flood hazard areas be shown on the plat, and that every lot has a buildable area that is above the base flood elevation.

Building Codes: Standards can be incorporated into building codes that address flood proofing for all new and improved or repaired buildings.

Floodplain Ordinances: Communities that participate in the National Flood Insurance Program are required to adopt the minimum floodplain management regulations, as developed by FEMA. The regulations set

minimum standards for subdivision regulations and building codes. Communities may adopt more stringent standards than those set forth by FEMA.

4. **Stormwater Management** - Development outside of a floodplain can contribute significantly to flooding by covering impervious surfaces, which increases storm water runoff. Storm water management is usually addressed in subdivision regulations. Developers are typically required to build retention or detention basins to minimize any increase in runoff caused by new or expanded impervious surfaces, or new drainage systems. Generally, there is a prohibition against storm water leaving the site at a rate higher than it did before the development. One technique is to use wet basins as part of the landscaping plan of a development. It might even be possible to site these basins based on a watershed analysis. Since detention only controls the runoff rates and not volumes, other measures must be employed for storm water infiltration - for example, swales, infiltration trenches, vegetative filter strips, and permeable paving blocks.
5. **Drainage System Maintenance** - Ongoing maintenance of channel and detention basins is necessary if these facilities are to function effectively and efficiently over time. A maintenance program should include regulations that prevent dumping in or altering water courses or storage basins; regrading and filling should also be regulated. Any maintenance program should include a public education component, so that the public becomes aware of the reasons for the regulations. Many people do not realize the consequences of filling in a ditch or wetland, or regrading.

B. Property Protection

Property protection measures are used to modify buildings subject to flood damage, rather than to keep floodwaters away. These may be less expensive to implement, as they are often carried out on a cost-sharing basis. In addition, many of these measures do not affect a building's appearance or use, which makes them particularly suitable for historical sites and landmarks.

1. **Relocation** - Moving structures out of the floodplain is the surest and safest way to protect against damage. Relocation is expensive, however, so this approach will probably not be used except in extreme circumstances. Communities that have areas subject to severe storm surges, ice jams, etc. might want to consider establishing a relocation program, incorporating available assistance.
2. **Acquisition** - Acquisition by a governmental entity of land in a floodplain serves two main purposes: 1) it ensures that the problem of structures in the floodplain will be addressed; and 2) it has the potential to convert problem areas into community assets, with accompanying environmental benefits. Acquisition is more cost effective than relocation in those areas that are subject to storm surges, ice jams, or flash flooding. Acquisition, followed by demolition, is the most appropriate strategy for those buildings that are simply too expensive to move, as

well as for dilapidated structures that are not worth saving or protecting. Acquisition and subsequent relocation can be expensive, however, there are government grants and loans that can be applied toward such efforts.

3. **Building Elevation** - Elevating a building above the base flood elevation is the best on-site protection strategy. The building could be raised to allow water to run underneath it, or fill could be brought in to elevate the site on which the building sits. This approach is cheaper than relocation, and tends to be less disruptive to a neighborhood. Elevation is required by law for new and substantially improved residences in a floodplain, and is commonly practiced in flood hazard areas nationwide.
4. **Floodproofing** - If a building cannot be relocated or elevated, it may be floodproofed. This approach works well in areas of low flood threat. Floodproofing can be accomplished through barriers to flooding, or by treatment to the structure itself.

Barriers: Levees, floodwalls and berms can keep floodwaters from reaching a building. These are useful, however, only in areas subject to shallow flooding.

Dry Floodproofing: This method seals a building against the water by coating the walls with waterproofing compounds or plastic sheeting. Openings, such as doors, windows, etc. are closed either permanently with removable shields or with sandbags.

Wet Floodproofing: This technique is usually considered a last resort measure, since water is intentionally allowed into the building in order to minimize pressure on the structure. Approaches range from moving valuable items to higher floors to rebuilding the floodable area. An advantage over other approaches is that simply by moving household goods out of the range of floodwaters, thousands of dollars can be saved in damages.

5. **Sewer Backup Protection** - Storm water overloads can cause backup into basements through sanitary sewer lines. Houses that have any kind of connection to a sanitary sewer system - whether it is downspouts, footing drain tile, and/or sump pumps, can be flooded during a heavy rain event. To prevent this, there should be no such connections to the system, and all rain and ground water should be directed onto the ground, away from the building. Other protections include:

- Floor drain plugs and floor drain standpipe, which keep water from flowing out of the lowest opening in the house.
- Overhead sewer - keeps water in the sewer line during a backup.
- Backup valve - allows sewage to flow out while preventing backups from flowing into the house.

6. **Insurance** - Above and beyond standard homeowner insurance, there is other coverage a homeowner can purchase to protect against flood hazard. Two of the most common are National Flood Insurance and basement backup insurance.

National Flood Insurance: When a community participates in the National Flood Insurance Program, any local insurance agent is able to sell separate flood insurance policies under rules and rates set by FEMA. Rates do not change after claims are paid because they are set on a national basis.

Basement Backup Insurance: National Flood Insurance offers an additional deductible for seepage and sewer backup, provided there is a general condition of flooding in the area that was the proximate cause of the basement getting wet. Most exclude damage from surface flooding that would be covered by the NFIP.

C. Natural Resource Protection

Preserving or restoring natural areas or the natural functions of floodplain and watershed areas provide the benefits of eliminating or minimizing losses from floods, as well as improving water quality and wildlife habitats. Parks, recreation, or conservation agencies usually implement such activities. Protection can also be provided through various zoning measures that are specifically designed to protect natural resources.

1. **Wetlands Protection** - Wetlands are capable of storing large amounts of floodwaters, slowing and reducing downstream flows, and filtering the water. Any development that is proposed in a wetland is regulated by either federal and/or state agencies. Depending on the location, the project might fall under the jurisdiction of the U.S. Army Corps of Engineers, which in turn, calls upon several other agencies to review the proposal. In New Hampshire, the N.H. Wetlands Board must approve any project that impacts a wetland. Many communities in New Hampshire also have local wetland ordinances.

Generally, the goal is to protect wetlands by preventing development that would adversely affect them. Mitigation techniques are often employed, which might consist of creating a wetland on another site to replace what would be lost through the development. This is not an ideal practice since it takes many years for a new wetland to achieve the same level of quality as an existing one, if it can at all.

2. **Erosion and Sedimentation Control** - Controlling erosion and sediment runoff during construction and on farmland is important, since eroding soil will typically end up in downstream waterways. Because sediment tends to settle where the water flow is slower, it will gradually fill in channels and lakes, reducing their ability to carry or store floodwaters.
3. **Best Management Practices** - Best Management Practices (BMPs) are measures that reduce non-point source pollutants that enter waterways. Non-point source pollutants are carried by storm water to waterways, and include such things as lawn fertilizers, pesticides, farm chemicals, and oils from street surfaces and industrial sites. BMPs can be incorporated into many aspects of new

developments and ongoing land use practices. In New Hampshire, the Department of Environmental Services has developed Best Management Practices for a range of activities, from farming to earth excavations.

D. Emergency Services

Emergency services protect people during and after a flood. Many communities in New Hampshire have emergency management programs in place, administered by an emergency management director (very often the local police or fire chief).

1. **Flood Warning** - On large rivers, the National Weather Service handles early recognition. Communities on smaller rivers must develop their own warning systems. Warnings may be disseminated in a variety of ways, such as sirens, radio, television, mobile public address systems, or door-to-door contact. It seems that multiple or redundant systems are the most effective, giving people more than one opportunity to be warned.
2. **Flood Response** - Flood response refers to actions that are designed to prevent or reduce damage or injury, once a flood threat is recognized. Such actions and the appropriate parties include:
 - Activating the emergency operations center (emergency director)
 - Sandbagging designated areas (Highway Department)
 - Closing streets and bridges (police department)
 - Shutting off power to threatened areas (public service)
 - Releasing children from school (school district)
 - Ordering an evacuation (Board of Selectmen/emergency director)
 - Opening evacuation shelters (churches, schools, Red Cross, municipal facilities)

These actions should be part of a flood response plan, which should be developed in coordination with the persons and agencies that share the responsibilities. Drills and exercises should be conducted so that the key participants know what they are supposed to do.

3. **Critical Facilities Protection** - Protecting critical facilities is vital, since expending efforts on these facilities can draw workers and resources away from protecting other parts of town. Critical facilities fall into two categories:

Buildings or locations vital to the flood response effort:

- Emergency operations centers
- Police and fire stations
- Highway garages
- Selected roads and bridges
- Evacuation routes

Buildings or locations that, if flooded, would create disasters:

- Hazardous materials facilities
- Schools

All such facilities should have their own flood response plan that is coordinated with the community's plan. Schools will typically be required by the state to have emergency response plans in place.

4. Health and Safety Maintenance - The flood response plan should identify appropriate measures to prevent danger to health and safety. Such measures include:

- Patrolling evacuated areas to prevent looting
- Vaccinating residents for tetanus
- Clearing streets
- Cleaning up debris

The Plan should also identify which agencies will be responsible for carrying out the identified measures. A public information program can be helpful to educate residents on the benefits of taking health and safety precautions.

E. Structural Projects

Structural projects are used to prevent floodwaters from reaching properties. These are all man-made structures, and can be grouped into types discussed below. The shortcomings of structural approaches are:

- Can be very expensive
- Disturb the land, disrupt natural water flows, & destroy natural habitats.
- Are built to an anticipated flood event, and may be exceeded by a greater-than expected flood
- Can create a false sense of security.

1. Diversions - A diversion is simply a new channel that sends floodwater to a different location, thereby reducing flooding along an existing watercourse. Diversions can be surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel. During flood flows, the stream spills over the diversion channel or tunnel, which carries the excess water to the receiving lake or river. Diversions are limited by topography; they won't work everywhere. Unless the receiving water body is relatively close to the flood prone stream and the land in between is low and vacant, the cost of creating a diversion can be prohibitive. Where topography and land use are not favorable, a more expensive tunnel is needed. In either case, care must be taken to ensure that the diversion does not create a flooding problem somewhere else.

F. Public Information

Public information activities are intended to advise property owners, potential property owners, and visitors about the particular hazards associated with a property, ways to protect people and property from these hazards, and the natural and beneficial functions of a floodplain.

1. **Map Information** - Flood maps developed by FEMA outline the boundaries of the flood hazard areas. These maps can be used by anyone interested in a particular property to determine if it is flood-prone. These maps are available from FEMA, the NH Homeland Security and Emergency Management (HSEM), the NH Office of Energy and Planning (OEP), or your regional planning commission.
2. **Outreach Projects** - Outreach projects are proactive; they give the public information even if they have not asked for it. Outreach projects are designed to encourage people to seek out more information and take steps to protect themselves and their properties. Examples of outreach activities include:
 - Presentations at meetings of neighborhood groups
 - Mass mailings or newsletters to all residents
 - Notices directed to floodplain residents
 - Displays in public buildings, malls, etc.
 - Newspaper articles and special sections
 - Radio and TV news releases and interview shows
 - A local flood proofing video for cable TV programs and to loan to organizations
 - A detailed property owner handbook tailored for local conditions.Research has shown that outreach programs work, although awareness is not enough. People need to know what they can do about the hazards, so projects should include information on protection measures. Research also shows that locally designed and run programs are much more effective than national advertising.
3. **Real Estate Disclosure** - Disclosure of information regarding flood-prone properties is important if potential buyers are to be in a position to mitigate damage. Federally regulated lending institutions are required to advise applicants that a property is in the floodplain. However, this requirement needs to be met only five days prior to closing, and by that time, the applicant is typically committed to the purchase. State laws and local real estate practice can help by making this information available to prospective buyers early in the process.
4. **Library** - Your local library can serve as a repository for pertinent information on flooding and flood protection. Some libraries also maintain their own public information campaigns, augmenting the activities of the various governmental agencies involved in flood mitigation.

- 5. Technical Assistance** - Certain types of technical assistance are available from the NFIP Coordinator, FEMA, and the Natural Resources Conservation District. Community officials can also set up a service delivery program to provide one-on-one sessions with property owners.

An example of technical assistance is the *flood audit*, in which a specialist visits a property. Following the visit, the owner is provided with a written report detailing the past and potential flood depths and recommending alternative protection measures.

- 6. Environmental Education** - Education can be a great mitigating tool if people can learn what not to do before damage occurs. The sooner the education begins the better. Environmental education programs for children can be taught in the schools, park and recreation departments, conservation associations, or youth organizations. An activity can be as involved as course curriculum development or as simple as an explanatory sign near a river.

Education programs do not have to be limited to children. Adults can benefit from knowledge of flooding and mitigation measures; decision makers, armed with this knowledge, can make a difference in their communities.

II. EARTHQUAKES

A. Preventive

1. Planning/zoning to keep critical facilities away from fault lines
2. Planning, zoning and building codes to avoid areas below steep slopes or soils subject to liquefaction
3. Building codes to prohibit loose masonry overhangs, etc.

B. Property Protection

1. Acquire and clear hazard areas
2. Retrofitting to add braces, remove overhangs
3. Apply Mylar to windows and glass surfaces to protect from shattering glass
4. Tie down major appliances, provide flexible utility connections
5. Earthquake insurance riders

C. Emergency Services

1. Earthquake response plans to account for secondary problems, such as fires and hazardous material spills

D. Structural Projects

1. Slope stabilization

III. DAM FAILURE

A. Preventive

1. Dam failure inundation maps
2. Planning/zoning/open space preservation to keep area clear

3. Building codes with flood elevation based on dam failure
4. Dam safety inspections
5. Draining the reservoir when conditions appear unsafe

B. Property Protection

1. Acquisition of buildings in the path of a dam breach flood
2. Flood insurance

C. Emergency Services

1. Dam condition monitoring
2. Warning and evacuation plans based on dam failure

D. Structural Projects

1. Dam improvements, spillway enlargements
2. Remove unsafe dams

IV. WILDFIRES

A. Preventive

1. Zoning districts to reflect fire risk zones
2. Planning and zoning to restrict development in areas near fire protection and water resources
3. Requiring new subdivisions to space buildings, provide firebreaks, on-site water storage, wide roads, multiple accesses
4. Building code standards for roof materials and spark arrestors
5. Maintenance programs to clear dead and dry brush, trees
6. Regulation on open fires

B. Property Protection

1. Retrofitting of roofs and adding spark arrestors
2. Landscaping to keep bushes and trees away from structures
3. Insurance rates based on distance from fire protection

C. Natural Resource Protection

1. Prohibit development in high-risk areas

D. Emergency Services

1. Fire Fighting

V. WINTER STORMS

A. Prevention

1. Building code standards for light frame construction, especially for wind-resistant roofs

B. Property Protection

1. Storm shutters and windows
2. Hurricane straps on roofs and overhangs
3. Seal outside and inside of storm windows and check seals in spring and fall
4. Family and/or company severe weather action plan & drills:
 - include a **NOAA** Weather Radio
 - designate a shelter area or location
 - keep a disaster supply kit, including stored food and water
 - keep snow removal equipment in good repair; have extra shovels, sand, rock, salt and gas
 - know how to turn off water, gas, and electricity at home or work

C. Natural Resource Protection

1. Maintenance program for trimming trees and shrubs

D. Emergency Services

1. Early warning systems/NOAA Weather Radio
2. Evacuation plans

Appendix C: List of Contacts

NH Homeland Security & Emergency Management

Hazard Mitigation Section271-2231

Federal Emergency Management Agency (Boston)..... 877-336-2734

NH Regional Planning Commissions:

Central NH Regional Planning Commission226-6020

Lakes Region Planning Commission.....279-8171

Nashua Regional Planning Commission.....424-2240

North Country Council RPC.....444-6303

Rockingham Planning Commission.....778-0885

Southern New Hampshire Planning Commission.....669-4664

Southwest Region Planning Commission.....357-0557

Strafford Regional Planning Commission742-2523

Upper Valley Lake Sunapee RPC448-1680

NH Executive Department:

New Hampshire Office Energy & Planning271-2155

NH Department of Cultural Affairs.....271-2540

Division of Historical Resources271-3483

NH Department of Environmental Services.....271-3503

Air Resources271-1370

Waste Management271-2900

Water Resources.....271-3406

Water Supply and Pollution Control.....271-3434

Rivers Management and Protection Program.....271-8801

Bureau of Dams.....271-3503

NH Fish and Game Department271-3421

NH DRED.....271-2411

Natural Heritage Inventory271-3623

Division of Forests and Lands271-2214

Division of Parks and Recreation271-3556

NH Department of Transportation271-3734

US Department of Commerce:

National Oceanic and Atmospheric Administration:
National Weather Service; Gray, Maine..... 207-688-3216

US Department of Interior:

US Fish and Wildlife Service.....223-2541

US Geological Survey.....225-4681

US Department of Agriculture:

Natural Resource Conservation Service.....868-7581

New Hampshire State Police846-3333

Additional Websites of Interest

Natural Hazards
Research Center, U. of Colorado
<http://www.colorado.edu/hazards/>

National Emergency Management
Association
<http://nemaweb.org>

NASA-Earth Observatory
http://earthobservatory.nasa.gov/NaturalHazards/category.php?cat_id=12

NASA Natural Disaster Reference
Reference of worldwide natural
disasters
<http://gcmd.nasa.gov/records/NASA-NDRD.html>

National Weather Service
Weather Warnings, 60 Second Updates
<http://nws.noaa.gov>

FEMA, National Flood Insurance
Program, Community Status Books
<http://fema.gov/business/nfip/>

Florida State & NWS University
Atlantic
Hurricane Site
<http://www.met.fsu.edu/orgs/explores/>

National Lightning Safety Institute
List of Lightning Safety Publications
<http://lightningsafety.com>

NASA Optical Transient Detector
Space-based sensor of lightning strikes
<http://www.gr.ssr.upm.es/~jambrina/rayos/thunder.msfc.nasa.gov/otd.html>

LLNL Geologic & Atmospheric
Hazards
General Hazard Information
<https://www.llnl.gov/>

The Tornado Project Online
Recent tornado information & details
<http://www.tornadoproject.com/>

National Severe Storms Laboratory
Information & tracking of severe storms
<Http://www.nssl.noaa.gov/>
USDA Forest Service

Forest Fire & Land Management
Information
<http://www.fs.fed.us/fire>

Appendix D: Technical and Financial Assistance for Multi-Hazard Mitigation

FEMA's Hazard Mitigation Assistance (HMA) grant programs provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages. Currently, FEMA administers the following HMA grant programs⁷:

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

FEMA's HMA grants are provided to eligible Applicants (States/Tribes/Territories) that, in turn, provide sub-grants to local governments and communities. The Applicant selects and prioritizes subapplications developed and submitted to them by subapplicants. These subapplications are submitted to FEMA for consideration of funding. Prospective subapplicants should consult the office designated as their Applicant for further information regarding specific program and application requirements. Contact information for the FEMA Regional Offices and State Hazard Mitigation Officers is available on the FEMA website, www.fema.gov.

HMA Grant Programs

The HMA grant programs provide funding opportunities for pre- and post-disaster mitigation. While the statutory origins of the programs differ, all share the common goal of reducing the risk of loss of life and property due to Natural Hazards. Brief descriptions of the HMA grant programs can be found below. For more information on the individual programs, or to see information related to a specific Fiscal Year, please click on one of the program links.

A. Hazard Mitigation Grant Program (HMGP)

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

What is the Hazard Mitigation Grant Program?

The Hazard Mitigation Grant Program (HMGP) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. Authorized under Section 404 of the Stafford Act and administered by FEMA, HMGP was created to reduce the loss of life and property due to natural disasters. The program enables mitigation measures to be implemented during the immediate recovery from a disaster.

⁷ Information in Appendix E is taken from the following website and links to specific programs unless otherwise noted; <http://www.fema.gov/government/grant/hma/index.shtm>

Who is eligible to apply?

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

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

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

How are potential projects selected and identified?

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

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

For more information on the **Hazard Mitigation Grant Program (HMGP)**, go to: <http://www.fema.gov/government/grant/hmgp/index.shtm>

B. Pre-Disaster Mitigation (PDM)

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

Program Overview

The Pre-Disaster Mitigation (PDM) program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event.

Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

C. Flood Mitigation Assistance (FMA)

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

Program Overview

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

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

Types of FMA Grants

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

- Planning Grants to prepare Flood Mitigation Plans. Only NFIP-participating communities with approved Flood Mitigation Plans can apply for FMA Project grants
- Project Grants to implement measures to reduce flood losses, such as elevation, acquisition, or relocation of NFIP-insured structures. States are encouraged to prioritize FMA funds for applications that include repetitive loss properties; these include structures with 2 or more losses each with a claim of at least \$1,000 within any ten-year period since 1978.
- Technical Assistance Grants for the State to help administer the FMA program and activities. Up to ten percent (10%) of Project grants may be awarded to States for Technical Assistance Grants

D. Repetitive Flood Claims (RFC)

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

Program Overview

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

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

Federal / Non-Federal Cost Share

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

E. Severe Repetitive Loss (SRL)

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

Program Overview

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

Definition

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

- (a) That has at least four NFIP claim payments (including building and contents) over \$5,000 each, and the cumulative amount of such claims payments exceeds \$20,000; or
- (b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

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

Purpose:

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

Federal / Non-Federal cost share:

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