KEENE HAZARD MITIGATION PLAN UPDATE 2025

Keene, New Hampshire

Prepared by the:
City of Keene
&
Southwest Region Planning Commission

CITY OF KEENE
NEW HAMPSHIRE

HOMELAND SECURITY
EMERGENCY MANAGEMENT
NEW HAMPSHIRE DEPARTMENT OF SAFETY

SWRPC

FEMA

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1 JURISDICTION INFORMATION

Keene Hazard Mitigation Plan Update is a single-jurisdiction local hazard mitigation plan for the City of Keene, New Hampshire.

The City has received FEMA approval for previous versions of the plan:

Table 1 Jurisdiction Information

Title	FEMA Approval Date
Keene Hazard Mitigation Plan Update 2018	August 14, 2018
Keene Hazard Mitigation Plan Update 2013	February 26, 2013

The City of Keene received funding through the Federal Emergency Management Agency Hazard Mitigation Grant Program 4516 to perform the update.

2 EXECUTIVE SUMMARY

The Keene Hazard Mitigation Plan serves as a tool to reduce or minimize future losses from natural or man-made hazard events before they occur. The Plan was developed by the City, through a planning team, and contains statements of policy adopted by the City Council in Adoption Documentation.

Mission Statement: *To foster, promote, and implement actions to eliminate or reduce the risk to human life and property from the effects of identified natural and manmade hazards.*

1.1 NATURAL HAZARDS

Natural hazards are addressed as follows:

- Flooding
- Drought
- Extreme Temperatures
- Wildfire
- Lightning Strikes
- Tornado Wind, Downburst, Severe Wind
- Hurricane/Tropical Storm
- Earthquake
- Severe Winter Weather
- Erosion/Landslide
- Hazardous Materials Spills
- Dam Failure
- Infectious Disease (new)
- Solar Storms & Space Weather (new)

2.1 CRITICAL FACILITIES (COMMUNITY LIFELINES)

The planning team identified critical facilities and other assets using FEMA's Community Lifelines categories listed below. For more information, see Community Assets.

- **Safety and Security** - Law Enforcement/Security, Fire Service, Search and Rescue, Government Service, Community Safety
- **Food, Hydration, Shelter** - Food, Hydration, Shelter, Agriculture
- **Health and Medical** - Medical Care, Public Health, Patient Movement, Medical Supply Chain, Fatality Management
- **Energy** - Power Grid, Fuel
- **Communications** - Infrastructure, Responder Communications, Alerts Warnings and Messages, Finance, 911 and Dispatch
- **Transportation** - Highway/Roadway/Motor Vehicle, Mass Transit, Railway, Aviation, Maritime
- **Hazardous Materials** - Facilities, HAZMAT, Pollutants, Contaminants
- **Water Systems** - Potable Water Infrastructure, Wastewater Infrastructure

2.2 Existing Programs

The Keene Hazard Mitigation Planning Team identified existing hazard mitigation programs as follows. For more information, see Existing Programs.

- Local Emergency Operations Plan
- Zoning Ordinance
- Building Code
- Fire Code
- Natural Resources Protection Ordinance
- Elevation Certificates Maintained
- Community Rating System
- National Flood Insurance Program
- Floodplain Development Ordinance
- Emergency Notification System
- Land Development Regulations
- Public Improvement Standards
- Bridge Maintenance Program
- Storm Drain/Culvert Maintenance Program
- Dam Emergency Action Plans
- Shoreland Protection Program
- Hazard Materials Plan/Team
- Public Education Programs
- Tree Maintenance
- Comprehensive Master Plan
- Capital Improvements Program
- Shelters with Emergency Back-up Power
- Mitigation Grants
- Climate Change Adaptation Plan
- Climate Change Action Plan
- Water Emergency Plan
- Water Supply Shortage Plan
- Land Development Code

2.3 Mitigation Priorities

The 2025 Keene Hazard Mitigation Planning Team prioritized previously identified and new strategies. For more information, see Development and Update of Strategy and Actions.

- Continue outreach efforts to homeowners on the benefits of NFIP and encourage participation in the program.
- Continue to enforce NFIP by requiring elevation certificates.
- Tanglewood Estates: Develop a program to assess flood risks and potential secondary hazards for the approximate 80 manufactured homes in the 100-year floodplain. Seek ways

to fund a manufactured home mitigation program to ensure homes and fuel tanks are securely anchored in place.

- Develop and maintain Continuity of Operations Plan (COOP) for the City Departments.
- Continue Incident Command System (ICS) training for all staff.
- Conduct tabletops, drills and exercises for all hazards.
- Implement emergency notification systems (i.e. reverse notification, social media and City website) to educate and prepare residents, businesses and others.
- Update communications and data equipment to ensure inter-operability for all City personnel.
- Obtain alternative energy back-up systems for critical facilities and infrastructure.
- Update the Emergency Operations Plan.
- Road and Bridge Repair: many bridges are red listed and need to be replaced. Repair or replace culverts & bridges associated with road flooding as identified by City Public Works (PWD).
- Develop strategies to acquire the necessary rights for the following properties and others that may be identified for the purpose of protecting and preserving floodplain storage:
    - Realities Inc. parcel - behind Hannaford
    - Parcel along Ashuelot - south of Tanglewood
    - Beaver Brook north of NH 101
    - Pearl Street parcel
    - Silent Way/Lower Main Street parcel
    - Wyman Road parcel
    - Lower Production Avenue
- Evaluate and floodproof, if necessary, Court Street Lift Station, Martell Court Pump Station, Bradco Lift Station and Well numbers one and four.
- Continue to review, update and obtain additional GIS data layers, specifically digital orthophotos, to be used for natural and human-caused hazard mitigation planning.
- Modification of Beaver Brook Bridges: In 1994, the Soil Conservation Service suggested that removal of flow constrictions caused by bridges could significantly reduce flooding, without causing additional problems downstream. Initial grant funds would be used for an engineering study to validate the impacts of this approach. Subsequent grants would be applied for to fund bridge modification.
- Annually review and update the floodplain development ordinance.
- Increase participation to develop and sustain a community outreach program to discuss mitigation and emergency preparedness with schools, businesses, the hospital, and colleges.
- Implement recommendations and projects identified in the Beaver Brook Escherichia coli Impairment Investigation and Remediation, and Habitat Restoration Project.
- Implement projects as identified in the Keene Comprehensive Master Plan.
- Implement strategies in the Climate Change Adaptation Plan.
- Update and continue enforcement of building codes.
- Collect data and install remote monitoring equipment at Three Mile Reservoir, Babbidge, Woodard and Robin Hood Dams.

- Continue annual exercising & updating of all Emergency Action Plans for all dams.
- Review and update road and utility design standards.
- Update and continue enforcement of fire codes.
- Implement stormwater-related programs from the Capital Improvement Plan.
- Develop a grant program Offer grants to retrofit older buildings for improved resilience by improving minimum safety standards, heating, ventilation, air conditioning, electrical panels and fuel storage.
- Continue ongoing update of the Hazardous Materials Plan and training of the team.
- Three Mile Reservoir: Existing impoundment at Three Mile Swamp is rated to mitigate against 10-to-25-year storm event. Assess feasibility to enlarge storage capacity to reduce flood potential in the Beaver Brook watershed.
- Develop and promote an education and outreach program focused on improving awareness of risks and prevention of infectious diseases.
- Develop and implement a citywide tree maintenance program.
- Partner with local and regional organizations to promote vaccination campaigns, especially in schools, community centers, and other high-traffic areas.
- Develop and conduct public outreach on the inundation pathway for High Hazard Dams and develop emergency evacuation strategies for properties within the pathway.

3 ADOPTION DOCUMENTATION

CITY OF KEENE
NEW HAMPSHIRE

CERTIFICATE OF ADOPTION
KEENE, NEW HAMPSHIRE
A RESOLUTION ADOPTING THE
KEENE HAZARD MITIGATION PLAN UPDATE 2025

WHEREAS, City Council recognizes the threat that natural hazards pose to people and property within the City of Keene; and

WHEREAS the City of Keene has prepared a multi-hazard mitigation plan, hereby known as Keene Hazard Mitigation Plan Update 2025 in accordance with federal laws, including the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended; the National Flood Insurance Act of 1968, as amended; and the National Dam Safety Program Act, as amended; and

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

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

WHEREAS, adoption of this Plan will make the City of Keene eligible for funding to alleviate the impacts of future hazards; now therefore the Keene City Council adopted the Keene Hazard Mitigation Plan Update 2025 on June :

1. The Plan is hereby adopted as an official plan of the City of Keene;
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.

Approved and signed, this 8th day of July, 2025.

Elizabeth A. Ferland, City Manager
City of Keene, NH

CITY OF KEENE
EMERGENCY MANAGEMENT

3 Washington Street
Keene, NH 03431

(603) 357-9804
KeeneNH.gov

Replace with image of FEMA final approval letter

4 BACKGROUND - COMMUNITY PROFILE

4.1 INTRODUCTION TO HAZARD MITIGATION AND THE PLAN UPDATE

The City of Keene Hazard Mitigation Plan Update serves as a critical tool to enhance the city's resilience against natural and human-made hazards. This plan identifies potential risks, assesses vulnerabilities, and outlines strategies to mitigate the impacts of disasters, ensuring the safety of residents, protection of infrastructure, and continuity of essential services. By updating the plan regularly, Keene aligns with federal and state requirements, maintains eligibility for hazard mitigation funding, and adapts to emerging threats influenced by climate change, development patterns, and evolving risk factors.

This update builds on previous planning efforts and incorporates input from city officials, emergency responders, stakeholders, and the community to create a comprehensive and actionable framework for hazard preparedness. It emphasizes proactive measures, such as infrastructure improvements, land use planning, and emergency response coordination, to reduce long-term risks and enhance the city's ability to recover from disasters. Through this process, Keene reaffirms its commitment to fostering a safer, more resilient community.

4.2 LOCATION INFORMATION AND GEOGRAPHY

The City of Keene is located in the central portion of Cheshire County in southwestern New Hampshire. It is bordered by the Towns of Surry and Gilsum to the north, the Town of Sullivan to the northeast, the Town of Roxbury to the east, the Town of Swanzey to the south, the Town of Chesterfield to the southwest, and the Town of Westmoreland to the west. Keene constitutes both the population and economic center of its region. The City is home to the regional hospital, Cheshire Medical Center/Dartmouth Hitchcock Keene, maintains the regional middle school and high school, Supervisory Administrative Unit 29, serves as the County seat, hosts the regional correctional facility, and is home to Keene State College, Antioch University and River Valley Community College. Keene is the economic center for the region and has four State highways, NH Rt 9/10/12/101, that converge within its borders.

The land of Keene is flat with surrounding hilly terrain with the most populated areas located at the bottom of the valley floor and has been referred to as a "bathtub." The City is comprised of five watersheds, the Ashuelot River, Beaver Brook, Black Brook, Ash Swamp Brook and Otter Brook. The floodplain of the Ashuelot River and Beaver Brook has very heavy residential and commercial development. The drainage area of the city is extremely flat. There are two federal flood control projects operated by the US Army Corp of Engineers, Surry Mountain Lake Dam in the Town of Surry and Otter Brook Dam in Keene and Town of Roxburt and one City control flood dam, Three Mile Reservior, that affects the City of Keene. The Ashuelot River is the principal water body in Keene. It is controlled by Surry Mountain Lake Dam, which is a federal flood control dam. The dam is located north of Keene, just above the Keene-Surry boundary, and controls flood flows from a 100-square mile drainage area. The other federal flood control facility is the Otter Brook Dam which is located to

the east in the Keene and Town of Roxbury. The third flood control project is the Three Mile Reservior Dam which is owned by the City of Keene, located in the upper northeast area of the City, and controls water in the Beaver Brook. The Ashuelot River flows south through Keene and collects runoff from the City of Keene stormwater system and from Beaver Brook, an additional 13-square mile drainage area and also collects water from the City's stormwater system, before being joined by the Branch River at Martell Court. Ash Swamp Brook joins the Ashuelot River further downstream, south of the Keene-Swanzey boundary.

4.3 DEMOGRAPHICS

Population Trends

The next table and the corresponding chart show the population trend that has occurred in Keene between 1970 and 2023**.** It shows a steady increase between 1970 and 1990, followed by a decade of decline. The rate picks back up between 2000 and 2010 to a similar rate as the 1970-1980 growth period and again declines between 2010 and 2020. It should be noted, however, that the last figure represents a 3-year period which is different from other figures shown. A more accurate representation of the decade will be shown in the 2030 census. It should be noted that since the City is the commercial and business center for the County its daytime population approximately doubles to approximately 50,000.

Table 2 Population Trend 1970 to 2023 (NH Employment Security)

1970	1980	1990	2000	2010	2020	2023
20,467	21,449	23,081	22,569	23,526	22,943	22,917
---	+4.8%	+7.6%	-2.2%	+4.2%	-2.5%	-0.1%

Population Projections

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

The New Hampshire Office of Planning and Development (NH OPD) prepares population projections every five years for each community in New Hampshire. The projections for Keene are presented below in five-year intervals up to the year 2050, beginning with the census count from the year 2020. Using these projections, Keene is expected to experience a slight decrease in population with an overall decline in population of 4.6% by 2050.

Keene Population Projections

Table 3 Population Projections (NH OPD)

2020	2025	2030	2035	2040	2045	2050	% Change 2020-2050
23,047	23,156	23,340	23,263	22,943	22,480	21,989	-4.6%

Source: NH Office of Planning and Development

Current Development Trends

The City of Keene's land use distribution is shown in the pie chart. The overall land use distribution has not changed appreciably over the past decade. Brownfield development and redevelopment of vacant buildings has been a priority. Focus for commercial development has been on infill development around the downtown area.

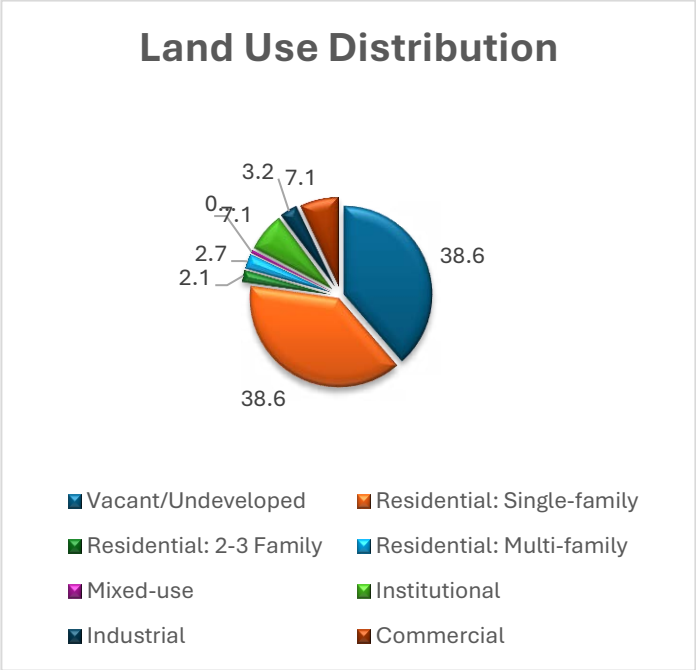


Figure 1 Land Use Distribution (2010 Keene Comprehensive Master Plan)

The chart shows that single family housing has the largest proportion of land and is equal to the vacant or undeveloped land (both with 38.6%). The next greatest land use is institutional (schools, churches, gov't.) and commercial, both with 7.1% of the total land area. As noted in the Community Description, the City is home to 3 colleges/universities as well as public and private regional schools (pre-k through 12).

The next table shows the trend in the number of housing units in Keene between 1970 and 2020. The largest increase in the number of housing units occurred between 1970 and 1980 with a 20.3% increase. The rate of increase has hovered around 5% since then. This is a similar trend seen throughout the southwest region of New Hampshire.

Trend in Number of Housing Units 1970 - 2020 (US Census Data)

Table 4 Housing Units 1970 - 2020

	1970	1980	1990	2000	2010	2020	Change 1970-2020

Housing Units	6,597	7,934	8,841	9,295	9,719	10,297	3,700
% Change	-----	+20.3%	+10.3%	+5.1%	+4.6%	+5.9%	+50.9%

Source: US Census Bureau

4.4 CONSIDERATION FOR DEVELOPMENT

Several factors have played, and will continue to play, an important role in the development of Keene. These include: the existing development pattern and availability of land for future development; the present road network; physical factors such as steep slopes, floodplains, poor soil conditions, land set aside for conservation, and the availability of utilities such as public water and sanitary sewers. These factors have an impact, both individually and cumulatively, on where and how development occurs.

Future development in Keene should take into consideration the use of best management practices for all types of potential hazards. Included in this is proper site selection, erosion controls, underground utilities, access, building construction materials and methods, as well as others.

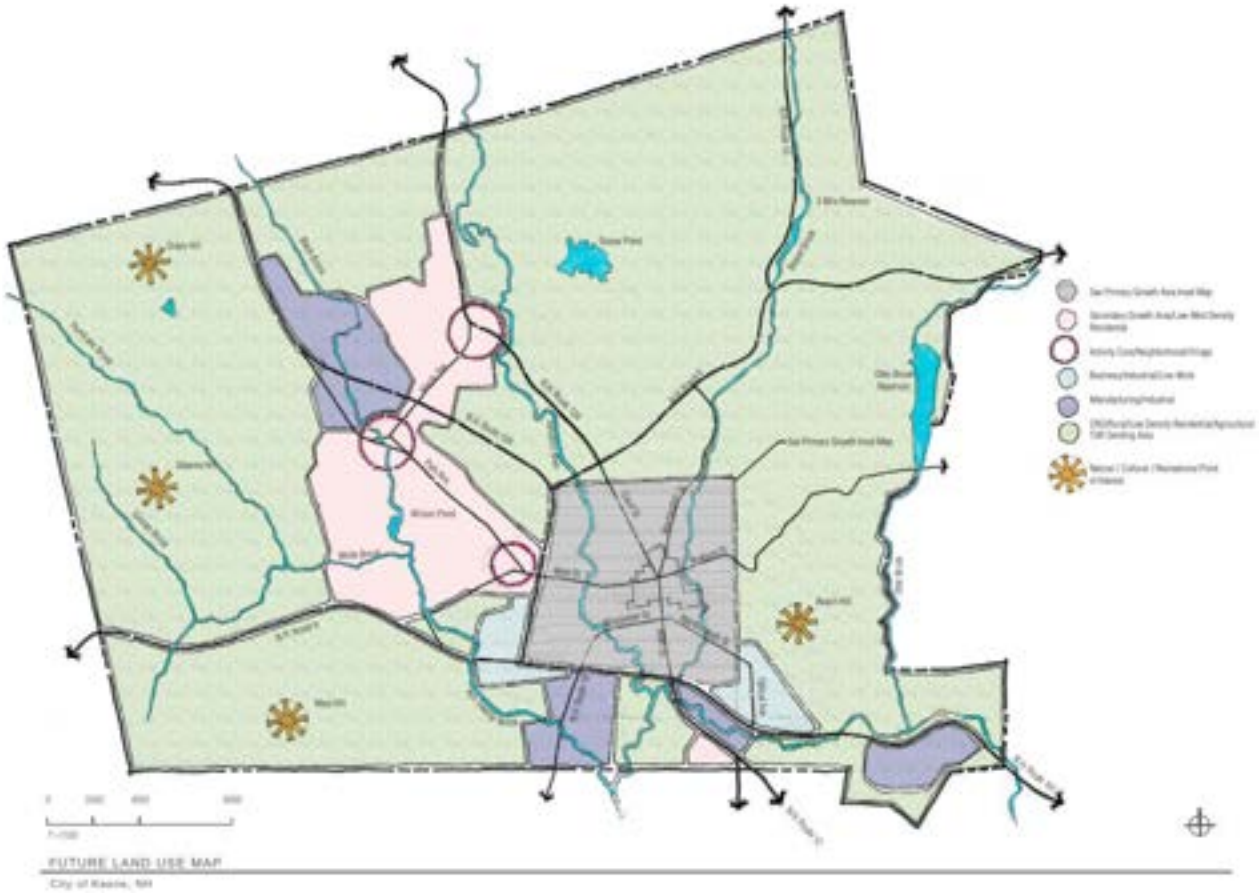
4.4.1 Future Land Use

The Future Land Use Map from the Keene Comprehensive Master Plan (2010) is an illustrated community vision for the future that will guide Keene's physical growth and change. This map provides the city with a basis for making consistent decisions on capital investments, and it is a tool for potential developers to use in creating their development proposals.

The Future Land Use Map shows:

- The concentration of high-density, mixed-use development and high-to-medium density neighborhoods in the urbanized area within the Bypass; noted as the primary growth area on the map;
- Secondary growth areas that consist of single-family, low to medium density development; and
- Expansion of mixed-use areas for commercial and industrial economic development.

Figure 2 Future Land Use Map



4.5 National Flood Insurance Program (NFIP) Participation

The City is currently participating in the National Flood Insurance Program (NFIP). The community has digital Flood Insurance Rate Maps (FIRM) dated May 23, 2006. FEMA has released Preliminary updated flood maps for Keene. Their finalization will not be finished for inclusion in this plan update. According to FEMA, there is a total of 186 NFIP policies including 62 single-family, 55 other residential, and 69 non-residential. This is a decrease from 303 reported in the previous Plan. There have been 179 paid losses totaling $5,618,214 since 1978. There are 141 policies for structures located in a 100-year floodplain. The most recent Community Assistance Visit with FEMA and the New Hampshire Office of Planning and Development was April 26, 2022.

The City has been a participating member of the Community Rating System (CRS) since 2002. The CRS is a voluntary program for NFIP participating communities. The goals of the CRS are to reduce flood damages to insurable property and strengthen and support the insurance aspects of the NFIP. The City is currently classified as a class 8, offering a 10% discount to all NFIP policy holders in the City of Keene. The City will continue to uphold programs and regulations in order to maintain this CRS classification.

4.5.1 Continued Compliance with NFIP Requirements

The City of Keene acknowledges the importance of maintaining requirements set forth in the NFIP. As such, the city took steps related to continued compliance with the program that will help to reduce or eliminate the potential for loss of life and property due to flooding. The following actions have been taken since the previous Hazard Mitigation Plan:

- Beaver Brook Sediment Removal from Beaver Street to NH Rte. 101, 2013;
- Removed debris and material to restore a wetland area in the Woodland/Greenlawn Cemetery to increase flood storage;
- Developed a program to assess flood risks and potential secondary hazards for the approximate 80 mobile homes in the 100-year floodplain;
- Maintained and replaced undersized culverts;
- Continued enforcement of the Floodplain Development Ordinance; and
- Continued enforcement of the Building and Zoning Ordinances.

The implementation of these actions as well as others have helped improve Keene's risk of death or injury, and structural damage, from severe weather events. As the intensity in storm events increases, additional actions may need to be added during the annual review or the five year update.

The City of Keene Floodplain Administrator is responsible for making determinations of substantial improvement and substantial damage as defined in Article 24.6 of the City of Keene, NH Land Development Code.[1] These determinations are made for all development in a special flood hazard area that proposes to improve an existing structure including alterations, movement, enlargement, replacement, repair, additions, rehabilitations, renovations, repairs of damage from any origin (such as, but not limited to flood, fire, wind, or snow) and any other improvement of or work on such structure including within its existing footprint.

The Floodplain Administrator, in coordination with any other applicable community official(s), shall be responsible for the following:

Determine if a substantial damage (SD) determination needs to be made and communicate SD and permit requirements to property owners.
Verify the cost of repairs to the structure.
Verify the market value of the structure.
Make the SD determination and issue it to the property owner.
Permit development / ensure compliance with community ordinance.
Inspect development and maintain as-built compliance documentation post construction.

[1] https://keenenh.gov/wp-content/uploads/2025/04/Land-Development-Code_Amended-February-2025.pdf

5 PLANNING PROCESS

5.1 PURPOSE, AUTHORITY, AND BACKGROUND

The Keene Hazard Mitigation Plan Update 2025 is a planning tool to be used by the City of Keene, as well as other local, state and federal governments, in their efforts to reduce the effects from natural and man-made hazards. By maintaining an updated Hazard Mitigation Plan, the City is eligible to receive grant funding for mitigation projects.

The scope of this Plan includes the identification of past and potential natural and manmade hazards affecting the City of Keene, the determination of vulnerability of existing and future structures to the identified potential hazards, and the identification and discussion of new strategies aimed at mitigating the likely effects of potential hazards before they occur.

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

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

5.2 BUILDING SUPPORT: COMMUNITY INVOLVEMENT, ROLES, RESPONSIBILITIES

Using the Local Hazard Mitigation Planning Handbook, the Keene Hazard Mitigation Planning Team developed the content of the Keene Hazard Mitigation Plan 2025 Update by following tasks set forth in the handbook. The Team held meetings to develop the Plan were held at City Hall on January 6, February 5, March 5 and April 29 of 2025.

New Hampshire's approach to hazard mitigation planning features what are called single-jurisdiction plans developed town-by-town and city-by-city. The following Planning Team participants in the plan update represented the City of Keene and Cheshire Medical Center.

Table 5 City of Keene Planning Team Participants

Name	Title, Agency
Kürt Blomquist	Emergency Management Director, City of Keene
Michael Hagan	Code Enforcement Officer, Floodplain Administrator, City of Keene
Carrah Fisk-Hennessey	Parks and Recreation Director, City of Keene
Rebecca Landry	Deputy City Manager, City of Keene
Jason Martin	Fire Chief, City of Keene
Michael Kopcha	Police Captain, City of Keene

Name	Title, Agency
Duncan Watson	Assistant Public Works Director, City of Keene
William Schoefmann	GIS Coordinator, City of Keene
Ryan Hornblower	Manager of EMS and Emergency Management, Cheshire Medical Center

5.3 UNDERSTANDING KEENE'S RISKS

5.3.1 Resources Used in Plan Preparation

In addition to the Handbook that was used as a framework for this plan, additional resources used included the Keene Hazard Mitigation Plan (2018), Keene Comprehensive Master Plan (2010), the FEMA Community Information System website (to obtain data about the town's National Flood Insurance Program status), the New Hampshire State Hazard Mitigation Plan 2023 Update, and a number of resources identified in Appendix C.

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

New Hampshire Homeland Security and Emergency Management:

33 Hazen Drive
Concord, NH 03305
1-800-852-3792

Stakeholder Liaison: Scott Lambertson
State Hazard Mitigation Planner: Lynne Doyle

New Hampshire Department of Transportation:

Frank Linnenbringer (District 4)
Swanzey, NH
603-352-2302

Eversource Utility:

Joseph Hoebeke, Community Development/ Economic Development Western NH
19 Production Avenue
Keene NH, 03431
1-603-765-1595

New Hampshire Department of Environmental Services-Dam Bureau:

Steve N. Doyon, Administrator of the Dam Safety Bureau
603- 271-8699

5.3.2 Stakeholder and Public Input

The City hosted a number of public meetings associated with the project. A Public Workshop was hosted on February 27, 2025, to inform the public and stakeholders about the plan update and to gather feedback from members of the public regarding hazards of concern, hazard event locations (both past and probable), and action items for the City to consider in its mitigation planning. This event was attended by Planning Team members, City Councilors, and community members. The public workshop was advertised on the local radio station, the City's social media, a City press release, the City calendar, the SWRPC's bi-weekly newsletter *Happenings*, the SWRPC website as featured news and the SWRPC calendar. Public input from this workshop included concerns about flooding, erosion, ice storms, wildfires, severe wind events, and extreme heat within the city. Meeting materials, community member feedback, newsletters and public meeting notices are included in Appendix D.

The EMD and consultants met with the City's IT team on February 12, 2025, to conduct a cyber-security vulnerability assessment. The EMD and consultants met with the Assistant Public Works Director for Utilities to discuss emerging contaminants and threats to the City's water supply on February 19, 2025. Comments from stakeholders and the public informed the development of this plan update.

A public opinion survey was promoted using the City's Flash Vote panel March 12 through 14, 2025. The survey gathered input from 262 individuals. The survey and results are contained in Appendix D.

A second public meeting was held on June 11, 2025, to present the draft plan update to the City Council's Planning, License and Development Committee. A public comment period regarding the updated plan was open from May 14 to June 13, 2025. The draft plan was posted to SWRPC's website and made available in-person at the City's Public Works Department for the duration of the comment period. No comments were received during this period. Additional public meetings were held during the plan update on June 19, 2025, with City Council and on February 4, 2025, with the Master Plan Steering Committee. Meeting agendas and other information are contained in Appendix D.

5.4 Updating Mitigation Strategy

5.4.1 Identification and Review of Goals, Actions, Priorities, Changes, Progress

The Keene Hazard Mitigation Planning Team reviewed the goals set forth in the New Hampshire State Hazard Mitigation Plan 2023 Update. The Team generally concurs with those goals and has amended them to better align them with current goals of the City.

The overall Goals of the City of Keene with respect to Hazard Mitigation are stipulated here:

1. To improve upon the protection of the general and underserved populations, the citizens and businesses of the City of Keene and visitors, from all natural and man-made hazards.

2. To reduce the potential impact of natural and man-made disasters on the City of Keene's emergency response services, critical facilities, and infrastructure.

3. To reduce the potential impact of natural and man-made disasters on the City of Keene's economy, natural resources, historic/cultural treasures, and private property.

4. To improve the City of Keene's emergency preparedness; disaster response and recovery capability; continuity of operations; and interoperability.

5. To reduce the City of Keene's risk with respect to natural and man-made hazards through outreach and education.

6. To identify, introduce and implement cost-effective hazard mitigation measures so as to accomplish the City's Goals and Objectives and to raise the awareness of and acceptance of hazard mitigation opportunities generally.

7. To address the challenges posed by climate change as they pertain to increasing risks to Keene's infrastructure, economy, and natural environment.

8. To work in conjunction and cooperation with the surrounding communities and the State of New Hampshire's Hazard Mitigation Goals.

5.5 Bringing the Plan to Life

5.5.1 Method Responsibilities & Schedule

Adoption

A copy of the resolution can be found in Adoption Documentation. Adopted policy addresses the actions for implementation set forth in the prioritized implementation schedule (action plan) in Mitigation Strategy and in the "Monitoring & Updates" below. All other sections of this Plan are supporting documentation for information purposes only and are not included as the statement of policy.

Monitoring & Updates

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

In order to track progress and update the mitigation strategies identified in the Action Plan (Section 7), it is recommended that the City revisit the Keene Hazard Mitigation Plan annually, or after a hazard event. The Emergency Management Director is responsible for initiating this review and needs to consult with City staff in order to track progress and update the Prioritized Project List according to Appendix H: Project Status Sheet. Changes should be made to the plan to

accommodate for projects that have failed or are not considered feasible after a review for their consistency with the timeframe, the city's priorities, and funding resources. Priorities that did not make the implementation list, but identified as potential mitigation strategies, should be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation. The City of Keene, NH Hazard Mitigation Plan must be reviewed, revised as appropriate, and resubmitted to NH HSEM for approval every five years in order to maintain eligibility for all Hazard Mitigation Assistance (HMA) funding.

Evaluating

In order to assess the effectiveness of the Mitigation Strategy in meeting Hazard Mitigation Goals, the City will review Hazard Mitigation Goals annually, or during the next plan update. These steps may be completed in conjunction with tracking the progress of Mitigation Strategies identified in the Action Plan or separately. The Emergency Management Director is responsible for initiating this review. Evaluation may consist of a review each of the Plan's goals (Section 5.4.1) and documenting: revisions to, or new Goals to consider; a rating of the effectiveness of ongoing Action Plan and Potential Strategies towards Hazard Mitigation Goals; a rationale describing the rating Appendix H: Project Status Sheet.

5.5.2 Continued Public Involvement

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

- Provide invitations to City Council members;
- Provide invitations to city department heads;
- Post notices of meetings at the City Hall, and the City website;
- Use of the City's social media accounts;
- Local Public Radio, and;
- Public notices in the local newspapers.

A number of Implementation Action items which will be undertaken relate to public education and involvement. Additionally, the public will be invited to participate in the process of updating the Keene Hazard Mitigation Plan. These outreach activities will be undertaken during the Plan's periodic review and during any Hazard Mitigation Planning Team meetings the Emergency Management Director or City Council calls to order.

6 Risk Assessment

6.1 Defining Risk and Methodology

Keene can be impacted by a variety of natural and man-made or technological hazards. These include:

- Drought
- Earthquake
- Erosion / Landslide
- Extreme Temperatures
- Inland Flooding
- Infectious Disease
- Lightning
- Severe Wind
- Severe Winter Weather
- Solar Storms & Space Weather
- Tropical Cyclone
- Wildfire
- Aging Infrastructure
- Conflagration Cyber Event
- Hazardous Materials (Fixed & Transport)
- Known and Emerging Contaminants
- Long Term Utility Outage
- Mass Casualty Incident
- Radiological
- Transport Accident
- Terrorism / Violence

The 2025 Plan Update includes newly identified natural hazards of infectious disease, and solar storms and space weather. Extreme cold has been recategorized with extreme temperatures, previously it was included in severe winter weather. Newly identified technological or human caused hazards include aging infrastructure, cyber events, and known and emerging contaminants. The occurrence of other disasters such as avalanche and subsidence are not common and are, therefore, not included in this Plan. The hazards that carry a greater risk locally include flood, hurricane/tropical storm, severe winter weather, tornado/downburst/severe wind, lightning strikes, extreme temperatures, and hazardous materials spills.

Hazard events were researched using a wide variety of sources. Sources and techniques included input from City staff and long-time residents of Keene; gathering information from the State of New Hampshire Hazard Mitigation Plan; and gathering information from governmental and non-profit web sites. The following is a list of natural and manmade disasters, and the areas affected by them, that have occurred locally, regionally or within the state. The Past and Potential Hazards Map reflects the contents of this list where data was available. Each natural hazard profiled includes the hazard description, location, extent, previous occurrences, probability of future events, and the impact of climate change on future events.

6.2 Significant Events Since Last Plan Update

Significant events since the previous plan update are contained within each hazard profile in Understanding Keene's Risks. The following list shows all Disaster Declarations that have occurred in the state since the last plan update as presented on FEMA.gov.[1]

New Hampshire Severe Storm and Flooding (DR-4812-NH)

Incident Period: July 10, 2024 - July 13, 2024

Major Disaster Declaration declared on August 20, 2024

New Hampshire Severe Winter Storm and Flooding (DR-4799-NH)

Incident Period: April 3, 2024 - April 5, 2024

Major Disaster Declaration declared on July 10, 2024

New Hampshire Severe Storms and Flooding (DR-4771-NH)

Incident Period: January 9, 2024 - January 14, 2024

Major Disaster Declaration declared on April 19, 2024

New Hampshire Severe Storm and Flooding (DR-4761-NH)

Incident Period: December 17, 2023 - December 21, 2023

Major Disaster Declaration declared on February 27, 2024

New Hampshire Severe Storms and Flooding (DR-4740-NH)

Incident Period: July 9, 2023 - July 17, 2023

Major Disaster Declaration declared on September 14, 2023

New Hampshire Severe Storm and Flooding (DR-4693-NH)

Incident Period: December 22, 2022 - December 25, 2022

Major Disaster Declaration declared on March 15, 2023

New Hampshire Severe Storm and Flooding (DR-4624-NH)

Incident Period: July 29, 2021 - August 2, 2021

Major Disaster Declaration declared on October 4, 2021

New Hampshire Severe Storm and Flooding (DR-4622-NH)

Incident Period: July 17, 2021 - July 19, 2021

[1] Disasters and Other Declarations | FEMA.gov

Major Disaster Declaration declared on September 30, 2021

New Hampshire Covid-19 Pandemic (DR-4516-NH)

Incident Period: January 20, 2020 - May 11, 2023

Major Disaster Declaration declared on April 3, 2020

New Hampshire Covid-19 (EM-3445-NH)

Incident Period: January 20, 2020 - May 11, 2023

Emergency Declaration declared on March 13, 2020

New Hampshire Severe Storm and Flooding (DR-4457-NH)

Incident Period: July 11, 2019 - July 12, 2019

Major Disaster Declaration declared on August 15, 2019

New Hampshire Severe Storm and Flooding (DR-4370-NH)

Incident Period: March 2, 2018 - March 8, 2018

Major Disaster Declaration declared on June 8, 2018

New Hampshire Severe Winter Storm and Snowstorm (DR-4371-NH)

Incident Period: March 13, 2018 - March 14, 2018

Major Disaster Declaration declared on June 8, 2018

New Hampshire Severe Storm and Flooding (DR-4355-NH)

Incident Period: October 29, 2017 - November 1, 2017

Major Disaster Declaration declared on January 2, 2018

6.3 NATURAL HAZARDS

The following list describes hazards that have occurred or have the potential to occur in the City of Keene. The descriptions provided are those used in the State of NH Hazard Mitigation Plan 2023 Update.

6.3.1 Drought

Description

A drought is a period of dryness in a region that occurs as a result of below-average precipitation received. Droughts can be further classified as follows:

- Meteorological drought: a deficit in precipitation over a period-of-time compared to some historical norm.
- Agricultural drought: when crops become affected by drought conditions.
- Hydrological drought: the occurrence of below normal stream flows, surface water levels, and groundwater levels as a result of meteorological drought.
- Socioeconomic drought: when economic supply and demand is negatively impacted by drought (NOAA, n.d.).

Location

Keene has had experience with severe drought conditions. Drought will increase the risk for wildfires, especially in forested areas. Drought could affect wells and irrigation in Keene.

Extent

One measure of the extent (or relative intensity) of drought is the Palmer Drought Severity Index[2]. Below is the Intensity Scale that is used with the Palmer Drought Severity Index to describe the observed impact with each category.

Figure 3 Palmer Drought Severity Index

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

Source: NOAA

[2] Climate Prediction Center - Weekly Palmer Drought and Crop Moisture Data Products Explanation

Standardized Precipitation Index (SPI) can also be used as an indicator for the severity of drought over different timescales. It is used to describe both wet and dry conditions based on precipitation.[3] The scale is based on a range of values (i.e. standard deviations away from normal) from extremely dry (-2 standard deviations) to extremely wet (+2 standard deviations).

Table 6 Standardized Precipitation Index (SPI)[4]

SPI	Probability	Interpretation
> 2.0	2%	Extremely Wet
1.5 to 2.0	4%	Moderately Wet
1.0 to 1.5	9%	Wet
-1.0 to +1.0	68%	Normal
-1.5 to -1.0	9%	Dry
-2.0 to -1.5	4%	Moderately Dry
<-2.0	2%	Extremely Dry

***Previous Occurrences*[5]**

Table 7 Previous Occurrences of Drought in Cheshire County

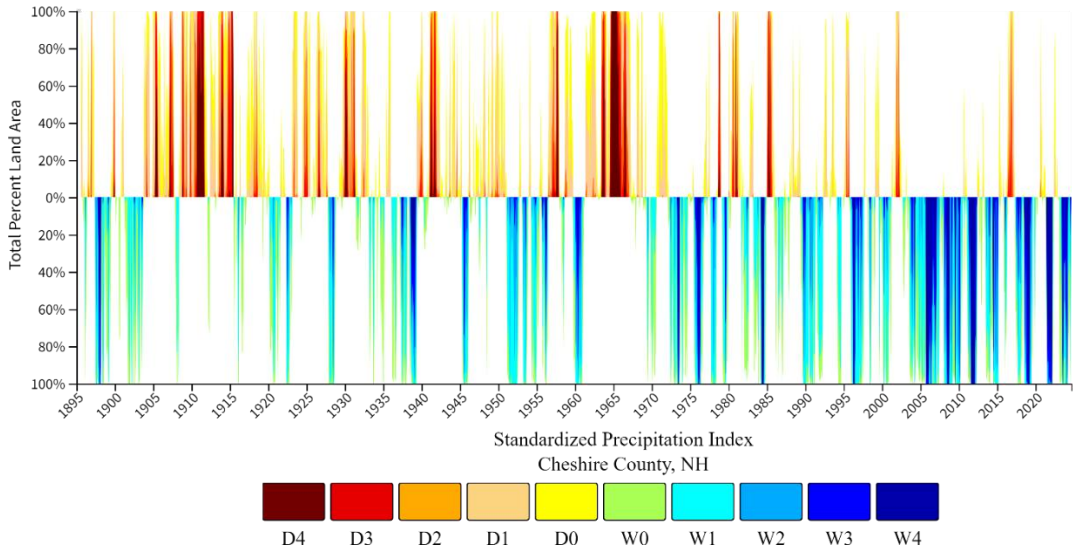
Date(s)	Event Description	Impacts	Location	Other Information
9/1/2022 - 9/30/2022	Drought (D1-D3)	No damages, injuries or deaths were reported	Cheshire County	On August 30th drought monitor, Cheshire County was 7% in extreme drought, 54% severe drought, 39% moderate drought. By the end of the month, 60% of the county was in moderate drought and 48% abnormally dry. A USDA Disaster Designation for drought was applied to Cheshire County.
8/1/2022 - 8/31/2022	Drought (D1-D2)	No damages, injuries or deaths were reported	Cheshire County	On the August 2nd drought monitor, Cheshire County was 6% in severe drought and 94% moderate drought. By the end of the month, 54% of the county was in severe drought and 39% in moderate drought.

[3] Characterizing extremes over Americas (nasa.gov)
[4] New Hampshire Climate Assessment 2021 (unh.edu)
[5] Storm Events Database | National Centers for Environmental Information

Date(s)	Event Description	Impacts	Location	Other Information
10/1/2020 - 10/31/2020	Drought (D2)	$100,00 in property damage; $500,000 in crop damage were reported	Cheshire County	During the first week of October 95% of the state was in D2 Severe drought and 22% of the state was in D3 Extreme drought. By the end of the month the areal extent of D2 Severe drought had decreased to 33% of the state and D3 Extreme drought decreased to 17% of the state. Overall, the greatest improvements were across Northern and Western New Hampshire, where D1 Moderate drought remained.
9/1/2020 9/30/2020	Drought (D2)	No damages, injuries or deaths were reported	Cheshire County	D2 severe drought expanded to cover every county in New Hampshire by the end of the month. In addition, an area of D3 extreme drought developed Strafford and parts of Rockingham, Carroll and Merrimack Counties by the end of the month. D3 covered 22% of the state by the end of the month. Numerous dry wells were reported by state agencies. Corn, potatoes, barley fruit crops and forage crops are the most affected. Farmers are concerned about having enough forage for their livestock to get through the winter. Dairy industry was especially impacted due to low grass yields.
2016 Summer				The drought in the summer of 2016 caused many private wells to run dry. Since these are private wells, there is no documentation on the number of wells affected. Periods of drought can add to the potential for wildfires, especially in areas of high recreational use, and depletes the water supply for firefighting. A greater emphasis is placed on responding to these hazards rather than mitigating for them. Outreach and education on methods of handling drought are important.

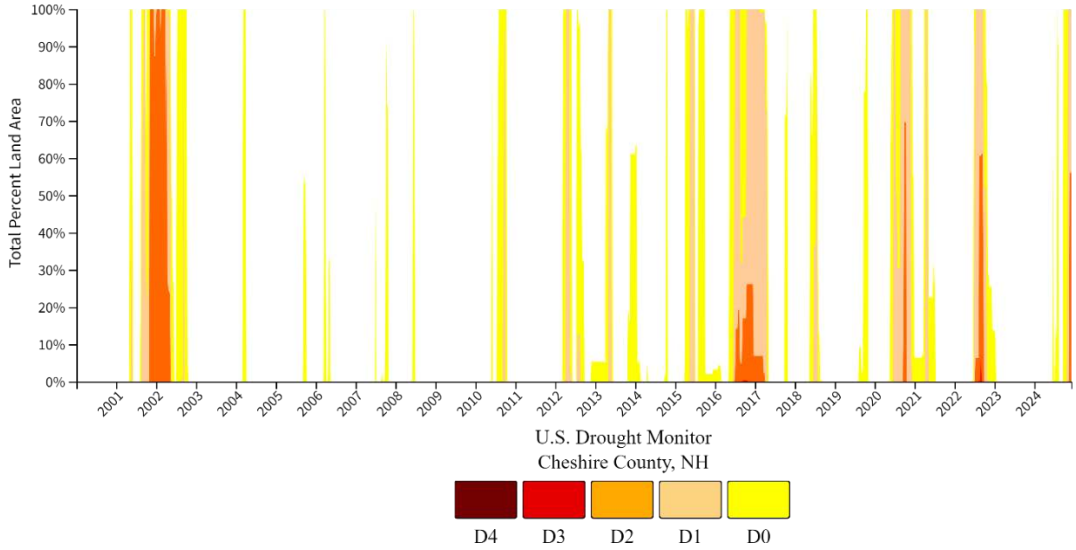
Over the long term, Cheshire County and Keene have experienced more periods of excess precipitation rather than drought.

Figure 4 Historical Drought Conditions for Cheshire County (1895- Present)[6]



Between 2000 and 2024 there was one very brief period of extreme (D3) drought that impacted a small portion of Cheshire County in 2022. In 2022, 2020 and 2017 moderate (D1) drought conditions were present throughout the County. In 2002, severe (D2) drought impacted Cheshire County.

Figure 5 Recent Drought Conditions for Cheshire County (2000-Present)



Since New Hampshire's first declaration in 1953, there were no State or federal major disaster declarations in Cheshire County relative to drought.

[6] Keene, NH, USA Conditions | Drought.gov

Probability of Future Events

VERY HIGH (5): It is highly likely that a hazardous event will occur within the next 25 years (1 - 2 events each year).

Effects of Climate Change – future conditions

New Hampshire Climate Assessment 2021 helps explain what drought conditions Keene may expect in the future due to changes in weather patterns. When comparing the period 1901-1960 to 1991-2020, the report noted an overall decrease in the number of dry (<0 SPI) and moderately dry (<-1 SPI) periods. However, it also concluded that the expected increases in summer temperatures expected over the period 2010-2099 will contribute to more short-term, or "flash drought" conditions in the future.

Potential Occurrences

The entire city could be affected by drought. Forested areas with high fuel content have more potential to burn.

Potential Impact (aka vulnerability for each hazard on community assets)

Drought could affect wells and irrigation in Keene.

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

Keene has not quantified the estimated impacts due to drought based on expected financial losses.

As specified in the State of New Hampshire Hazard Mitigation Plan (p. 155-156), impacts of drought are wide ranging and include:[7]

Economic Impacts

- Destruction of crops affecting farmers and consumers driving up food costs for consumers
- Cost of irrigation and drilling new wells
- Farmers spending more money on water and feed for animals
- Businesses that rely on farming, such as tractor and feed suppliers, may lose income
- Timber industry workers may be affected if wildfires exacerbated by drought destroy timber
- Businesses that sell boating and fishing equipment may lose business due to dried up water sources
- Power companies that utilize hydroelectric may have to spend money on other fuel sources and customers may also have to pay more for power

[7] NH State Hazard Mitigation Plan (2023)

- Barges and ships may have difficulty navigating bodies of water due to the ships draft (water depth required for boat to be able to operate) being greater than the depth of the body of water
- Water companies and private well owners having to spend money on new or additional water supplies

Environmental Impacts

- Loss or destruction of fish and wildlife habitat
- Lack of food and drinking water for wild animals
- Increased stress on and possible extinction of endangered species
- Lower water levels in reservoirs, lakes, and ponds
- Loss of wetlands
- More frequent wildfires
- Wind and water erosion of soils
- Poor soil quality

Social Impacts

- Anxiety or depression about economic losses caused by drought
- Health problems related to poor water quality or lack of water
- Health problems related to dust and pollen
- Loss of life
- Threat to public safety from an increased number of wildfires
- Reduced incomes
- People may have to relocate or close farms
- Fewer recreational activities

6.3.2 Earthquake

Description

The United States Geological Survey (USGS) defines an earthquake as the shaking of the surface of the Earth caused by the release of energy from a sudden slip on a fault. Tectonic plates are always slowly moving but can get stuck on edges due to friction. When the stress on the plates overcomes the friction, there is an earthquake that releases an energy wave that travels through the earth's crust.[8] The earthquake hazard is anything associated with an earthquake that may affect the normal activities of people, such as, surface faulting, ground shaking, landslides, tsunamis, structural damage, etc.[9] The underground point of origin of an earthquake is called its focus; the point on the surface directly above the focus is the epicenter. There are two primary ways in which earthquakes are measured, magnitude (the size of the earthquake) and intensity (measure of the shaking and damage, which can vary from location to location). Magnitude is measured in the Moment Magnitude (MM) scale (based off the obsolete Richter scale). The Modified Mercalli Intensity (MMI) classifies the

[8] What is an earthquake and what causes them to happen? | U.S. Geological Survey
[9] What are the Effects of Earthquakes? | U.S. Geological Survey

perceived feeling of the earthquake. It is possible for earthquakes to occur away from plate boundaries, in intraplate areas, such as New Hampshire.[10]

Location

According to the NH State Hazard Mitigation Plan, New Hampshire is considered to lie in an area of "Moderate" seismic activity with respect to other areas of the United States and is bordered to the North and Southwest by areas of "Major" activity. There are no identified fault lines for the entire state, therefore, an earthquake could occur and/or affect any location in the City.

Extent

The table below is used to categorize earthquakes using two different scales: Mercalli Scale and Richter Scale. The Richter Scale is more scientific and is based on the magnitude (amplitude of the largest seismic wave). The Mercalli Scale is based on observations by people who experienced the earthquake to describe its intensity.

Modified Mercalli Scale vs. Richter Scale		
Mercalli Intensity	**Mercalli Observations**	**Richter Magnitude**
I	Not felt by people	1-2
II	Felt by only a few people, especially on upper floors of buildings	3
III	Felt by people lying down, seated on a hard surface, or in tall buildings	3.5
IV	Felt indoors by many, dishes and windows rattle	4
V	Generally felt by everyone; may wake from sleep	4.5
VI	Trees may sway, objects fall from walls and tables	5
VII	Walls crack, some structural damage	5.5
VIII	Building damage noticeable	6
IX	Some buildings collapse	6.5
X	Ground cracks and landslides	7
XI	Few buildings survive, bridge damage, severe landslide	7.5
XII	Total destruction, objects thrown into the air	8

Source: USGS Hazards Program

Previous Occurrences

There have been no reported injuries or structural damage from earthquakes in Keene in recent years. However, on December 20, 1940, an earthquake of 5.5 on the Richter Scale occurred in Ossipee which cracked walls in the Keene Police Station 80 miles away. The 2002 Plattsburg, NY earthquake, like many other larger tri-state area earthquakes, caused several water leaks and cracked a wall in the fire station as well as other buildings.

[10] Kafka, A.L. (2022, November 28). Why Does the Earth Quake in New England? The Science of Unexpected Earthquakes. Boston College, Weston Observatory. (2004) http://aki.bc.edu/why_quakes.html

Table 8 Previous Occurrence of Earthquake

Date(s)	Event Description	Impacts	Location
2024	Earthquake	4 small earthquakes ranging from 0.5-2.2 Mn*. No damage or impact locally (*data from Weston Observatory, Boston College)	New Hampshire
2023	Earthquake	12 small earthquakes ranging from 0.8-3.1 Mn*. No damage or impact locally (*data from Weston Observatory, Boston College)	New Hampshire
2022	Earthquake	12 small earthquakes ranging from 1.0-3.1 Mn*. No damage or impact locally (*data from Weston Observatory, Boston College)	New Hampshire
2021	Earthquake	7 small earthquakes ranging from1.4-1.9 Mn*. No damage or impact locally (*data from Weston Observatory, Boston College)	New Hampshire
2020	Earthquake	10 small earthquakes ranging from 1.0-2.2 Mn*. No damage or impact locally (*data from Weston Observatory, Boston College)	New Hampshire
2019	Earthquake	12 small earthquakes ranging from 0.3-2.1 Mn*. No damage or impact locally (*data from Weston Observatory, Boston College)	New Hampshire
2018	Earthquake	13 small earthquakes ranging from 0.2-2.7 Mn*. No damage or impact locally (*data from Weston Observatory, Boston College)	New Hampshire
2017	Earthquake	10 small earthquakes ranging from 0.6-2.3 Mn*. No damage or impact locally (*data from Weston Observatory, Boston College)	New Hampshire
2016	Earthquake	9 small earthquakes ranging from 1.3 - 2.5*. No damage or impact locally. (*data from Weston Observatory, Boston College).	New Hampshire
2015	Earthquake	16 small earthquakes ranging from 1.0 - 2.5*. No damage or impact locally. (*data from Weston Observatory, Boston College).	New Hampshire
2014	Earthquake	9 small earthquakes ranging from 1.3 - 2.7*. No damage or impact locally. (*data from Weston Observatory, Boston College).	New Hampshire
12/20 & 24/1940	Earthquake	Both earthquakes of magnitude 5.5, both felt for 400,000 sq. miles, structural damage to homes, damage in Boston, MA, water main rupture.	Near Ossipee, NH
12/28/1947	Earthquake	4.5	Dover-Foxcroft, ME
1900s	Earthquake	200 felt earthquakes in New Hampshire.	Statewide- NH

Date(s)	Event Description	Impacts	Location
1800s	Earthquake	83 felt earthquakes in New Hampshire.	Statewide- NH
11/18/1755	Earthquake	6.0, much damage.	Cape Ann, MA
10/29/1727	Earthquake	Widespread damage Massachusetts to Maine.	Off NH/MA coast
12/29/1727	Earthquake	Widespread damage Massachusetts to Maine.	Off NH/MA coast
1638	Earthquake	6.5-7	Central New Hampshire
10/20/1988	Earthquake	4	Near Berlin, NH
1/19/1982	Earthquake	4.5, walls and chimneys cracked, damage up to 15 miles away in Concord.	Gaza (west of Laconia), NH
6/15/1973	Earthquake	4.8	Near NH Quebec Border, NH
4/28/1957	Earthquake	4.7	Portland, ME
4/10/1962	Earthquake	4.2	Middlebury, VT
6/10/1951	Earthquake	4.6	Kingston, RI
3/18/1926	Earthquake	Felt in Hillsborough County.	Manchester, NH
8/23/2011	Earthquake	5.8. No damage locally.	Travelled up the east coast from Virginia to New Hampshire
9/18/2012	Earthquake	1.2 No damage locally.	Southern New Hampshire
10/16/2012	Earthquake	4.0. No damage locally.	Felt throughout most of the New England states; centered in Maine
10/11/2013	Earthquake	2.3. No damage locally.	Concord
1/3/2011	Earthquake	2.5. No damage locally.	Northwest of Laconia

Probability of Future Events

MEDIUM (3): There is moderate likelihood that a hazardous event will occur within the next 25 years (1 - 2 events each 5 - 10 years).

Effects of Climate Change (AKA Future Conditions)

Not applicable

Potential Occurrences

An earthquake could occur and/or affect any location in the City.

Potential Impact (aka vulnerability for each hazard on community assets)

Keene is located on a lakebed (Connecticut River valley) that has high liquefaction factor which

increases the impact of an earthquake. It is assumed that all of the buildings in the City have not been designed to withstand seismic activity. More specifically, the older historic buildings that are constructed of non-reinforced masonry are especially vulnerable to any moderate sized earthquake. In the 2018 Plan Update, it was estimated that if a strong earthquake were to occur, there would be the potential for an estimated loss of 20% of city assessed structural valuation which was approximately $375,302,560 at that time. The costs for repairing or replacing roads, bridges, power lines, or the contents of the structures area not included.

- There is the potential for damage to structures from earthquakes;
- There is a potential for injury or death.
- Damaged power lines could disrupt services; and
- The entire city is at risk.

6.3.3 Erosion / Landslide

Description

A landslide is the downward or outward movement of earth materials on a slope that is reacting to a combination of the force of gravity and a predisposed weakness in the material that allows the sliding process to initiate. The broad classification of landslides includes mudflows, mudslides, debris flows, rockslides, debris avalanches, debris slides and earth flows. Landslides may be formed when a layer of soil atop a slope becomes saturated by significant precipitation and slides along a more cohesive layer of soil or rock. Although gravity becomes the primary reason for a landslide once a slope has become weak through a process such as the one just described, other causes can include:[11]

- Erosion by rivers or the ocean that creates over-steepened slopes through erosion of the slope's base. In the case of rivers, this can occur as a result of flash flooding
- Rock and soil slopes are weakened through saturation by snowmelt or heavy rains
- Earthquake creates stress that makes weak slopes fail—earthquakes of 4.0 magnitude and greater have been known to trigger landslides
- Wildfires (loss of vegetation)
- Excess weight from accumulation of rain or snow, stockpiling of rock or ore, the formation of waste piles, or building of man-made structures may stress weak slopes to the point of failure

Location

The extent of landslides can be measured by the steepness/grade of a slope, the geographical area, measured in square feet (or yards or other measurement) or measured using LIDAR/GIS. The Planning Team expressed concern about erosion around driveways in the east Keene hilly neighborhoods and potential for new development in that area as the result of recent subdivisions.

[11] Landslide Hazards Program | U.S. Geological Survey

Extent

While there is not universally accepted standard or scientific scale has been developed for measuring the severity of all landslides, severity can be measured several other ways:

- Steepness/grade of the Slope (measured as a percent)
- Geographical Area
    - Measured in square feet, square yards, etc.
    - More accurately measured using LiDAR/GIS systems
- Earthquake, either causing the event or caused by the event (measured using the Moment Magnitude Intensity or Mercalli Scale)

There are also multiple types of landslides[12]:

- Falls: A mass detaches from a steep slope or cliff and descends by free-fall, bounding, or rolling
- Topples: A mass tilts or rotates forward as a unit
- Slides: A mass displaces on one or more recognizable surfaces, which may be curved or planar
- Flows: A mass moves downslope with a fluid motion. A significant amount of water may or may not be part of the mass

Like flooding, landslides are unique in how they affect different geographic, topographic, and geologic areas. Therefore, consideration of a multitude of measurements is required to determine the severity of the landslide event.

Previous Occurrences

No specific incidents of landslide or erosion were noted by the Planning Team.

Probability of Future Events – see risk assessment chart

LOW (2): There is little likelihood that a hazardous event will occur within the next 25 years (1 event in 25 years).

Effects of Climate Change (AKA Future Conditions)

An increase in extreme precipitation events increase the likelihood of landslide and erosion events. Data collected from 10 weather stations distributed throughout the state and analyzed as part of New Hampshire Climate Assessment 2021 help explain what New Hampshire may expect from changes in weather patterns. A weather station in Keene offered a historical perspective as well as projections. The assessment found that from 1901 to 1960, the Keene station measured an average of 6.9 days per year where over an inch of liquid precipitation fell. The average number of days where over 2 inches of liquid precipitation fell in 24 hours was measured to be 0.7. The average amount of liquid precipitation on the wettest day of the year during this period was determined to be 2.2 inches. For the period of 1991 to 2020, the Keene station recorded an average of 10.9 days per year where

[12] CHAPTER 10 - LANDSLIDE HAZARD ASSESSMENT

over an inch of liquid precipitation fell, which represents an increase of 4.1 days from the prior period.

The average number of days where more than 2 inches of liquid precipitation fell within 24 hours was determined to be 1.8, an increase of 0.8 days compared to the 1901-1960 period. For the 1991 to 2020 period, on average, there was 2.7 inches of liquid precipitation measured to fall within a 24-hour period, which is an increase of 0.6 inches from the 1901 to 1960 period. The data recorded at the Keene station over these yearly ranges suggests an increase in the number and the severity of extreme precipitation events, which may present a risk of increased vulnerability. Looking into the future, extreme precipitation events (defined as the number of days with more than 1 inch of precipitation falls in 24 hours) will increase by 0.5 days per year between 2010-2039 under a low emissions scenario and by 0.6 days per year under a high emissions scenario.

Potential Occurrences

There is a potential for erosion of riverbanks and steep slopes by heavy rain and/or spring runoff if it is not vegetated or supported by other methods.

- There is potential for mud and debris to enter streams;
- There is a potential for mud and debris on roads;
- This can occur on steep slopes and riverbanks anywhere in the City.

Potential Impact (aka vulnerability for each hazard on community assets)

The primary impacts of a landslide are the damage and destruction to property and infrastructure located in the area that the landslide occurred. The land material moved during a landslide can cause damage to roads, buildings, and infrastructure at the base of the slope on which the landslide occurred. Buildings or infrastructures that are atop the slide, or on the side of the slope where the slide occurs, can be severely damaged or destroyed through its consumption by the slide. The hazard of death and injury to individuals atop, on, or at the base of a slide exists if such individuals are present in those locations when the landslide occurs.

A change in topography or geology can also affect the flora and fauna as well as crops and farmland. Landslides that occur adjacent to a waterbody, such as a river or lake, can introduce excess sediment, increase in the turbidity of the receiving waterbody and impacting water quality if the quantity of sediment is of sufficient quantity. A very large landslide into a river could cause an obstruction that acts like a dam, creating an impoundment of water which leads to sediment and woody material deposition within it. This could also further create an additional risk of a “dam failure” at some future time when the natural dam breaks down, resulting a rapid release of the stored water from upstream.

Landslides at or adjacent to dams can not only cause structural collapse, but those occurring within dam impoundments can displace large amounts of stored water, leading to increased water levels and flood waves that can cause overtopping failures. All such hazards may impact dams, though the frequency of occurrence for landslides in New Hampshire is very minimal – and those occurring in the vicinity of high hazard dams even less so.

6.3.4 Extreme Heat / Extreme Cold

Description

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

Extreme Heat events occur as a result of above normal temperatures, which often coincide with high relative humidity, that increase the likelihood of heat disorders with prolonged exposure or strenuous activity. This risk comes from the heat and humidity preventing the human body from adequately cooling itself using natural methods; this can result in heat disorders and, if untreated, unconsciousness and eventually death. Heat related disorders include heat cramps, heat exhaustion, and heat stroke.[13] Populations at risk, such as the young and elderly, are more likely to experience a heat related disorder during a heat event. Humidity exacerbates how the human body experiences heat when hazy, damp air is trapped near the ground. Certain relative humidity percentages can render the body's natural ability to cool itself by sweating ineffective. These meteorological conditions can lead to heat stroke, which is an immediate medical emergency.[14] Extreme heat can also add to the potential for wildfires and depletion of the water supply for firefighting.

Extreme Cold events occur during meteorological cold waves, also known as cold snaps, that are caused by the southern transport of arctic airmasses into the Northeast. These events occur during the winter months and increase the likelihood of cold disorders in humans and animals that have prolonged exposure to low ambient temperatures. This effect is exacerbated when there are winds present that effectively lower the temperature that is perceived by the human body, known as the wind chill. The risk comes from when the body is losing heat faster than it can produce it. Wind acts to carry heat away from the body, therefore amplifying the perceived temperature by the human body and reducing the body's core temperature. Cold disorders can include frostbite and hypothermia. Frostbite occurs when uncovered skin/extremities are exposed to extreme cold and the body tissue is either injured or killed. Hypothermia is when the body is unable to heat itself at the rate it is being cooled and the body's core temperature begins to drop below normal values. A normal core body temperature is considered to be 98.6°F; mild hypothermia occurs when core body temperature drops between 90-95°F and severe hypothermia occurs at core body temperatures of below 90°F. If left untreated, hypothermia can result in unconsciousness and eventually death. Extreme cold can also damage or kill crops and animals (wild, farm, or domesticated), potentially presenting a risk to the economy.[15]

Location

The entire City of Keene is at risk for extreme temperatures. The hazard is very season dependent: summer months present the greatest hazard for extreme heat events, while winter months present the greatest threat of extreme cold.

[13] http://www.nws.noaa.gov/om/heat/heat_index.shtml
[14] http://www.nws.noaa.gov/om/heat/heat-illness.shtml
[15] Impacts of Temperature Extremes

[16]It is not impossible for individuals to experience extreme heat or extreme cold related illnesses year-round. For example, during the summer it is possible for people to experience hypothermia if they are swimming or submerged in a body of water for a long period of time that is cooler than their body temperature.[17]

Survival Times in Cold Water Without Protective Clothing

Water Temperature		Loss of Dexterity	Exhaustion or	Expected Time of
Degrees C	Degrees F	with no protective clothing	Unconsciousness	Survival
0.3	32.5	Under 2 min.	Under 15 min.	Under 15 to 45 min.
0.3 to 4.5	32.5 - 40	Under 3 min.	15 to 30 min.	30 to 90 min.
4.5 to 10	40 - 50	Under 5 min.	30 to 60 min.	1 to 3 hrs.
10 to 15.5	50 - 60	10 to 15 min.	1 to 2 hrs.	1 to 6 hrs.
15.5 to 21	60 - 70	30 to 40 min.	2 to 7 hrs.	2 to 40 hrs.
21 to 26.5	70 - 80	1 to 2 hrs.	2 to 12 hrs.	3 hrs. to indefinite
Over 26.5	Over 80	2 to 12 hrs.	Indefinite	Indefinite

Figure 6 Survival Times in Cold Water

Extent

One measure of the extent (or relative intensity) of extreme heat is the National Weather Service Heat Index, which is an indicator of the likeliness of heat disorders with prolonged exposure or strenuous activity, especially for those with a history of stroke and heart issues. The National Weather Service utilizes the following terms when describing the extent of **extreme heat**:[18]

- Heat Advisory—Two or more consecutive hours of Heat Index values of 95-99 degrees Fahrenheit for two or more days OR any duration of Heat Index values of 100-104 degrees Fahrenheit. A Heat Advisory is issued within 36 hours of the onset of extremely dangerous heat conditions.
- Excessive Heat Warning—Two or more hours with Heat Index values of 105 degrees Fahrenheit or greater. An Excessive Heat Warning is issued within 36 hours of the onset of extremely dangerous heat conditions.
- Excessive Heat Watches—Heat watches are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. A Watch is used when the risk of a heat wave has increased but its occurrence and timing is still uncertain.
- Excessive Heat Outlooks—Issued when the potential exists for an excessive heat event in the next 3-7 days. An Outlook provides information to those who need considerable lead-time to prepare for the event.

[16] USCG Captains License – Narragansett Bay Maritime Training
[17] Maine Game Wardens find body of missing kayaker
[18] Heat Watch vs. Warning (weather.gov)

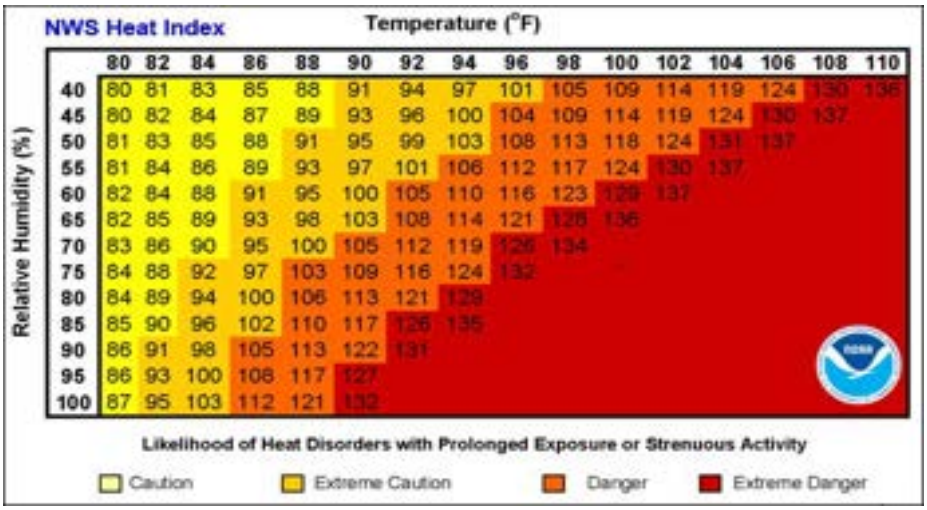


Figure 7 NWS Extreme Heat Index (Source: National Weather Service)

A measure of the extent of extreme cold is the National Weather Service Wind Chill Chart below, which shows the impact that wind and cold temperatures can have by indicating the number of minutes until frostbite strikes.

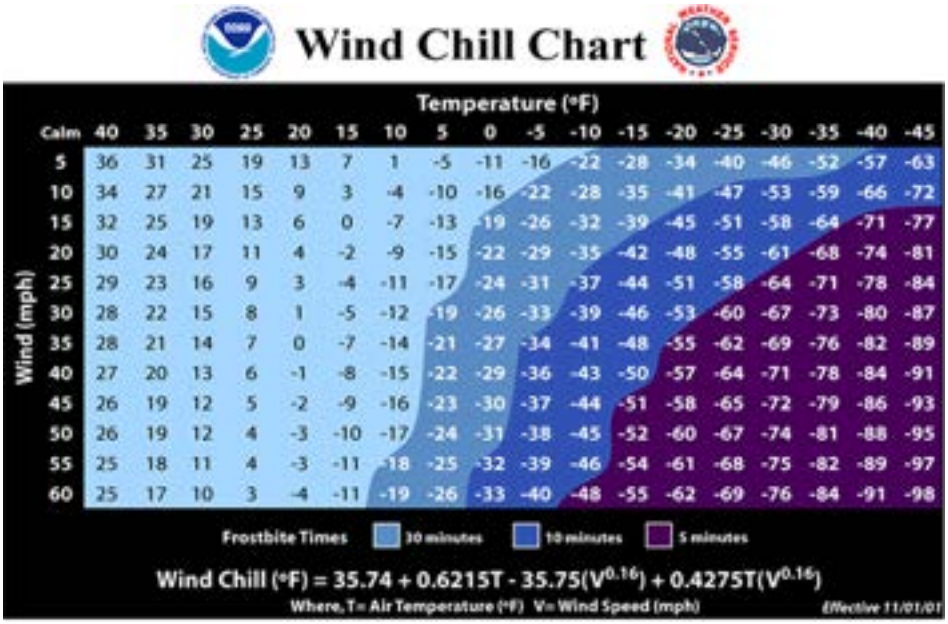


Figure 8 Wind Chill Chart (Source National Weather Service)

The National Weather Service utilizes the following terms when describing the extent of **extreme cold**:[19]

- Wind Chill Watch: NWS issues a wind chill watch when dangerously cold wind chill values are possible. Residents need to take action to protect themselves, animals, and their property.

[19] Wind Chill Warning vs Watch (weather.gov)

- Wind Chill Advisory: NWS issues a wind chill advisory when seasonably cold wind chill values, but not extremely cold values are expected or occurring. A Wind Chill Advisory is issued for New Hampshire is wind chill values are expected to be -20°F to -29°F and winds are greater than 5 mph.
- Wind Chill Warning: NWS issues a wind chill warning when dangerously cold wind chill values are expected or occurring. A Wind Chill Advisory is issued for New Hampshire is wind chill values are expected to be -30°F and winds are greater than 5 mph.
- Freeze Watch: NWS issues a freeze watch when there is a potential for significant, widespread freezing temperatures within the next 24-36 hours. A freeze watch is issued in the autumn until the end of the growing season and in the spring at the start of the growing season.
- Frost Advisory: Be Aware: A frost advisory means areas of frost are expected or occurring, posing a threat to sensitive vegetation.
- Freeze Warning: When temperatures are forecasted to go below 32°F for a long period of time, NWS issues a freeze warning. This temperature threshold kills some types of commercial crops and residential plants.
- Hard Freeze Warning: NWS issues a hard freeze warning when temperatures are expected to drop below 28°F for an extended period of time, killing most types of commercial crops and residential plants.

Previous Occurrences

Table 9 Previous Occurrence of Extreme Temperature

Date(s)	Event Description	Impacts	Location	Other Information
2/3/2023-2/4/2023	Extreme Cold/Wind Chill	No damages, injuries or deaths were reported	Cheshire County	The coldest wind chill values approached -40 degrees early on the 4th before winds gradually began to diminish. This included -38 at Jaffrey Silver Ranch Airport and -38 at Dillant-Hopkins Airport.
2/1/2018	One Day Winter Heat Wave	High temperature records set across NH	Statewide	Exceptionally strong high-pressure ridge in place across the Eastern Seaboard. Record high temperatures were

Date(s)	Event Description	Impacts	Location	Other Information
				broken across the State.
12/1/2017	Cold Wave	Record low temperatures set across New Hampshire	Statewide	Record low temperatures were set across the State as a result of a cold wave.
9/1/2017	Heat Wave	High temperature records set across NH	Statewide	Mount Washington set record a daily high temperature records for four consecutive days
3/1/2012	Heat Wave			

Probability of Future Events

VERY HIGH (5): It is highly likely that a hazardous event will occur within the next 25 years (1 - 2 events each year).

Effects of Climate Change (AKA Future Conditions)

New Hampshire Climate Assessment 2021[20] helps explain what extreme temperatures Keene may expect in the future due to changes in weather patterns. Depending on greenhouse gas emission scenarios, New Hampshire can expect a range of higher annual average maximum and minimum annual average temperatures. A weather station in Keene offered a historical perspective as well as projections in the assessment. It found that under a low and high emissions scenario, maximum summer temperatures will increase by 2.4 and 2.6 degrees respectively (when comparing the expected 2010-2039 temperature to the 1980-2009 temperature). Summer maximum and winter minimum temperatures are also expected to increase by a similar amount over the same time period. Changes in extreme temperatures are expected to follow a similar trend *(**Error! Reference s ource not found.**)*.

Table 10 New Hampshire Climate Assessment 2021

Climate Indicator	Historical (1980-2009)	2010-2039 Change from Historical	
		Low Emissions	High Emissions
Maximum temperature on coldest day of year	11.9°	+3.2°	+3.5°

[20] New Hampshire Climate Assessment 2021

Climate Indicator	Historical (1980-2009)	2010-2039 Change from Historical	
		Low Emissions	High Emissions
Minimum temperature on coldest day of year	-15.3°	+3.9°	+4.9°
# Days < 0°	13.4	-5.0	-6.0
# Days < 32°	162.5	-11.8	-12.9
# Days > 90°	9.1	+9.4	+10.4
# Days > 95°	1.3	+3.0	+3.7
Maximum temperature on hottest day of year	95.2°	+2.8°	+3.3°
Minimum temperature on hottest day of year	70.9°	+2.0°	+2.1°
# Days when minimum temperature is > 28°	227.7	+10.9	+12.3

Potential Occurrences

Extreme temperatures are a citywide event.

Potential Impact (aka vulnerability for each hazard on community assets)

Extreme heat events can adversely affect human health, especially children, seniors and people with respiratory illnesses. In the framework of climate change forecasting, the City of Keene has been participating in the "Climate Resilient Communities Program", which resulted in the Climate Change Adaptation Plan (2007). This Plan includes a review of the impacts of extreme heat events on public health, energy needs and agriculture. The Plan includes a summary of testimony by Dr. Cameron Wake of the University of New Hampshire which states "that if the world remains on a pathway of using fossil fuels as it does now, New Hampshire will be a very different place, with sixty summer days over 90°, and 50% less snowfall. Wake says New Hampshire weather will be like a very dry North Carolina."

- The elderly are at risk from extreme temperature events. Approximately 18% of the city population is 65 and over;
- Power outages could occur due to excessive use of air conditioners and fans;
- There is the potential for damage to structures from heavy snow, and freezing pipes;
- There is a potential for injury or death.

Keene has not quantified the estimated impacts due to extreme temperatures based on expected financial losses.

6.3.5 Flooding (Inland)

Description

Flooding, inclusive of inland flooding, is generally defined as a high flow, overflow, or inundation by water, which causes or threatens damage.[21] Flooding results from the overflow of rivers, their tributaries, and streams throughout the State, primarily from high precipitation events. Flash flooding is defined as a flow with a rapid rise in water level and extreme velocities in a river or stream, beginning within six hours of the causative event (e.g., intense rainfall, dam failure, ice jam). Ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters. Because of New Hampshire's steep terrain in the headwaters of watersheds, flash floods also lead to riverbank and bed erosion. Extreme precipitation events in recent years, such as Tropical Storm Irene, or slow-moving summer thunderstorms over steep terrain, have led to buildings on the edges of streambanks becoming at risk to river erosion, or culvert failures.

The National Flood Insurance Program (NFIP) has a more specific definition of flooding, which can also be considered and used when looking at floodplain and floodplain mapping. The NFIP defines a flood as a general and temporary condition of partial or complete inundation of 2 or more acres of normally dry land area or of 2 or more properties (at least 1 of which is the policyholder's property) from:[22]

1. Overflow of inland or tidal waters; or
2. Unusual and rapid accumulation or runoff of surface waters from any source; or
3. Mudslides (i.e., mudflows) which are proximately caused by flooding and are akin to a river of liquid and flowing mud on the surfaces of normally dry land areas, as when earth is carried by a current of water and deposited along the path of the current.; or
4. Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above.

Location

There is great potential for annual flood incidents in Keene due to the community's topography and numerous watercourses and water bodies. The City of Keene is a very complex hydrologic system. The City's floodplain, due to its size and complexity, may be one of the most important in New England. The complexity arises from the fact that 12 steep rivers and streams from 6 major watersheds eventually drain into the City. The outlet of the Keene floodplain is a flat stretch of river, which does not gain any significant slope for about 25 miles at the Town of Winchester. The result of having large volumes of water flowing into a flat bowl is frequent flooding. During major region-wide rainstorms or during spring snowmelt there can be basin-wide flooding. Since only so much water can flow past Winchester and Hinsdale to the Connecticut River, the City has experienced backwater flooding, as water backs up from Winchester and Swanzey northward into the Keene basin. However, flooding can occur along any one of the rivers or brooks, and there may be significant flooding on the east side of Keene (due to a local rainstorm in the Beaver Brook watershed,

[21] NOAA's National Weather Service - Glossary
[22] National Flood Insurance Program Terminology Index | FEMA.gov

for example), while there is no flooding on the west side of the City. That is why the Keene floodplain is so complex, in terms of forecasting and in terms of management. The area most susceptible to major flooding is that portion of the City which extends southward from the Colony dam just north of West Street (next to Starbucks Coffee) down into Swanzey, and in a swath along each of the rivers and streams. The general extent of the floodplain is shown in Appendix G: Past and Potential Hazards Map. In total, the 100-year floodplain extends over 1,400 acres.

Extent

One measure of the extent (or relative intensity) of flooding is the change in magnitude of river flooding. All rivers in the State published in EPA's Climate Change Map Viewer[23] experienced a significant increase in the *magnitude* of river flooding between 1965 and 2015, including the Ashuelot River running through Keene. The same study found that the rivers experienced a significant increase in the *frequency* of river flooding. In New Hampshire, precipitation events and resulting floods have become more common, as evidenced by the number of recent annual rainfall figures in exceedance of the 1991-2020 average.

Another way to describe the extent of flooding requires monitoring of stream flows. Monitoring stations do exist on the Ashuelot River (USGS 01158110 – Branch River/Ashuelot River) in Keene[24] and just outside of the city to the north (USGS 01158000 Ashuelot River- Below Surry Dam) and . The river may be at any number of water levels or stages: south (USGS 01160350 Ashuelot River at West Swanzey). The river may be at any number of water levels or stages:

- Bankfull Stage: An established gage height at a given location along a river or stream, above which a rise in water surface will cause the river or stream to overflow the lowest natural stream bank somewhere in the corresponding reach.
- Action Stage: The stage which, when reached by a rising stream, represents the level where the NWS or a partner/user needs to take some type of mitigation action in preparation for possible significant hydrologic activity. The appropriate action is usually defined in a weather forecast office (WFO) hydrologic services manual.
- Flood Stage: An established gage height for a given location above which a rise in water surface level begins to create a hazard to lives, property, or commerce. The issuance of flood (or in some cases flash flood) warnings is linked to flood stage. Not necessarily the same as bankfull stage.

The National Weather Service (NWS), in coordination with local officials, defines flood levels for each of its river forecast locations, based on the impact over a given area. The flood categories are defined as follows[25]:

- Minor Flooding: Minimal or no property damage, but possibly some public threat (e.g., inundation of roads).

[23] Weather and Climate | Climate Indicators Map Explorer
[24] USGS | Monitoring Station
[25] 2023 National Weather Service - Office of Water Prediction

- Moderate Flooding: Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations.
- Major Flooding: Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.
- Record Flooding: Flooding which equals or exceeds the highest stage or discharge observed at a given site during the period of record. The highest stage on record is not necessarily above the other three flood categories – it may be within any of them or even less than the lowest, particularly if the period of record is short (e.g., a few years).

The extent of flooding can also be described by area within FEMA's special flood hazard areas depicted on the Past and Potential Hazards Map. This area was estimated at approximately 1,700 acres. approximately.

Previous Occurrences

A search for the terms "Flood" and "Flash Flood" in NOAA's Storm Events were used to identify past events. The following events help to explain the range of anticipated intensities of flooding events.

Table 11 Previous Occurrence of Flooding

Date(s)	Event Description	Impacts	Location	Other Information
7/10/2023	Flash Flood	No damages, injuries or deaths were reported	Westmoreland	Heavy rain caused the Partridge Brook to flood and washout a portion of Partridge Brook Road in Westmoreland.
7/10/2023	Flood	No damages, injuries or deaths were reported	Surry	The Ashuelot River flooded Gilsum Road between Gilsum and Surry.

Date(s)	Event Description	Impacts	Location	Other Information
7/9/2023	Flash Flood	No damages, injuries or deaths were reported	Swanzey	After multiple days of heavy rainfall, Swanzey Lake overflowed on July 9th. The flooding caused Swanzey Lake Road to washout and necessitated the evacuation of lakeshore residents. Fire Department responded with the City of Keene (Cheshire County) swift water rescue team. This caused over 100 vehicles to become stranded and then required the evacuation of nearly 150 guests of the Pilgrim Pines Camp and Retreat Center.

Date(s)	Event Description	Impacts	Location	Other Information
7/9/2023	Flash Flood	No damages, injuries or deaths were reported	Swanzey	Severe widespread flooding in Swanzey prompted Police to issue a statement Please avoid driving in Swanzey at this time. Numerous roads across the community were flooded and damaged by floodwaters including Route 10, Holbrook Avenue, Old Homestead Highway, East Shore, and Carlton Roads, along with several others.
6/26/2023	Flash Flood	No damages, injuries or deaths were reported	Chesterfield	Torrential rainfall resulted in flooding across sections of Main Street, Brook Street, Streeter Hill Road, and Gulf Road. Washouts were reported on Gulf Road.
6/26/2023	Flash Flood	No damages, injuries or deaths were reported	West Chesterfield	Pond Brook surged out of banks and onto Pond Brook Drive near Chamberlain Way.

Date(s)	Event Description	Impacts	Location	Other Information
7/29/2021 - 8/1/2021	Flash Flood	City wide road closures. No injuries or deaths reported. $139,000 in damages to roads.	Keene	Streets closed during storm due to localized flooding. Washouts along ditch lines. Significant erosion of roadside drainage. Damaged culverts. Catch basin damages. Slope failure. Pavement washout. Streets invloved include: Chapman Rd., Concord Rd., Daniels Hill (multiple locations), Ferry Brook Rd., Grimes Rd., Nims Rd., Roxbury Rd., Roxbury St., Rule St., and Stearns Rd. From DR 4624 - City of Keene Damage Inventory_v3.
7/29/2021	Flash Flood	$10,000 in property damage reported, no deaths or injury reported.	Surry	The Ashuelot River flooded Route 12A at Gilsum Road.
7/17-18/2021	Flash Flood	$107,000 in property damages, no injuries or deaths reported.	Swanzey	Erosion along several local roads, primarily shoulders and pavement damage.

Date(s)	Event Description	Impacts	Location	Other Information
7/17-18/2021	Flash Flood	$300,000 in property damages reported, no injuries or deaths.	Keene	Over 80 residential basements flooded along with several businesses. A large sinkhole developed on Roxbury Street with severe damage. There were at least 2 evacuations, one on Wetmore Street and another at Boston Place. See flood event map.
7/18/2021	Flood	$120,000 in property damages reported, no injuries or deaths reports.	Swanzey	The Ashuelot River flooded Carlton Road and Old Richmond Rd in Swanzey. Three residents had to be water rescued.
7/17/2021	Flash Flood	$50,000 in property damages, no injuries or deaths reported.	Keene	Law Enforcement reported that a portion of Roxbury Street in Keene was washed out due to flash flooding.
7/8/2020	Flash Flood	No reported property damages, injuries, or deaths.	Park Ave./Arch St. Intersection Keene	Three to five and a half inches of rain fell in about 3 hours in the Keene area caused flash flooding at the intersection of Park Avenue and Arch St. in Keene where water was seen rapidly flowing over the roadway.

7/15/2014	Flood	Over $35,000 in property damage reported	Keene	The City experienced a severe storm event with approximately 2.5 inches of rain falling over a one hour period. This resulted in localized flooding and closure of streets with damage occurring to pavement, shoulders and ditches. The City responded performing settlement and debris removal on various City streets including; Stearns Road, Water St, Court St, Roxbury Road, Daniels Hill Road, Concord Road, and Washington Street extension. In addition to clean-up, barricades and warning devices on flooded and damaged streets were employed. Sand bags were used to protect properties from flood waters and emergency repairs were made to some streets. The work included the removal of sediments from ditches, stabilizing shoulders and banks, rip-rapping washed out areas.

Date(s)	Event Description	Impacts	Location	Other Information
				The streets involved included Ralston St., Rule St., Sullivan St., Stearns Rd., Water St., Court St., Roxbury Rd., Daniels Hill Rd., and Concord Rd.

Date(s)	Event Description	Impacts	Location	Other Information
9/13/2013	Flood	The City expended over $150,000 in response and repairs to damage infrastructure.	Keene	The City experienced severe weather event with approximately 5.8" of rain over a 5 hour period. Storm was concentrated on the eastern side of the City, focused over Beech Hill and east and the City experienced limited street flooding in the central portion of the City. Type of damage resulting from the storm was roadside washouts resulting in pavement failure. A number of private properties along Eastern Avenue, Bellevue Avenue and Woodland Avenue experienced basement flooding and property erosion
6/26/2013 - 7/3/2013	Flood	No damages, injuries or deaths were reported	Cheshire, Sullivan, and Grafton Counties	NH 12 A was severely washed out and caused lengthy detours for 6 months. No damage to structures and no injuries.

Date(s)	Event Description	Impacts	Location	Other Information
5/29/2012	Flood	The City expended over $1.23M responding and recovering from the event.	City of Keene	The City experienced a significant rain event that resulted in significant damage to the City's transportation infrastructure. Over 216 properties were affected. Flooding to basement and first floor was experienced. The roadways that experienced damage include: $422,569 for permanent repairs to Belvedere Road and $144,131 for permanent repairs to the following roadways: Hurricane Road, Old Walpole Road, Wyman Road, Gunn Road, Darling Road, Ferry Brook Road, Sullivan Road, May Avenue and Upper Knight Street. The damage expended approximately $928,890 for permanent repairs to transportation infrastructure.

Date(s)	Event Description	Impacts	Location	Other Information
10/8/2005	Flood	The wastewater treatment plant had extensive damage.	Southwest New Hampshire	The City of Keene evacuated 5,000 residents; there was 4’ to 8' of water on the east side of Main St. Emergency shelters were opened for five days and the City's EOC was opened for four days. The Keene Department of Public Works operated 24/7 for several weeks on debris clean up and repair of roads and bridges.
9/18/2004	Flood	No injuries were reported and damage to the City was minimal.	Cheshire County	Heavy rainfall associated with the remnants of Ivan caused flash flooding in Cheshire County. Storm totals of 3 to 5 inches brought a tributary of the Branch Brook out of its banks and flooded a nearby roadway. Localized flooding on Church Street.

Disaster Declarations

Below is a list of Disaster Declarations for flooding events within the State of New Hampshire that have occurred since the 2018 Plan Update taken from the FEMA Disaster Search tool[26]. Several severe events have caused significant damage to structures and roadways within the Southwest Region.

[26] https://www.fema.gov/disaster

Table 12 Flood Disaster Declarations Since 2018 Update

Declaration Title	Declaration Date	Incident Subcategory	Incident Period	Disaster Number
Severe Storm and Flooding	9/30/2021	Severe Storm	July 17 - July 19, 2021	4622
Severe Storm and Flooding	10/4/2021	Flood	July 29 - August 2, 2021	4624
Severe Storm and Flooding	9/14/2023	Flood	July 9 - July 17, 2023	4740

The following list of Disaster Declarations is carried forward from the previous plan update.

Table 13 Flood Disaster Declarations Previous Plan Update

FLOOD DISASTER DECLARATIONS WITHIN STATE OF NH (PREVIOUS PLAN UPDATE)			
1927	Flood	Damage to Road Network. Caused many roads to wash out.	Southern NH
3/11 - 21/ 1936	Flood	Damage to Road Network. Flooding caused by simultaneous heavy snowfall totals, heavy rains and warm weather.	NH State
8/27/1986	Flood/ Severe Storm	FEMA Disaster # **771-DR** (Presidentially Declared Disaster) $1,005,000 in damage.	Cheshire, Hillsborough Counties, NH
4/16/1987	Flood/ Severe Storm	FEMA Disaster Declaration # **789-DR** (Presidentially Declared Disaster). Flooding of low-lying areas along river caused by snowmelt and intense rain. $4,888,889 in damage.	Cheshire, Carroll, Grafton, Hillsborough, Merrimack, Rockingham, & Sullivan Counties, NH
8/7 - 11/ 1990	Flood	FEMA Disaster Declaration # **876**. Flooding caused by a series of storm events with moderate to heavy rains. $2,297,777 in damage.	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack & Sullivan Counties, NH
10/29/1996	Flood	FEMA Disaster Declaration #**1144-DR**. Flooding caused by heavy rains. $2,341,273 in damage.	Grafton, Hillsborough, Merrimack, Rockingham, Strafford, Sullivan Counties, NH
7/2/1998	Flood	FEMA Disaster Declaration # **1231**. Severe storms and flooding.	Southern NH

July – August 2003	Flood	FEMA Disaster Declaration # **1489**. Severe storms and flooding. NH 12 washed out locally.	Cheshire & Sullivan Counties
10/26/2005	Flood	FEMA Disaster Declaration # **1610**. Severe storms and flooding.	Cheshire, Grafton, Merrimack, Sullivan, and Hillsborough Counties, NH
October - November 2005	Flood	FEMA Disaster Declaration # **DR-1144- NH DR-1610** $12,314,320 assistance Statewide. Keene and several towns in the region were greatly impacted by this flooding. Additional details in *Flooding - Localized*.	Cheshire, Grafton, Hillsborough, Merrimack, Rockingham, Strafford & Sullivan counties
5/25/2006	Flood	FEMA Disaster Declaration # **1643**. Severe storms and flooding.	Several counties in NH
4/16/2007	Flood	FEMA Disaster Declaration # **1695**. Severe storms and flooding.	All counties in NH
5/26 - 30/ 2011	Flood	FEMA Disaster Declaration # DR-**4006**; May flood event.	Coos and Grafton County
5/29 - 31/ 2012	Flood	FEMA Disaster Declaration # **4065**; $3,046,189 (Statewide assistance). There were some road washouts. Local details provided under *Flooding-Localized* heading below.	Cheshire County
6/26 - 7/3/ 2013	Flood	FEMA Disaster Declaration # **4139**; $6,389,704 (Statewide assistance). NH 12 A was severely washed out and caused lengthy detours for 6 months. No damage to structures and no injuries.	Cheshire, Sullivan and Grafton Counties
7/1-2/2017	Flood	FEMA Disaster Declaration # **4329**; No damage to structures and no injuries.	Coos and Grafton Counties
October 29 - November 1 2017	Flood	FEMA Disaster Declaration # **4355**; $72,739 (Statewide assistance). No damage to structures and no injuries.	Coos, Sullivan, Belknap, Carroll and Grafton Counties
3/2-8/2018	Flood	FEMA Disaster Declaration # **4370**; Rockingham County, Severe storm and flooding. No local damage to structures and no injuries.	Rockingham County

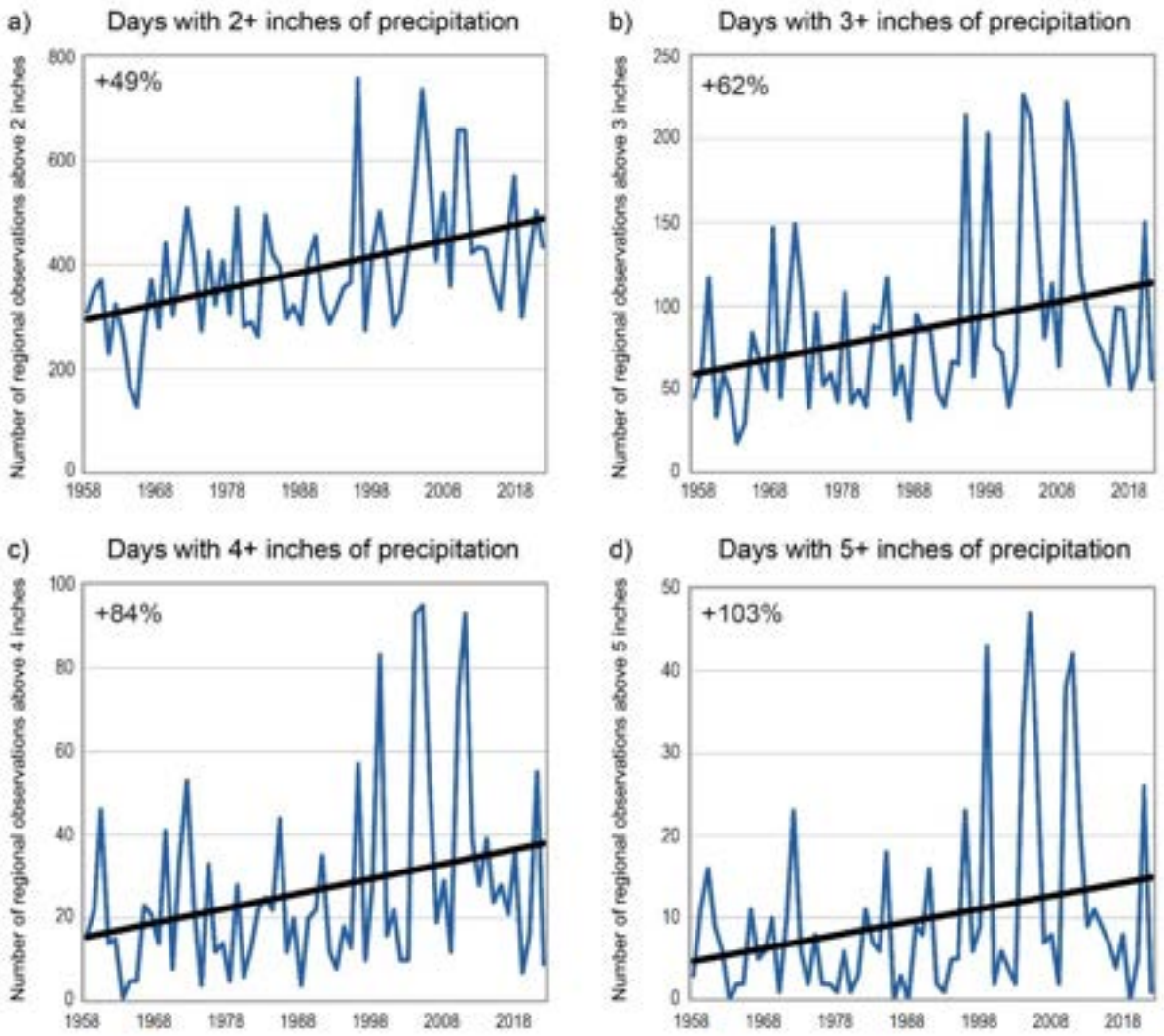
Probability of Future Events

VERY HIGH (5): It is highly likely that a hazardous event will occur within the next 25 years (1 - 2 events each year).

Effects of Climate Change (AKA Future Conditions)

The Fifth National Climate Assessment[27] has found that extreme precipitation events (defined as events with the top 1% of daily precipitation accumulations) are increasing in the Northeast.

Figure 9 Trends in Extreme Precipitation in the Northeast[28]



Data collected from 10 weather stations distributed throughout the state and analyzed as part of New Hampshire Climate Assessment 2021[29] help explain what New Hampshire may expect from

[27] Fifth National Climate Assessment
[28] https://nca2023.globalchange.gov/chapter/21/#fig-21-1
[29] New Hampshire Climate Assessment 2021

changes in weather patterns. A weather station in Keene offered a historical perspective as well as projections. The assessment found that from 1901 to 1960, the Keene station measured an average of 6.9 days per year where over an inch of liquid precipitation fell. The average number of days where over 2 inches of liquid precipitation fell in 24 hours was measured to be 0.7. The average amount of liquid precipitation on the wettest day of the year during this period was determined to be 2.2 inches. For the period of 1991 to 2020, the Keene station recorded an average of 10.9 days per year where over an inch of liquid precipitation fell, which represents an increase of 4.1 days from the prior period. The average number of days where more than 2 inches of liquid precipitation fell within 24 hours was determined to be 1.8, an increase of 0.8 days compared to the 1901-1960 period. For the 1991 to 2020 period, on average, there was 2.7 inches of liquid precipitation measured to fall within a 24-hour period, which is an increase of 0.6 inches from the 1901 to 1960 period. The data recorded at the Keene station over these yearly ranges suggests an increase in the number and the severity of extreme precipitation events, which may present a risk of increased vulnerability. Looking into the future, extreme precipitation events (defined as the number of days with more than 1 inch of precipitation falls in 24 hours) will increase by 0.5 days per year between 2010-2039 under a low emissions scenario and by 0.6 days per year under a high emissions scenario.

An increase in temperature may also impact flood hazards. As warmer temperatures cause more water to evaporate and therefore more water to fall as precipitation this causes changes in the size and frequency of heavy precipitation events, and hence the size and frequency of river flooding. Increasing temperatures also impact the amount of snowpack that accumulates in the winter and the timing of snow melt.

Potential Occurrences

Flooding on the Branch River, Beaver Brook, and Ash Swamp Brook may be caused by runoff from the upstream drainage areas and by backwater flooding from the Ashuelot River. Flooding on Otter Brook is largely controlled by regulated outflow from Otter Brook Dam. Flooding can occur from the runoff from the watershed below Otter Brook Dam or from backwater from the Branch River. Flooding in the Minnewawa Brook basin can occur during all seasons of the year.

Potential Impact (aka vulnerability for each hazard on community assets)

The extent of damage caused by any flood depends on the depth and duration of flooding, the topography of the area flooded, velocity of flow, rate of rise, and the amount and form of development in the floodplain. Deep floodwater carrying floating debris would create hazardous conditions for people and vehicles attempting to cross flooded areas. In depths of greater than 3 feet or in areas where the flow attains faster velocity, an adult could be swept off balance creating the danger of injury or drowning.

In general, a major flood could affect the whole city, either directly or indirectly. In 1989, the U.S. Army Corps of Engineers estimated that a 100-year flood could cause at least $5 million worth of damage in Keene, and that a 500-year flood could result in at least $10.5 million worth of damage. Using an inflation calculator, these amounts in 2024 currency would be approximately $12,728,400 (100-year flood) and $26,729,600 (500-year flood).

6.3.6 Infectious Disease

Description

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

Some diseases are consistently present in a community and, according to the United States Centers for Disease Control and Prevention (CDC), the "baseline" or "endemic level" for these diseases is the number of people normally infected in an underlying population. This number may be more cases than is desired, but it is the typical amount observed in the population. Without intervention to reduce the amount of disease, the disease may continue to occur at this level indefinitely. Thus, the baseline level is often regarded as the expected level of the disease. While some diseases are so rare in each population that a single case warrants an epidemiologic investigation (e.g., anthrax, rabies, plague, polio), there are other diseases that occur more commonly so that only deviations from the norm (i.e., seeing more cases than expected) warrants investigation or could be an indicator of an exposure event(s) or ongoing exposure (e.g., legionella) (CDC, n.d.).

Epidemics occur when an agent (the organism) and susceptible hosts are present in adequate numbers, and the agent can be effectively passed from a source to the susceptible people (similar to dose – response relationship). More specifically, an epidemic may result from:

- A recent increase in amount of virulence of the agent,
- The recent introduction of the agent into a setting where it has not been before,
- An enhanced mode of transmission so that more susceptible persons are exposed,
- A change in the susceptibility of people's response to the agent, and/or
- Factors that increase exposure or involve introduction through new portals of entry.

Epidemics that are caused by infectious diseases, are typically transmitted through food, water, the environment, person-to-person or animal-to-person (e.g., zoonotic infections). Epidemics can also be caused by noninfectious diseases, such as a chemical exposure, that cause increased rates of illness. Infectious diseases that may cause an epidemic can be broadly categorized into the following groups:

- Foodborne (e.g. Salmonellosis, Escherichia coli)
- Water (e.g., Cholera, Giardiasis, legionellosis)
- Vaccine Preventable (e.g., Measles, Mumps)
- Sexually Transmitted (e.g., Human Immunodeficiency Virus, Syphilis)
- Person-to-Person (e.g., Tuberculosis, meningitis)

- Healthcare associated (e.g., some opportunistic fungal infections and antimicrobial resistant infections).
- Vector borne disease (e.g., Lyme, West Nile Virus, Powassan Virus)
- Zoonotic (e.g., Rabies, Psittacosis, avian influenza)
- Opportunistic fungal and fungal infections (e.g., Candidiasis)

An epidemic may also result from a bioterrorist event in which an infectious agent is released into a susceptible population, often through an enhanced mode of transmission, such as aerosolizing (inhalation of small infectious disease particles).

Regarding foodborne and waterborne outbreaks, the epidemic hazard involves the safety of the food and water supply. This food and water safety may be jeopardized because of a fire, flood, hurricane, earthquake, or other natural, technological or man-made disaster (e.g., construction and water pipe damage perpetuating growth of legionella bacteria).

Location

Infectious disease can impact the entire city of Keene.

Extent

The magnitude and severity of infectious diseases is described by its speed of onset (how quickly people become sick or cases are reported) and how widespread the infection is. Some infectious diseases are inherently more dangerous and deadly than others, but the best way to describe the extent of infectious diseases relates to the disease occurrence:

- Endemic - Constant presence and/or usual prevalence of a disease or infection agent in a population within a geographic area
- Hyperendemic - The persistent, high levels of disease occurrence
- Cluster - Aggregation of cases grouped in place and time that are suspected to be greater than the number expected even though the expected number may not be known
- Epidemic - A sudden increase in the number of cases of a disease above what is normally expected
- Outbreak - The same as epidemic, but over a much smaller geographical area
- Pandemic - Epidemic that has spread over several countries or continents, usually affecting many people

According to the State of New Hampshire Hazard Mitigation Plan, annual infectious disease hazards range from annual norovirus, influenza and foodborne illnesses to outbreaks of Mpox (2022), Hepatitis A (2019-2020), Legionella (2018) and other diseases.[30] Illnesses with notable recent impacts in Keene include COVID-19 (6,990 cases in Keene and 139 deaths in Cheshire County) and Lyme disease.[31]

[30] New Hampshire State Hazard Mitigation Plan (2023)
[31] NH DHHS Data Portal

Previous Occurrences

Table 14 Previous Occurrences of Infectious Disease

Date(s)	Event Description	Impacts	Location	Other Information
Fall 2014-February 2016	Ebola virus disease	>100 people in New Hampshire monitored for potential Ebola virus symptoms	Statewide	New Hampshire residents were monitored for symptoms of Ebola virus disease after travelling to West Africa during the unprecedented outbreak of Ebola virus. No actual cases of Ebola virus occurred in New Hampshire.
2022	Mpox	35 Cases in New Hampshire	Statewide	Cases of Mpox started appearing in countries where it is not endemic in May 2022, and quickly spread to the U.S., with the CDC declaring it a public health emergency in August 2022
2020-2023	Coronavirus	Over 375,000 cases of COVID-19 in New Hampshire, and nearly 3,000 deaths	Statewide	Coronavirus disease 2019 (COVID-19) was first identified in China in December 2019, and in March 2020 the WHO declared it a global pandemic
2019-2020	Hepatitis A	339 cases, 210 hospitalizations, and 3 deaths in NH. Nationally, there have been 44,779 cases, 27,342 hospitalizations, and 421 deaths	Statewide/ National	Since March 2017, multiple state and local health departments experienced hepatitis A outbreaks, spread primarily through person-to-person contact.
2018	Legionella	49 persons probable or suspect	Statewide	2 deaths and 22 hospitalizations
2017-2018	Seasonal Influenza Outbreak	As of April 2018, 63 adult influenza related deaths had been identified in New Hampshire	Statewide	A particularly virulent flu season impacted the region. The overall effectiveness of the flu vaccine during this flu season was estimated at 36%.

Date(s)	Event Description	Impacts	Location	Other Information
Fall 2014-February 2016	Ebola virus disease	>100 people in New Hampshire monitored for potential Ebola virus symptoms	Statewide	New Hampshire residents were monitored for symptoms of Ebola virus disease after travelling to West Africa during the unprecedented outbreak of Ebola virus. No actual cases of Ebola virus occurred in New Hampshire.
2012	Fungal meningitis and other infections	14 patients infected in NH, 753 nationally and 64 deaths	Statewide/ National	Patients became infected with fungal infections following medications compounded at one pharmacy: https://www.cdc.gov/hai/outbreaks/m eningitis.html
2009	H1N1 Influenza	754 Hospitalizations and 10 Deaths	Statewide	WHO Level 1 Pandemic "swine flu" Division of Public Health Services processed 4,192 specimens and 786 cases
2005	Hepatitis A	82 Cases	Statewide	82 cases were reported; 30% higher than previous four years
Annually	Foodborne outbreaks	Ill individuals associated with outbreaks	Statewide	Approximately 5-10 outbreaks per year in state and 15-30 cases identified as associated with national outbreaks*
Annually	Influenza and other respiratory virus outbreaks	Ill individuals associated with outbreaks	Statewide	Approximately 25-50 outbreaks per year primarily occurring in long-term care facilities and schools *
Annually	Norovirus and other gastrointestinal virus outbreaks	Ill individuals associated with outbreaks	Statewide	Approximately 60-80 outbreaks per year primarily occurring in long-term care facilities and schools*

Disaster Declarations

Below is a list of Disaster Declarations for infectious disease events within the State of New Hampshire that have occurred since the 2018 Plan Update taken from the FEMA Disaster Search tool.

Declaration Title	Declaration Date	Incident Subcategory	Incident Period	Disaster Number
COVID-19 Emergency Declaration (EM)	3/13/2020	Infectious Disease	January 20, 2020 - May 11, 2023	3445
COVID-19 Pandemic Major Disaster Declaration (DR)	4/3/2020	Infectious Disease	January 20, 2020 - May 11, 2023	4516
NH State of Emergency – COVID-19	3/13/2020	Infectious Disease	March 13, 202 – June 11, 2021	NH Executive Order 2020-04

Probability of Future Events

MEDIUM (3): There is moderate likelihood that a hazardous event will occur within the next 25 years (1 - 2 events each 5 - 10 years).

Effects of Climate Change (AKA Future Conditions)

Vector-borne diseases transmitted by mosquito and tick bites are expected to rise in the future due to milder winters with fewer days of frost. The growth of algae or cyanobacteria is also more common due to warming water temperatures and increased nutrient levels.[32]

Potential Occurrences

The is a city wide event; therefore no specific locations are listed.

Potential Impact (aka vulnerability for each hazard on community assets)

- Those with weakened immune systems are at greater risk during these events.
- There is a potential for injury or death to people, domestic animals and wildlife.
- There is a potential for risk to waterbodies and wildlife habitat.
- There is a potential for loss of crops and vegetation, and economic disparity.

Keene has not quantified the estimated impacts due to infectious disease based on expected financial losses.

6.3.7 Lightning

Description

Lightning is a visible electric discharge produced by a thunderstorm. The discharge may occur within or between clouds, between a cloud and the air, between a cloud and the ground, or between the ground and a cloud.[33]

There are roughly 5-10 times as many cloud flashes as there are cloud to ground flashes. There are two types of ground flashes: negative polarity (those that occur because of electrification in the environment) and positive polarity (charge build up on tall structures, airplanes, rockets, and towers

[32] New Hampshire's Cyanobacteria Plan
[33] http://www.lightningsafety.noaa.gov/science/science_thunder.htm

on mountains). Negative polarity lightning goes from cloud to ground while positive polarity lightning goes from ground to cloud.

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

Location

High elevations and areas around water and wetlands may be more susceptible to lightning strike incidents. Lightening could strike tall trees anywhere in Keene and could potentially start wildfires in periods of drought or create telephone and power outages. Church steeples are also at risk.

Extent

While weather forecasters can and do forecast the likelihood of intense lightening activity, it is impossible to forecast individual strikes as lightning is so widespread, frequent, and random during a storm, as there is still not a full scientific understanding of the cloud electrification processes. Lightning strikes can be measured against each other through electrical calculations of the voltage and amperage that was discharged (the higher the voltage and amperage, the stronger and more severe the individual strike is). For the purposes of emergency management, all lightning strikes are viewed as equally dangerous regardless of their amps or volts, as any lightning strike is strong enough to cause infrastructure damage, injury, or death.

Research shows that the severity of a storm is roughly correlated to lightning frequency; however, there is significant regional variability, and no direct correlation has yet been found.[34] That said, there appears to be a general increase in the frequency of lightning as a thunderstorm becomes more intense (e.g., larger in area and vertical growth, more organized, hail producing, etc.). There is currently not a widely adopted scale for measuring lightning storms in the northeastern United States. When developing fire weather forecasts, the National Weather Service measures the severity of lightning storms using the Lightning Activity Level (LAL) which is based on cloud and storm development as well as number of lightning strikes in a 5-minute period.

Error! Reference source not found. categorizes lightning hazards according to the Lightning Activity L evel (LAL) using cloud conditions and precipitation, and an estimate of lightning strikes per every 15 minutes.

[34] The Relationship between Severe Storm Reports and Cloud-to-Ground Lightning Polarity in the Contiguous United States from 1989 to 1998 in: Monthly Weather Review Volume 131 Issue 7 (2003)

Table 15 Lightning Activity Level (Source: NOAA)

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

Previous Occurrences

Cheshire County and the Census tracts containing Keene received a rating of Relatively High for Lightning Risk according the FEMA's National Risk Index. This finding was informed by a database of cloud-to-ground lightning strikes from 1991 to 2012.[35] There have been no lightning strikes that have caused damage to structures or injuries since the previous hazard mitigation plan that have been recorded.

Since New Hampshire's first declaration in 1953, there were no State or federal major disaster declarations in Cheshire County specific to lightning.

Probability of Future Events

VERY HIGH (5): It is highly likely that a hazardous event will occur within the next 25 years (1 - 2 events each year).

Effects of Climate Change (AKA Future Conditions)

Lightning strikes are highly seasonal and occur more often when it is hotter. Some research indicates there will be more lightning strikes in the continental United States as temperature increases.[36]

Potential Occurrences

Residents and visitors to the New Hampshire area are more vulnerable to being struck by lightning because of the activities with which they are involved, particularly on those warm summer days when lightning is most likely to occur. More likely to be affected are structures and utilities, often

[35] National Risk Index Technical Documentation (fema.gov)
[36] Projected increase in lightning strikes in the United States due to global warming | Science

resulting in structure fires and power outages. High elevations and areas around water and wetlands may be more susceptible to lighting strike incidents. Lightning could strike tall trees anywhere in Keene and could potentially start wildfires in periods of drought or create telephone and power outages. Church steeples are also at risk.

Potential Impact (aka vulnerability for each hazard on community assets)

- This could occur citywide;
- There is a potential for interruption of service, and damage to structures;
- There is a potential for injury or death.
- Areas of high fuel load are at higher risk;
- Antennas and towers are at higher risk; and
- Hikers, fishermen and boaters are at higher risk.

Keene has not quantified the estimated impacts due to lightning based on expected financial losses.

6.3.8 Severe Wind (Tornado / Downburst)

Description

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

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

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

Location

Severe wind events (downburst, tornadoes or high winds associated with thunderstorms) can occur anywhere in Keene. Generally higher elevations, such as Beech Hill, are more susceptible as well as more vulnerable due to the fact that they are home to many communication towers, including

emergency response/mutual aid towers. Due to the sporadic nature of Tornados, they could occur anywhere in the City of Keene.

Extent

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

- **EF-0**: Wind speed 65-85 mph.; frequency 53.5%. Minor damage.
- **EF-1**: Wind speed 86-101 mph.; frequency 31.6%. Moderate damage.
- **EF-2**: Wind speed 111-135 mph.; frequency 10.0%. Considerable damage.
- **EF-3**: Wind speed 136-165 mph.; frequency 3.4%. Severe damage.
- **EF-4**: Wind speed 166-200 mph.; frequency 0.7%. Extreme damage.
- **EF-5**: Wind speed >200 mph.; frequency 0.1%. Total destruction.

Most tornadoes are in the F0 to F2 Class. Building to modern wind standards provides significant property protection from these hazard events. New Hampshire is located within Zone 2 for Design Wind Speed for Community Shelters, which is 160 mph, and is also noted as being within a hurricane susceptible region.

Damaging winds are often called "straight-line" winds to differentiate the damage they cause from tornado damage. Most thunderstorm winds that cause damage at the ground are a result of outflow generated by a thunderstorm downdraft. Damaging winds are classified as those exceeding 50-60mph.[37]

Previous Occurrences

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

Table 16 Previous Occurrences of Severe Wind

Date(s)	Event Description	Impacts	Location	Other Information
9/15/1922	Tornado (EF2)		Cheshire County	
9/13/1928	Tornado (EF2)		Cheshire County	
8/13/1963	Tornado (EF2)		Cheshire County	

[37] Severe Weather 101: Damaging Winds FAQ (noaa.gov)

Date(s)	Event Description	Impacts	Location	Other Information
6/6/1963	Tornado (EF2)		Cheshire County	
7/3/1997	Tornado (EF1)	An F1 tornado caused severe tree loss in Swanzey, destroyed a building and damaged the stables at the Cheshire Fairgrounds. No injuries reported locally.	Swanzey, NH	
7/3/1997	Tornado (EF2)	An F2 Tornado caused damage to a summer camp, the recycling center and completely destroyed a lumber facility.	Greenfield, NH	
5/23/1998	Tornado (EF2)	F2. No significant damage or injuries reported locally.	Hillsborough County	
12/1/2006	Severe Wind	A line of severe thunderstorms moved through Cheshire County ahead of a strong cold front and caused significant damage. Two trees were downed onto houses in Keene, one on Allen Court and one on New Acres Road. The house on New Acres Road was completely destroyed.	Cheshire County	
7/24/2008	Tornado (EF2)	EF2. No significant damage or injuries reported locally.	Deerfield/Northwood	
6/1/2012	Downburst	A microburst hit Harrisville and caused many downed trees, but no significant damage to structures was recorded. Some residents lost power for several days. No local impact to Keene.	Harrisville, NH	
7/18/2022	Tornado (EF1)	$2,000 in property damage, no deaths or injuries reported	Spofford	0.36 miles in length by 250 yards wide.
7/27/2023	Tornado (EF1)	No damages, injuries or deaths were reported	Keene to Dublin	12.65 miles in length by 200 yards wide.

Date(s)	Event Description	Impacts	Location	Other Information
6/23/2024	Tornado (EF1)	$1,000 in property damage, no deaths or injuries reported	Dublin	3.36 miles in length by 80 yards wide.
7/16/2024	Straight line winds	13 homes destroyed, 54 damaged	Keene	

Probability of Future Events – see risk assessment chart

VERY HIGH (5): It is highly likely that a hazardous event will occur within the next 25 years (1 - 2 events each year).

Effects of Climate Change (AKA Future Conditions)

Unlike the influences of climate change on precipitation and temperature, changes in the occurrence of tornados is more complex. For example, the annual number of tornadoes occurring in the United States EF-1 or greater is stable.[38]

Potential Occurrences

- High elevations are at greatest risk.
- This is a town wide event; therefore, no specific locations are listed.

Potential Impact (aka vulnerability for each hazard on community assets)

The City is at risk from severe localized blasting winds. Structural damage potential; such events cause small blocks of downed timber. Old trees along roads are at risk of falling and causing damage to structures during wind events. There is a potential for loss of electricity. Downbursts are sometimes mistaken for tornados and can cause very similar damage.

Tornadoes rarely occur in this part of the country; therefore, assessing damage is difficult. The 2018 estimated damages to 10% of structures with 20% damage were approximately $37,530,256. The estimated cost does not include building contents, land values or damages to utilities.

- The potential for damage to structures from severe wind, downbursts, and tornados is citywide;
- There is a potential for interruption of service and damage to utilities; and
- There is a potential for injury or death.

6.3.9 Severe Winter Weather

Description

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

[38] Tornadoes and Climate Change (noaa.gov)

Heavy Snow In forecasts, the amount of snow that is expected to fall is expressed as a range of values, such as 10-12". There can be considerable uncertainty regarding snowfall values during heavy snowstorms and phrases such as "...up to 20 inches" or "12 inches or more" can be utilized. Heavy snow is generally defined as[39]:

- Snowfall accumulating to 4" – 6" or more in depth within 12 hours or less; or
- Snowfall accumulating to 6" – 8" or more in depth within 24 hours or less

These amounts are determined to be significant enough to disrupt or slow transportation systems and public safety departments' response capability.

Blizzard A blizzard is a snowstorm with the following conditions that is expected to prevail for a period of three hours or longer[40]:

- Sustained wind or frequent gusts to 35mph or greater; AND,
- Considerable falling and/or blowing snow that frequently reduces visibility to less than one-quarter mile.

Snow Squall A snow squall is an intense, but limited duration, period of moderate to heavy snowfall, accompanied by strong, gusty surface winds, near zero visibilities and possibly lightning (generally moderate to heavy snow showers). Snow accumulation rates are significant but overall amounts are limited.

Sleet Sleet is defined as pellets of ice composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes. These pellets of ice usually bounce after hitting the ground or other hard surfaces. Heavy sleet is a relatively rare event defined as an accumulation of ice pellets covering the ground to a depth of one-half inch or more. Sleet can be extremely slick and hazardous to drive on compared to snow, but it doesn't drift or cause low visibilities.

Nor'easter A Nor'easter is a large cyclonic storm that tracks north/northeastward along the East Coast of North America. It is so named due to the northeasterly prevailing wind direction that occurs during the storm. While these storms may occur at any time of the year, they are most frequent and severe during the months of September through April. Nor'easters usually develop off the east coast between Georgia and New Jersey, travel northeastward, and intensify in the New England region. Nor'easters nearly always bring precipitation in the form of heavy rain and/or snow, as well as gale force winds, rough seas, and coastal flooding.[41]

New Hampshire (New England) is especially susceptible to strong Nor'easters during the winter as the polar Jet stream transports cold, artic air southward across the northern central US. This airmass then moves eastward toward the Atlantic Ocean where it meets warm air from the Gulf of Mexico generating a strong low-pressure system. The warm waters of the Gulf Stream help keep the coastal

[39] NOAA's National Weather Service - Glossary
[40] NOAA's National Weather Service - Glossary
[41] http://www.nws.noaa.gov/om/winter/noreaster.shtml

waters off of New England relatively mild during the winter, which in turn helps warm the cold winter air over the water. The presence of the relatively warmer, moist air over the Atlantic and cold, dry Arctic air over the land provide the temperature contrast necessary to generate the strong frontal boundaries that help a Nor'easter intensify.

Ice Storm Ice storms typically occur with warm frontal boundaries, where warm air rises up and over a shallow mass of cold air near the earth's surface. When snow falls from clouds near just north of the warm frontal boundary, it will fall through the deep warm layer aloft first and melt completely into a liquid water droplet. As it passes through the shallow cold layer near the surface, the water droplet cools to the point of being supercooled (a liquid raindrop that remains a liquid at the freezing point). When these supercooled water droplets make contact with freezing surfaces on the ground, such as streets and walkways, they freeze on contact forming layers of ice. This process of freezing rain, when persistent over a long period of time, will form layers that may exceed over an inch thick in extreme cases.

Any accumulation of ice can present hazards; however, significant accumulations of ice (1/4" of mean radial ice thickness or greater) can pull down trees and utility lines resulting in loss of power and communications. Walking and driving also becomes very dangerous to almost impossible during an ice storm.[42]

Location

The entire city is at risk.

Extent

One measure of the extent (or relative intensity) of severe winter weather is based on how much snow is falling (in inches) and how fast it is falling (inches per hour. The National Weather Service Winter Storm Warning criteria for the State of New Hampshire are as follows:

- 6" or more of snow expected in a 12-hour period; or,
- 9" or more of snow is expected in a 24-hour period; or,

NOAA has developed the Regional Snowfall Index (RSI) which is a snowfall impact scale that uses the area of snowfall, amount of snowfall, and population to attempt to quantify the societal impacts of a snowstorm.

Category	RSI Value	Description
1	1–3	Notable
2	3–6	Significant
3	6–10	Major
4	10–18	Crippling
5	18.0+	Extreme

[42] NOAA's National Weather Service - Glossary

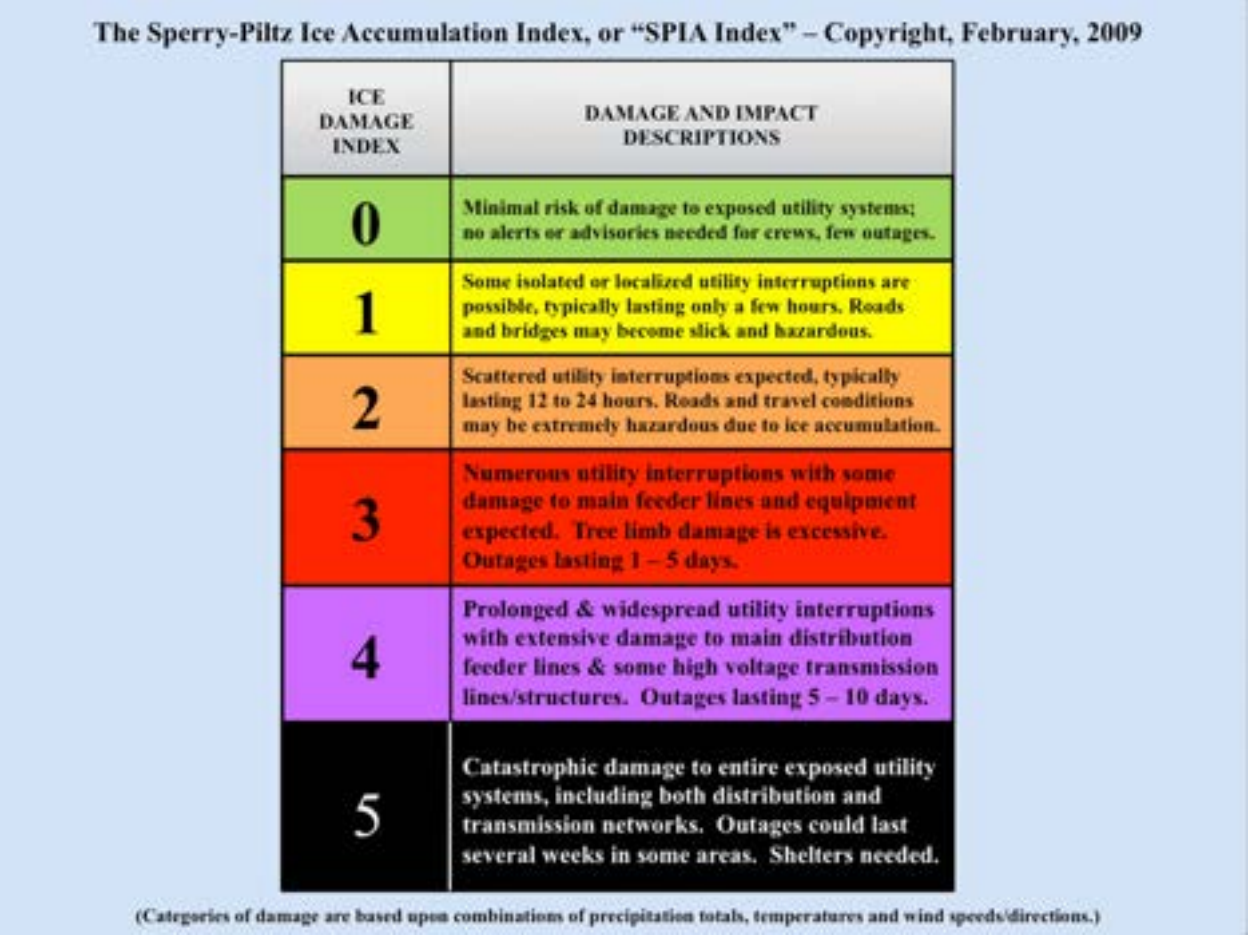
The RSI is an evolution of the previous Northeast Snowfall Impact Scale (NESIS).[43]

Category	NESIS Value	Description
1	1—2.499	Notable
2	2.5—3.99	Significant
3	4—5.99	Major
4	6—9.99	Crippling
5	10.0+	Extreme

The Sperry–Piltz Ice Accumulation Index, or SPIA® Index, is a forward-looking, ice accumulation and ice damage prediction index that uses an algorithm of researched parameters that, when combined with National Weather Service forecast data, predicts the projected footprint, total ice accumulation, and resulting potential damage from approaching ice storms. It is a tool to be used for risk management and/or winter weather preparedness.[44]

[43] Regional Snowfall Index (RSI) | National Centers for Environmental Information (NCEI) (noaa.gov)
[44] SPIA Index

Figure 10 - SPIA Index



Previous Occurrences

Table 17 Previous Occurrence of Severe Winter Weather

Date(s)	Event Description	Impacts	Location	Other Information
12/17-12/20/1929	Ice Storm		New Hampshire	Unprecedented disruption and damage to telephone, telegraph and power system.
2/14-2/17/1958	Blizzard		New Hampshire	20-30 inches of snow in parts of NH.
3/18-3/21/1958	Snow Storm		New Hampshire	Up to 22 inches of snow in south central NH.
1/18-1/20/1961	Snow Storm		New Hampshire	Up to 25 inches of snow in southern NH.
2/2-2/5/1961	Snow Storm		New Hampshire	Up to 18 inches of snow in southern NH.

Date(s)	Event Description	Impacts	Location	Other Information
1/11-1/16/1964	Snow Storm		New Hampshire	Up to 12 inches of snow in southern NH.
1/29-1/31/1966	Blizzard		New Hampshire	Third and most severe storm of 3 that occurred over a 10-day period. Up to 10“ of snow across central NH.
12/26-12/28/1969	Snow Storm		New Hampshire	Up to 41 inches of snow in west central NH.
2/18-2/20/1972	Snow Storm		New Hampshire	Up to 19 inches of snow in southern NH.
1/19-1/21/1978	Snow Storm		New Hampshire	Up to 16 inches of snow in southern NH.
2/5-2/7/1978	Blizzard		New Hampshire	New England-wide. Up to 25 inches of snow in central NH.
Feb. 1979	Snow Storm		New Hampshire	President's Day storm.
1/8-1/25/1979	Ice Storm		New Hampshire	Major disruptions to power and transportation.
4/5-4/7/1982	Snow Storm		New Hampshire	Up to 18 inches of snow in southern NH.
2/14/1986	Ice Storm		New Hampshire	Fiercest ice storm in 30 years in the higher elevations in the Monadnock region. It covered a swath about 10 miles wide from the MA border to New London, NH.
Nov - Dec, 1988	Extreme Cold		New Hampshire	Temperature was below 0 degrees F for a month.
3/3-3/6/1991	Ice Storm		New Hampshire	Numerous outages from ice-laden power lines in southern NH.
1/15/1998	Ice Storm		New Hampshire	**Federal disaster declaration # DR-1199-NH**, 20 major road closures, 67,586 without electricity statewide, 2,310 without phone service, $17+ million in damages to Public Service of NH alone.
Feb. 2006	Snow Storm		New Hampshire	Trees down and power outages due to heavy snowfall.
12/11/2008	Ice Storm		New Hampshire	Many downed trees and power lines throughout the state.
10/29-30/2011	Snow Storm		New Hampshire	**FEMA Disaster Declaration # DR-4049** (Hillsborough and Rockingham Counties). Severe snowstorm event. Snowfall 34” in a 24 hour period.

Date(s)	Event Description	Impacts	Location	Other Information
2/8-10/2013	Snow Storm		New Hampshire	February blizzard "Nemo", exceeded previous snow fall amounts; category B Declaration # DR4105. Local – no injuries or structures damaged.
11/1/2014	Snow Strom		New Hampshire	"Thanksgiving Storm"- was declared the 4th largest power outage in NH history. Many communities received over 12" of snow. Local – no injuries or structures damaged.
1/1/2015	Snow Storm		New Hampshire	**FEMA Disaster Declaration # DR-4209**. (Hillsborough, Rockingham, and Strafford Counties). Several successive snow storms that dumped in excess of 10" each. Local – no injuries or structures damaged.
3/14-15/2017	Snow Storm		New Hampshire	**FEMA Disaster Declaration #DR-4316**. (Belknap and Carroll Counties) Local – no injuries or structures damaged.
3/13-14/2018	Snow Storm		New Hampshire	**FEMA Disaster Declaration #DR-4371**. (Carroll, Strafford, and Rockingham Counties) Local – no injuries or structures damaged.
1/20/2019	Heavy Snow	No damages, injuries or deaths were reported	Cheshire County	Snowfall totals generally ranged from 6 to 10 inches.
12/1/2019-12/3/2019	Heavy Snow	No damages, injuries or deaths were reported	Cheshire County	Snowfall totals ranged from 6 to 12 inches by the morning of the 2nd, with storm total snowfall on the afternoon of the 3rd ranging from 12 inches near the Connecticut River to 24 inches in the eastern part of Cheshire County. Locally higher amounts in excess of 30 inches were measured from the Monadnocks south through Rindge.
3/23/2020	Winter Storm	No damages, injuries or deaths were reported	Cheshire County	Snowfall rates approached one inch per hour at times in the evening, before tapering off quickly around midnight. Total snowfall ranged from 5 to 8 inches.

Date(s)	Event Description	Impacts	Location	Other Information
12/5/2020-12/6/2020	Winter Storm	No damages, injuries or deaths were reported	Cheshire County	Snow totals ranged from around 3 inches in the Connecticut River Valley to as much as 12 inches in the higher terrain.
12/17/2020	Winter Storm	No damages, injuries or deaths were reported	Cheshire County	Snowfall totals ranged from 12 to 24 inches.
2/1/2021-2/2/2021	Winter Storm	No damages, injuries or deaths were reported	Cheshire County	Snowfall ranged from 8 to 12 inches.
4/15/2021-4/16/2021	Heavy Snow	No damages, injuries or deaths were reported	Cheshire County	The heavy wet snow led to isolated power outages in the county that were quickly restored. Storm total snow ranged from 7 to 13 inches.
1/17/2022	Winter Storm	No damages, injuries or deaths were reported	Cheshire County	Snowfall totals generally ranged from 5 inches near the lower elevations around Keene to as much as 10 inches near Mount Monadnock.
1/29/2022	Winter Storm	No damages, injuries or deaths were reported	Cheshire County	Snowfall ranged from 8 inches in the higher terrain of the Monadnocks to 2 inches along the Connecticut River.
2/25/2022	Winter Storm	No damages, injuries or deaths were reported	Cheshire County	Snowfall amounts ranged from 6 to 8 inches.
12/16/2022-12/17/2022	Winter Storm	No damages, injuries or deaths were reported	Cheshire County	Snowfall totals ranged from 4 inches around Keene, to as high as 18 inches in the Monadnocks.
1/22/2023-1/23/2023	Winter Storm	No damages, injuries or deaths were reported	Cheshire County	Snowfall totals ranged from 6 inches in the Monadnocks to 16 inches near the Connecticut River.

Date(s)	Event Description	Impacts	Location	Other Information
3/3/2023-3/4/2023	Winter Storm	No damages, injuries or deaths were reported	Cheshire County	Snowfall totals ranged from 5 to 9 inches.
3/13/2023-3/15/2023	Winter Storm	No damages, injuries or deaths were reported	Cheshire County	Snowfall totals ranged from 9 inches in the valleys to more than 30 inches in the Monadnocks. Power outages were widespread where snowfall totals exceeded 10 inches, along with numerous downed trees and closed roads.
1/6/2024-1/7/2024	Winter Storm	No damages, injuries or deaths were reported	Cheshire County	Snowfall totals ranged from 5 to 10 inches.
3/23/2024	Winter Storm	No damages, injuries or deaths were reported	Cheshire County	Snowfall rates in excess of 1 inch per hour in the morning led to snowfall totals ranging between 4 and 13 inches.
4/3/2024-4/4/2024	Winter Storm	No damages, injuries or deaths were reported	Cheshire County	Snowfall totals ranged from 4 inches in the Connecticut Valley to 10 inches near the Monadnocks. Key Impacts: Heavy snow, scattered power outages, transportation delays.

Probability of Future Events

VERY HIGH (5): It is highly likely that a hazardous event will occur within the next 25 years (1 - 2 events each year).

Effects of Climate Change (AKA Future Conditions)

New Hampshire Climate Assessment 2021 noted that winters will be warmer in the future and both snowfall and snow cover are likely to decrease (22-42% in Keene by 2099).[45] Minimum temperatures during the winter will rise faster than those in other seasons leading to fewer days below 0 degrees (5.0-6.0 fewer over the period 2010-2039 compared to the historical average) as well as below 32 degrees (11.8-12.9 fewer 2010-2039 compared to historical).

[45] New Hampshire Climate Assessment 2021 (unh.edu)

Potential Occurrences
This is a city-wide event, therefore no specific locations are listed. However, there are several roads in Keene with moderate to steep grades are a concern for driver safety.

Potential Impact (aka vulnerability for each hazard on community assets)
Heavy snow can collapse buildings and ice storms can disrupt power and communication services. Extreme cold affects the elderly. Keene's recent history has not recorded any loss of life due to extreme winter weather. These random events are difficult to set a cost to repair or replace any of the structures or utilities affected.

- There is the potential for damage to structures from heavy snow, and freezing pipes;
- There is a potential for injury or death;
- Power outages could occur due to heavy snow and ice on power lines; and
- The entire city is at risk.

6.3.10 Solar Storms & Space Weather

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

Solar activity (solar storms) refers to solar flares, coronal mass ejections, high-speed solar wind, and energetic solar particles. Any of these events may occur for a few minutes to several hours, can affect Earth for days to weeks. All solar activity is driven by the solar magnetic field. A solar flare is an intense burst of radiation resulting from the release of sunspot magnetic energy, which can occur for minutes to hours. Solar prominence is a large, bright feature that extends outward from the sun's surfaces. A coronal mass ejection (CME) occurs when the outer solar atmosphere's magnetic field is closed, resulting in a confined atmosphere that suddenly explodes, releasing bubbles of gas and magnetic fields. The surface of the sun is hot electrified gas boiling up from the interior of the sun out into space-this is referred to as high-speed solar wind. Solar wind travels at 800,000 to 5 million miles per hour and carries mass the size of Utah's Great Salt Lake into space every second; however, solar wind is 1000 million times weaker than the winds that we experience on Earth.

A geomagnetic storm occurs when a CME or high-speed solar winds strike and begin to penetrate the Earth's magnetosphere and can decrease the Earth's magnetic field strength for 6-12 hours

Location
This is a citywide event.

Extent

Solar activity (also called solar storms or geomagnetic storms) refers to solar flares, coronal mass ejections, high-speed solar wind, and energetic solar particles. One measure of the extent (or relative intensity) of solar storms and space weather comes the National Oceanic and Atmospheric Administration (NOAA) uses a series of three scales to alert those who depend on radio communications such as first responders and airlines on days that could create life threatening situations if their radios are impacted. They can also affect our satellite operations and GPS navigation capabilities. Any of these events may occur for a few minutes to several hours, can affect Earth for days to weeks.

NOAA categorizes **geomagnetic storms** on a scale ranging from G1 to G5. A G5 storm, the most extreme level, can result in complete high frequency radio blackouts across the sunlit side of Earth, lasting for several hours.

Figure 11 NOAA Space Weather Scales (Geomagnetic Storms)

Scale	Description	Effect	Physical measure	Average Frequency (1 cycle = 11 years)
G 5	**Extreme**	**Power systems:** Widespread voltage control problems and protective system problems can occur, some grid systems may experience complete collapse or blackouts. Transformers may experience damage. **Spacecraft operations:** May experience extensive surface charging, problems with orientation, uplink/downlink and tracking satellites. **Other systems:** Pipeline currents can reach hundreds of amps, HF (high frequency) radio propagation may be impossible in many areas for one to two days, satellite navigation may be degraded for days, low-frequency radio navigation can be out for hours, and aurora has been seen as low as Florida and southern Texas (typically 40° geomagnetic lat.).	Kp = 9	4 per cycle (4 days per cycle)

Scale	Description	Effect	Physical measure	Average Frequency (1 cycle = 11 years)
G 4	**Severe**	**Power systems:** Possible widespread voltage control problems and some protective systems will mistakenly trip out key assets from the grid. **Spacecraft operations:** May experience surface charging and tracking problems, corrections may be needed for orientation problems. **Other systems:** Induced pipeline currents affect preventive measures, HF radio propagation sporadic, satellite navigation degraded for hours, low-frequency radio navigation disrupted, and aurora has been seen as low as Alabama and northern California (typically 45° geomagnetic lat.).	Kp = 8, including a 9-	100 per cycle (60 days per cycle)
G 3	**Strong**	**Power systems:** Voltage corrections may be required, false alarms triggered on some protection devices. **Spacecraft operations:** Surface charging may occur on satellite components, drag may increase on low-Earth-orbit satellites, and corrections may be needed for orientation problems. **Other systems:** Intermittent satellite navigation and low-frequency radio navigation problems may occur, HF radio may be intermittent, and aurora has been seen as low as Illinois and Oregon (typically 50° geomagnetic lat.).	Kp = 7	200 per cycle (130 days per cycle)
G 2	**Moderate**	**Power systems:** High-latitude power systems may experience voltage alarms, long-duration storms may cause transformer damage. **Spacecraft operations:** Corrective actions to orientation may be required by ground control; possible changes in drag affect orbit predictions. **Other systems:** HF radio propagation can fade at higher latitudes, and aurora has been seen as low as New York and Idaho (typically 55° geomagnetic lat.).	Kp = 6	600 per cycle (360 days per cycle)
G 1	**Minor**	**Power systems:** Weak power grid fluctuations can occur. **Spacecraft operations:** Minor impact on satellite operations possible. **Other systems:** Migratory animals are affected at this and higher levels; aurora is commonly visible at high latitudes (northern Michigan and Maine).	Kp = 5	1700 per cycle (900 days per cycle

NOAA categorizes **solar radiation storms** on a scale ranging from S1 to S5. A S5 storm, the most extreme level, can result in satellites being rendered useless and complete blackout of high frequency communications. However, these effects are limited to high latitudes and polar regions.

Figure 12 NOAA Space Weather Scales (Solar Radiation Storms)

Scale	Description	Effect	**Physical measure** (Flux level of >= 10 MeV particles)	**Average Frequency** (1 cycle = 11 years)
S 5	**Extreme**	**Biological:** Unavoidable high radiation hazard to astronauts on EVA (extra-vehicular activity); passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk. **Satellite operations:** Satellites may be rendered useless, memory impacts can cause loss of control, may cause serious noise in image data, star-trackers may be unable to locate sources; permanent damage to solar panels possible. **Other systems:** Complete blackout of HF (high frequency) communications possible through the polar regions, and position errors make navigation operations extremely difficult.	10^5	Fewer than 1 per cycle
S 4	**Severe**	**Biological:** Unavoidable radiation hazard to astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk. **Satellite operations:** May experience memory device problems and noise on imaging systems; star-tracker problems may cause orientation problems, and solar panel efficiency can be degraded. **Other systems:** Blackout of HF radio communications through the polar regions and increased navigation errors over several days are likely.	10^4	3 per cycle
S 3	**Strong**	**Biological:** Radiation hazard avoidance recommended for astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk. **Satellite operations:** Single-event upsets, noise in imaging systems, and slight reduction of efficiency in solar panel are likely. **Other systems:** Degraded HF radio propagation through the polar regions and navigation position errors likely.	10^3	10 per cycle

Scale	Description	Effect	**Physical measure** (Flux level of >= 10 MeV particles)	**Average Frequency** (1 cycle = 11 years)
S 2	**Moderate**	**Biological:** Passengers and crew in high-flying aircraft at high latitudes may be exposed to elevated radiation risk. **Satellite operations:** Infrequent single-event upsets possible. **Other systems:** Small effects on HF propagation through the polar regions and navigation at polar cap locations possibly affected.	10^2	25 per cycle
S 1	**Minor**	**Biological:** None. **Satellite operations:** None. **Other systems:** Minor impacts on HF radio in the polar regions.	10	50 per cycle

NOAA categorizes **radio blackouts** on a scale ranging from R1 to R5. A R5 storm, the most extreme level, results in a complete high frequency radio blackout on the entire sunlit side of Earth.

Figure 13 NOAA Space Weather Scales (Radio Blackouts)

Scale	Description	Effect	**Physical measure**	**Average Frequency** (1 cycle = 11 years)
R 5	**Extreme**	**HF Radio:** Complete HF (high frequency) radio blackout on the entire sunlit side of the Earth lasting for a number of hours. This results in no HF radio contact with mariners and en route aviators in this sector. **Navigation:** Low-frequency navigation signals used by maritime and general aviation systems experience outages on the sunlit side of the Earth for many hours, causing loss in positioning. Increased satellite navigation errors in positioning for several hours on the sunlit side of Earth, which may spread into the night side.	X20 (2×10^{-3})	Less than 1 per cycle

Scale	Description	Effect	Physical measure	Average Frequency (1 cycle = 11 years)
R 4	**Severe**	**HF Radio:** HF radio communication blackout on most of the sunlit side of Earth for one to two hours. HF radio contact lost during this time. **Navigation:** Outages of low-frequency navigation signals cause increased error in positioning for one to two hours. Minor disruptions of satellite navigation possible on the sunlit side of Earth.	X10(10^{-3})	8 per cycle (8 days per cycle)
R 3	**Strong**	**HF Radio:** Wide area blackout of HF radio communication, loss of radio contact for about an hour on sunlit side of Earth. **Navigation:** Low-frequency navigation signals degraded for about an hour.	X1 (10^{-4})	175 per cycle (140 days per cycle)
R 2	**Moderate**	**HF Radio:** Limited blackout of HF radio communication on sunlit side, loss of radio contact for tens of minutes. **Navigation:** Degradation of low-frequency navigation signals for tens of minutes.	M5 (5×10^{-5})	350 per cycle (300 days per cycle)
R 1	**Minor**	**HF Radio:** Weak or minor degradation of HF radio communication on sunlit side, occasional loss of radio contact. **Navigation:** Low-frequency navigation signals degraded for brief intervals.	M1 (10^{-5})	2000 per cycle (950 days per cycle)

Previous Occurrences

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

The entire State of New Hampshire is at risk of solar storms and space weather. One specific example of an R 3 or Strong radio blackout was observed by NOAA on July 3, 2021.[46] The Planning Team was not aware of any specific events or disruptions.

Since New Hampshire's first declaration in 1953, there were no State or federal major disaster declarations in Cheshire County specific to solar storms and space weather.

Probability of Future Events

LOW (2): There is little likelihood that a hazardous event will occur within the next 25 years (1 event in 25 years).

[46] R3 (Strong) Radio Blackout Observed | NOAA / NWS Space Weather Prediction Center

Effects of Climate Change (AKA Future Conditions)

The impact of changes in long-term weather patterns, precipitation, and temperature have an unknown impact on the probability of occurrence of solar storms.

Potential Occurrences

The entire city of Keene is at risk of solar storms and space weather.

Potential Impact (aka vulnerability for each hazard on community assets)

- There is a potential for interruption of service.
- Solar storms and space weather can impact the connections for emergency services. It can also impact the wells and tanks which communicate by radio.

Keene has not quantified the estimated impacts due to solar storms and space weather based on expected financial losses.

6.3.11 Tropical Cyclone (Tropical Storm / Hurricane)

Description

A tropical cyclone is the generic term for a non-frontal synoptic scale low-pressure system over tropical or sub-tropical waters with organized convection (i.e., thunderstorm activity) and defined cyclonic surface wind circulation. Once formed, a tropical cyclone is maintained by the extraction of heat energy from the ocean at high temperature and heat export at the low temperatures of the upper troposphere.[47]

There are several stages throughout the life cycle of a tropical cyclone:[48]

- Potential Tropical Cyclone: Term used by the National Hurricane Center (NHC) in advisory products to describe a disturbance that is not yet a tropical cyclone, but which poses the threat of bringing tropical storm or hurricane conditions to land areas within 48 hours. This is a new term that was introduced by the NHC in the summer of 2017.[49]
- Tropical Disturbance: A tropical disturbance is a cluster of showers and thunderstorms that flares up over the tropics. It is typically about 100 to 300 miles in diameter and generally moves westward. Tropical disturbances last for more than 24 hours, so there's a clear distinction between diurnal convection and tropical disturbances. Lacking a closed circulation of winds, tropical disturbances do not qualify as tropical cyclones.
- Tropical Storm: Once the maximum sustained winds of a developing tropical cyclone reach 34 knots (39 MPH), the low-pressure system is typically called a tropical storm and is assigned a formal name. The tropical cyclone maintains a tropical-storm status as long as its maximum sustained winds are above 34 knots and less than 64 knots (74 MPH).

[47] Glossary of NHC Terms
[48] Quick Guide to the Stages of Tropical Cyclones
[49] Update on National Hurricane Center Products and Services for 2017; 20170309_pa_2017SeasonChanges.pdf

- Hurricane: Once a tropical cyclone's maximum sustained winds reach 64 knots (74 MPH), the storm becomes a hurricane (in the North Atlantic and Northeast Pacific Ocean basins).
- Major Hurricane: A tropical cyclone with maximum stained winds of 96 knots (111 MPH) or higher.
- Post-tropical Cyclone: A former tropical cyclone, this term is used to describe a cyclone that no longer possess the sufficient tropical characteristics to be considered a tropical cyclone. These post-tropical cyclones often undergo an extratropical transition and form frontal boundaries. Post-tropical cyclones can continue carrying heavy rains and high winds and cause storm surge.

A subtropical cyclone is a non-frontal low-pressure system that has characteristics of both tropical and extratropical cyclones. Like tropical cyclones, they are non-frontal, synoptic-scale cyclones that originate over tropical or subtropical waters and have a closed surface wind circulation about a well-defined center. In addition, they have organized moderate to deep convection, but lack a central dense overcast. Unlike tropical cyclones, subtropical cyclones derive a significant proportion of their energy from baroclinic sources and are generally cold-core in the upper troposphere, often being associated with an upper-level low or trough. In comparison to tropical cyclones, these systems generally have a radius of maximum winds occurring relatively far from the center (usually greater than 60 n mi), and generally have a less symmetric wind field and distribution of convection.[50]

Location

Keene's location in southwestern New Hampshire reduces the risk of extremely high winds that are associated with hurricanes. Hurricanes can and do create flooding. The potential for damage from tropical cyclone events is citywide.

Extent

One measure of the extent (or relative intensity) of tropical storms and hurricanes is the Saffir-Simpson Hurricane Wind Scale, a 1 to 5 rating system based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous and require preventative measures.

[50] Glossary of NHC Terms

Figure 14 Saffir-Simpson Hurricane Wind Scale[51]

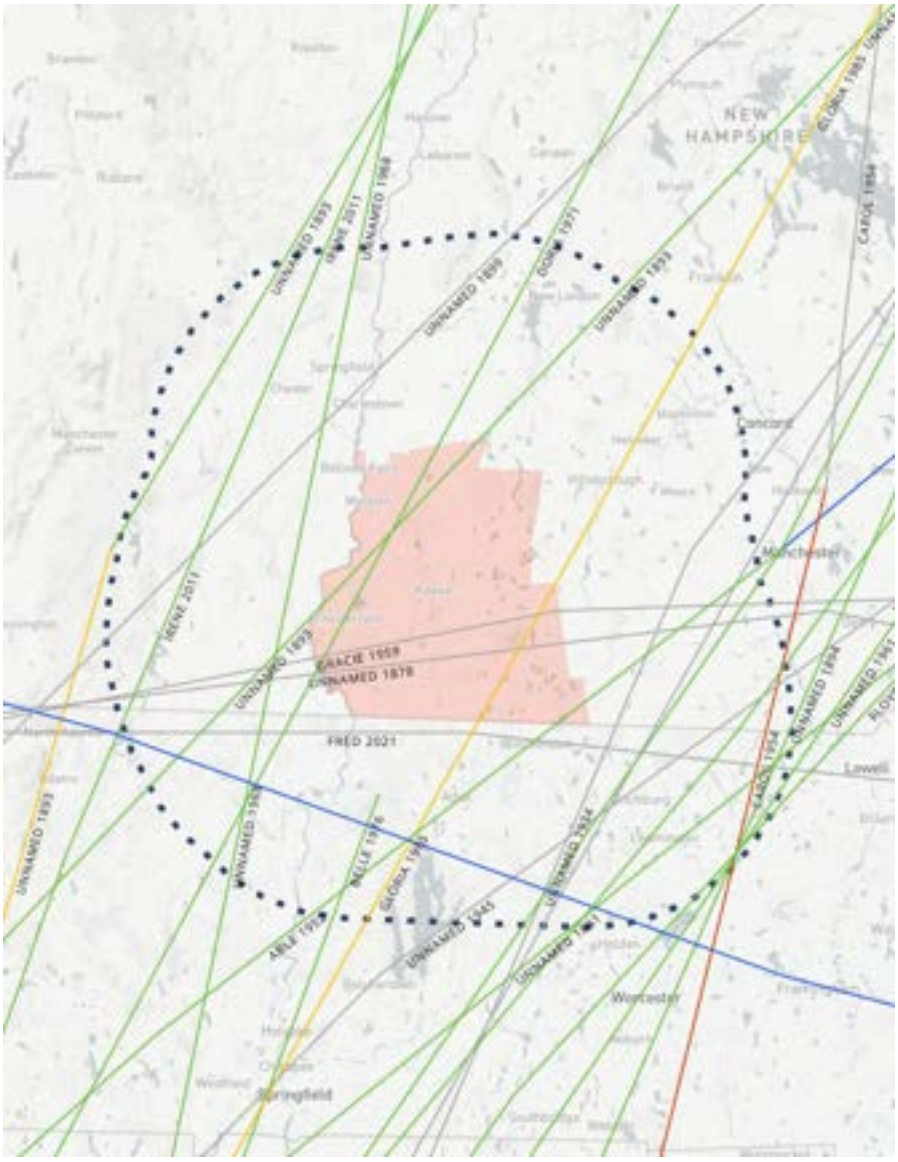
Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	**Very dangerous winds will produce some damage:** Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

[51] Saffir-Simpson Hurricane Wind Scale

Previous Occurrences

According to historical hurricane tracks, the highest magnitude tropical storm to pass through Cheshire County at a Category 1 hurricane was Gloria in 1985.

Figure 15 NOAA Hurricane Tracks (within 20 nautical miles of Cheshire County)[52]



[52] Historical Hurricane Tracks

Table 18 Previous Occurrences of Tropical Cyclone

Date(s)	Event Description	Location	Other Information
9/21/1938	Hurricane	Southern New England	Flooding caused damage to road network and structures. 13 deaths, 494 injured throughout NH. Disruption of electric and telephone services for weeks. Two billion feet of marketable lumber blown down. Total storm losses of $12,337,643 (1938 dollars). 186 mph maximum winds.
8/31/1954	Hurricane (Carol)	Southern New England	Category 3, winds 111-130 mph. Tree and crop damage in NH, localized flooding.
9/11/1954	Hurricane (Edna)	Southern New England	Category 3 in Massachusetts. This Hurricane moved off shore but still cost 21 lives and $40.5 million in damages throughout New England.
9/12/1960	Hurricane (Donna)	Southern and Central NH	Category 3 (Category 1 in NH). Heavy flooding in some parts of the State.
10/7/1962	Tropical Storm	Coastal NH	Heavy swell and flooding along the coast.
8/28/1971	Tropical Storm	New Hampshire	Center passed over NH resulting in heavy rain and damaging winds.
8/10/1976	Hurricane (Belle)	Southern New England	Category 1, primarily rain with resulting flooding in NH.
9/-/1985	Hurricane (Gloria)	Southern New England	Category 2, winds 96-110 mph. Electric structures damaged; tree damages. This Hurricane fell apart upon striking Long Island with heavy rains, localized flooding, and minor wind damage in NH.
8/19/1991	Hurricane (Bob)	Southern New England	Structural and electrical damage in region from fallen trees. Three people were killed and $2.5 million in damages were suffered along coastal New Hampshire. Federal Disaster **FEMA-917-DR**.
9/1/1996	Hurricane (Edouard)	Southern New England	Winds in NH up to 38 mph and 1 inch of rain along the coast. Roads and electrical lines damaged.
Sept. 16-18, 1999	Tropical Storm (Floyd)	Southern New England	**FEMA DR-1305-NH**. Heavy Rains.

Date(s)	Event Description	Location	Other Information
Oct. 5-13, 2005	Tropical Storm (Tammy)	East Coast of US	Remnants of Tammy contributed to the October 2005 floods which dropped 20 inches of rain in some places in NH.
Aug. 26-Sept. 26, 2011	Tropical Storm (Irene)	New England states	**FEMA Disaster Declaration # DR-4026 and EM-3333**. No significant local damage to structures and no services needed. There were some local power outages for 1-2 days and some debris.
Oct. 26 to Nov. 8, 2012	Tropical Storm (Sandy)	Eastern United States	**FEMA Disaster Declaration # DR 4095**; NH Counties that received the most damage were Belknap, Carroll, Coos, Grafton, Rockingham, and Sullivan. No significant local damage to structures and no services needed. Some minor power outages were noted.
8/4/2020	Tropical Storm	Cheshire County	Tropical Storm Isaias. No damages, injuries or deaths were reported

Probability of Future Events

VERY HIGH (5): It is highly likely that a hazardous event will occur within the next 25 years (1 - 2 events each year).

Effects of Climate Change (AKA Future Conditions)

There have been recent increases in tropical cyclone occurrences, however it is unclear whether the change is due to new observation methods.[53]

Potential Occurrences

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

Potential Impact (aka vulnerability for each hazard on community assets)

The 2018 estimated wind damage of 5% of the structures with 10% damage was approximately $9,382,564. The estimated flood damage of 10% of the structures with 20% damage was approximately $37,530,256. The cost of repairing or replacing the roads, bridges, utilities and contents of structures was not included.

- The potential for damage to structures is citywide;
- There is a potential for injury or death;
- Damaged power lines could disrupt services; and
- Flooding could wash out evacuation routes.

[53] Climate Change Indicators: Tropical Cyclone Activity | US EPA

6.3.12 Wildfire

Description

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

Location

As timber harvesting is reduced, wood roads close, and debris builds up on the ground, the potential for wildfire increases town-wide. The entire town is at risk with minimal forest fire protection.

Extent

Currently, there is not a universally adopted scale for measuring wildfires within the State of New Hampshire. There are numerous factors that can be used to describe the severity and complexity of a wildfire.[54] One of the most common methods is to classify a wildfire according to size:

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

Previous Occurrences

Surry Mountain experienced a large forest fire in the late 1970's. Goose Pond had a fire for 3 days in the early 1980s. There have been several minor arson incidents at the college and different parts of the City.

Table 19 Previous Occurrence of Wildfire

Date(s)	Event Description	Impacts	Location	Other Information
2016	Wildfire	over 200 acres burned resulting in extensive utility damage	Stoddard	Caused by arson. Mutual Aid from numerous locations assisted.
2016	Wildfire	No injuries or structure loss reported	Keene	This was a drought year with very high fire risk. Several Class B fires occurred in the City

[54] NH State Hazard Mitigation Plan 2023

Probability of Future Events

VERY HIGH (5): It is highly likely that a hazardous event will occur within the next 25 years (1 - 2 events each year).

Effects of Climate Change (AKA Future Conditions)

The probability of wildfire is related to drought. During periods of hot, dry weather the risk of wildfires increases. New Hampshire Climate Assessment 2021 helps explain what drought conditions Sullivan may expect in the future due to changes in weather patterns. When comparing the period 1901-1960 to 1991-2020, the report noted an overall decrease in the number of dry and moderately dry periods. However, it also concluded that the expected increases in summer temperatures expected over the period 2010-2099 will contribute to more short-term, or "flash drought" conditions in the future.

Potential Occurrences

The potential for wildfire depends on terrain, the fuel load, the humidity and other characteristics of the area. Previous ice storms and high wind events have left a significant amount of woody debris in the forests that may fuel future wildfires. Fires in New Hampshire are predominantly human-caused, and roughly half of the total fire activity is in the most populous three southern counties. The proximity of many populated areas to the local and state forested lands exposes these areas and their populations to the potential impact of wildfire. There is a higher risk for urban fires in the downtown area where older homes have been converted to business offices.

Potential Impact (aka vulnerability for each hazard on community assets)

- Entire city is at risk; A wildfire can strike at any time and in any place;
- There is a potential for interruption of service and damage to structures;
- There is a potential for injury or death; and
- Risk increases for wooded areas with higher elevation.

Keene Hazard Mitigation Plan Update 2018 previously estimated impacts due to wildfire based on financial losses at approximately $1,000/acre.

6.4 MANMADE OR TECHNOLOGICAL HAZARDS

The Planning Team identified the following technological or manmade hazards as having the potential to impact the city of Keene:

- Aging infrastructure (new)
- Conflagration
- Cyber event (new)
- Dam failure
- Hazardous materials (fixed and transport)
- Known and emerging contaminants (new)
- Long term utility outage

- Mass casualty incident
- Radiological
- Transport accident,
- Terrorism / violence (includes armed attack, bomb / explosion, civil disorder, biological terrorism, terrorist attack)

As shown on Table 25, many of the manmade and technological hazards received a Low Risk rating. As such, the Planning Team determined resources for this plan update would be better spent elsewhere. New manmade or technological hazards are profiled here, with the exception of dam failure – there are 4 high hazard potential dams within the Keene area.

6.4.1 Aging Infrastructure

Aging infrastructure refers to the deteriorating physical structures and systems that are essential for a community's functioning, such as roads, bridges, utilities, energy networks, and public facilities - that have surpassed their intended lifespan, often defined as exceeding 75 years. In Keene and the broader region, much of this infrastructure is well beyond this age threshold, leading to increased vulnerability to failures.[55]

Localized Examples:

- New Hampshire houses over 2,600 dams, with an average age of 90 years.[56] Notably, the Forest Lake Dam in Winchester failed in July 2023, causing significant water level drops and local flooding.[57]
- Many wastewater collection systems in New Hampshire were constructed in the late 1800s and have exceeded their useful life, leading to frequent failures and environmental concerns.[58]
- Over 70% of local building stock was constructed before 1970, demonstrating a significant lead paint risk.

Who and What Is at Risk When These Systems Fail:

- Public Health and Safety: Failures in water and wastewater systems can lead to contamination, posing direct health risks.
- Economic Disruptions: Infrastructure failures can lead to significant economic losses. The 2011 Halloween nor'easter caused widespread power outages in New England, leading to business closures and costly recovery efforts.[59]

[55] LII / Legal Information Institute
[56] Experts: N.H.'s Water Infrastructure Is Old, Underfunded, And Susceptible To Severe Weather Damage | New Hampshire Public Radio
[57] Sununu surveys flood-impacted areas, offers reassurance to residents | Local News | keenesentinel.com
[58] 2017-NH-Report-Card-hq-with-cover.pdf
[59] WINTER STORM SUMMARY FOR OCTOBER 29, 2011 EVENT

- Environmental Damage: Aging dams and wastewater systems can fail, leading to uncontrolled releases of water or sewage, resulting in habitat destruction and long-term ecological impacts.
- Community Displacement: Infrastructure failures can force evacuations and displacements. During the July 2023 floods in New Hampshire, numerous roads were washed out, isolating communities and necessitating evacuations.

6.4.2 Cyber Events

Cybersecurity threats pose a significant risk to Keene, with various types of cyber incidents impacting local government operations. Common attack vectors include phishing campaigns, system vulnerabilities due to outdated software, and social engineering efforts targeting employees. Cyber incidents can range in severity from minor credential theft to large-scale ransomware attacks that can severely disrupt municipal services.

Types of Cyber Incidents & Impact Magnitude

Cyber events can generally be categorized into three levels of risk:

- High Risk: Advanced persistent threats (APTs), including ransomware attacks, where bad actors infiltrate municipal infrastructure, compromise backups, and demand ransoms for data decryption. These incidents can cause weeks of operational downtime and require extensive system rebuilding.
- Medium Risk: Financial fraud incidents, such as man-in-the-middle attacks (e.g., the Peterborough incident), where attackers intercept transactions, leading to significant financial losses.
- Low Risk: Stolen credentials, which, if detected early, can be mitigated through password resets and access monitoring.

Frequency & Notable Incidents

The frequency of cyber incidents varies, but municipalities remain ongoing targets due to resource limitations in cybersecurity preparedness. A notable example in the region includes the Peterborough cyber fraud incident,[60] in which attackers impersonated town officials and redirected large financial transactions.

Cyber threats to municipalities align with broader trends in government-targeted cybercrime, where attackers exploit financial systems, disrupt public services, and compromise sensitive data. According to CISA[61] (Cybersecurity and Infrastructure Security Agency) and MS-ISAC[62] (Multi-State Information Sharing and Analysis Center), municipalities should focus on proactive measures such

[60] Peterborough, N.H. Loses $2.3 Million To Cyber Criminals | New Hampshire Public Radio
[61] www.cisa.gov
[62] www.cisecurity.org/ms-isac

as multi-factor authentication (MFA), network segmentation, and zero-trust security frameworks to enhance resilience.

Challenges & Mitigation Strategies

Key challenges for municipalities include:

1. Keeping pace with evolving attack methods—Municipal employees are not always trained to recognize sophisticated cyber threats.
2. Budget constraints—Many towns struggle to afford dedicated cybersecurity specialists or advanced defense mechanisms.

Best practices for mitigation include:

- Implementing a layered cybersecurity defense approach to reduce vulnerabilities.
- Prioritizing employee training and awareness to prevent phishing and social engineering attacks.
- Allocating resources for dedicated security specialists rather than relying solely on general IT staff.
- Enhancing backup and recovery strategies to minimize the impact of ransomware attacks.

6.4.3 Dam Failure / Breach

The town has not experienced any dam failures, however, if one occurred it could potentially cause death, injury, or structural damage.

The Table below shows the dams in Keene that are registered with the State of New Hampshire.

The State of New Hampshire classifies dams into the following four categories:

NM **-** Non-menace S **-** Significant hazard Blank **-** Non-Active

L **-** Low hazard H **-** High Hazard

Detailed description of classification terms:

Non-Menace structure means a dam that is not a menace because it is in a location and of a size that failure or misoperation of the dam would not result in probable loss of life or loss to property, provided the dam is:

- Less than six feet in height if it has a storage capacity greater than 50 acre-feet; or
- Less than 25 feet in height if it has a storage capacity of 15 to 50 acre-feet.

Low Hazard structure means a dam that has a low hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in any of the following:

- No possible loss of life.
- Low economic loss to structures or property.
- Structural damage to a town or city road or private road accessing property other than the

dam owner's that could render the road impassable or otherwise interrupt public safety services.

- The release of liquid industrial, agricultural, or commercial wastes, septage, or contaminated sediment if the storage capacity is less than 2 acre-feet and is located more than 250 feet from a water body or water course.
- Reversible environmental losses to environmentally-sensitive sites.

Significant Hazard structure means a dam that has a significant hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in any of the following:

- No probable loss of lives.
- Major economic loss to structures or property.
- Structural damage to a Class I or Class II road that could render the road impassable or otherwise interrupt public safety services.
- Major environmental or public health losses, including one or more of the following:
- Damage to a public water system, as defined by RSA 485:1-a, XV, which will take longer than 48 hours to repair.
- The release of liquid industrial, agricultural, or commercial wastes, septage, sewage, or contaminated sediments if the storage capacity is 2 acre-feet or more.
- Damage to an environmentally-sensitive site that does not meet the definition of reversible environmental losses.

High Hazard means a dam that has a high hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in probable loss of human life as a result of:

- Water levels and velocities causing the structural failure of a foundation of a habitable residential structure or commercial or industrial structure, which is occupied under normal conditions.
- Water levels rising above the first floor elevation of a habitable residential structure or a commercial or industrial structure, which is occupied under normal conditions when the rise due to dam failure is greater than one foot.
- Structural damage to an interstate highway, which could render the roadway impassable or otherwise interrupt public safety services.
- The release of a quantity and concentration of material, which qualify as "hazardous waste" as defined by RSA 147-A:2 VII.
- Any other circumstance that would more likely than not cause one or more deaths.

Generally, all Class H dams need to have Emergency Action Plans, and most Class S dams also require them. There are 4 Class H dams within the City of Keene and one Class S dams according to the Department of Environmental Services Dam Bureau.

Dams in Keene Registered to the State of New Hampshire

Table 20 Registered Dams in Keene

DAM	HAZCL	STATUS	NAME	RIVER	HEIGHT ft	IMPND ac	OWNER
D126037	NM	ACTIVE	BRETWOOD GOLF COURSE FIRE POND DAM	TR ASHUELOT RIVER	8.5	0.5	PRIVATE
D126012	NM	ACTIVE	BRANCH RIVER DAM	MINNEWAWA BROOK	9.5	2	PRIVATE
D126013		REMOVED	FERRY BROOK DAM	FERRY BROOK	11.27	3.3	CHESHIRE COUNTY FISH & GAME CLUB INC
D126024		REMOVED	CITY LANDFILL DIKE	RUNOFF			CITY OF KEENE
D126005	NM	ACTIVE	KATE TYLER LOWER RAVINE DAM	KATE TYLER BROOK	9.5	2	CITY OF KEENE
D126034		EXEMPT	KEENE LANDFILL DET POND DAM	RUNOFF	6	0.5	CITY OF KEENE
D126001	L	ACTIVE	ASHUELOT RIVER DAM	ASHUELOT RIVER	15.5	34	CITY OF KEENE DPW
D126003	H	ACTIVE/MULTIPLE	GOOSE POND DAM	TR ASHUELOT RIVER	22	51	CITY OF KEENE DPW
D126033	L	ACTIVE/MULTIPLE	GOOSE POND DIKE	TR ASHUELOT RIVER	8	51	CITY OF KEENE DPW
D126009	H	ACTIVE	THREE MILE RESERVOIR DAM	BEAVER BROOK	20	8.6	CITY OF KEENE DPW
D126025	H	ACTIVE	ROBINHOOD PARK RESERVOIR DAM	TR BEAVER BROOK	18	7	CITY OF KEENE PARKS DEPT
D126031	NM	ACTIVE	WRIGHT ESTATE DET POND 3 DAM	RUNOFF	6	0.26	PRIVATE
D126019		EXEMPT	KATE TYLER RAVINE DAM	UNNAMED STREAM	3.5	0.25	DARTMOUTH HITCHCOCK HOSPITAL
D126038	L	ACTIVE	WICHLAND RECREATION POND	UNNAMED STREAM	9.3	0.25	PRIVATE
D126008		RUINS	BEAVER BROOK DAM	BEAVER BROOK			PRIVATE
D126002	S	ACTIVE	WILSON POND DAM	ASH SWAMP BROOK	8	9	KEENE SCHOOL DISTRICT
D126006		RUINS	BEAVER BROOK DAM	BEAVER BROOK	4.5		PRIVATE
D126016		RUINS	MILL POND DAM	BEAVER BROOK	9		PRIVATE
D126007		RUINS	BEAVER BROOK MILL DAM	BEAVER BROOK	6		PRIVATE
D126017		REMOVED	KENDALL DAM	BLACK BROOK	5	4	PRIVATE
D126023		BREACHED	WILDLIFE POND DAM	STURTEVANT BROOK	7	1.5	PRIVATE
D126022	NM	ACTIVE	FARM POND DAM	UNNAMED STREAM	6	0.25	PRIVATE
D126021	NM	ACTIVE	FARM POND DAM	UNNAMED STREAM	12	0.25	PRIVATE

DAM	HAZCL	STATUS	NAME	RIVER	HEIGHT ft	IMPND ac	OWNER
D126026		EXEMPT	KIDDER POND DAM	TR GRIMES BROOK	4.8	0.13	PRIVATE
D126014		RUINS	OTTER BROOK DAM	OTTER BROOK			PRIVATE
D126020		EXEMPT	COATES DAM	FERRY BROOK	4	0.25	PRIVATE
D126027		EXEMPT	COATES FARM POND DAM	UNNAMED STREAM	5.6	0.13	PRIVATE
D126015	NM	ACTIVE	NAMELESS BROOK DAM	TR ASHUELOT RIVER	10	0.25	PRIVATE
D126004	NM	ACTIVE	KATE TYLER UPPER RAVINE DAM	KATE TYLER BROOK	14	3	PRIVATE
D126035		EXEMPT	STONE ARCH VILLAGE DET BASIN 2 DAM	RUNOFF	8.5	0.16	PRIVATE
D126036		EXEMPT	STONE ARCH VILLAGE DET BASIN 3 DAM	RUNOFF	4.8	0.17	PRIVATE
D126028		EXEMPT	MASIELLO DET POND DAM	INTERMITTENT STREAM	3.5	3.4	PRIVATE
D126032	NM	ACTIVE	WOODGATE DET POND DAM	RUNOFF	11	0.7	PRIVATE
D126018		RUINS	BRANCH BROOK DAM	MINNEWAWA BROOK			UNKNOWN
D126011		RUINS	MINNEWAWA BROOK DAM	MINNEWAWA BROOK			UNKNOWN
D126010	H	ACTIVE	OTTER BROOK DAM	OTTER BROOK	133	70	US ARMY CORP OF ENGINEERS
D126029		EXEMPT	WRIGHT ESTATE DET POND 1 DAM	RUNOFF	5	0.06	PRIVATE
D126030		EXEMPT	WRIGHT ESTATE DET POND 2 DAM	RUNOFF	6	0	PRIVATE

The Planning Team determined the potential for a future occurrence of dam failure to be low. **LOW (2):** There is little likelihood that a hazardous event will occur within the next 25 years (1 event in 25 years).

6.4.4 Known and Emerging Contaminants

Known and emerging contaminants are pollutants found in water, soil, and air that pose potential risks to human health and the environment. "Known contaminants" are well-documented substances with established regulatory standards, while "emerging contaminants" (also known as contaminants of emerging concern or CECs) are newly recognized pollutants that may not yet be fully regulated but are increasingly detected in the environment.

Examples:

- Per- and Polyfluoroalkyl Substances (PFAS): Synthetic chemicals found in various consumer products and industrial applications. In New Hampshire, PFAS contamination has been detected in over 3,000 wells statewide, leading to health advisories and regulatory actions.[63]
- Microplastics: Tiny plastic particles less than 5 millimeters in size, resulting from the breakdown of larger plastic debris or manufactured as microbeads. Research indicates that microplastics are present in over 98% of samples collected from New Hampshire estuaries, with concentrations varying by region, site, and season.[64]

6.5 Vulnerability for Each Hazard

6.5.1 Community Assets

Community Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. The Planning Team considered the following asset and community lifeline categories while updating the critical facilities and assets list from the 2018

[63] New Hampshire sellers must disclose PFAS risks by 2025 - EHN

[64] Assessing Microplastic Pollution in New England's Estuaries | College of Life Sciences and Agriculture

Plan Update. Where appropriate, the assets are depicted on

in locations where a minimum of six feet of clearance is maintained for pedestrian access. In addition, the applicant is permitted to close off a portion of Railroad Street from Main Street to Wells Street and a portion of Lamson Street from Main Street to Federal Street. This permission is granted subject to the following conditions: the signing of a revocable license and indemnification agreement; that the petitioner provide a certificate of liability insurance with the City of Keene listed as additional insured in the amount of $1,000,000; and submittal of signed letters of permission from any private property owners for the use of their property. In addition, the petitioner is granted use of the requested parking spaces free of charge under the provisions of the Free Parking Policy. Said permission is granted subject to obtainment of any necessary licenses or permits and compliance with all laws, including obtainment of any necessary licensing for the use of intellectual property, and compliance with any recommendations of City staff. The petitioner agrees to absorb the cost of any City services over and above any amount of City funding allocated in the FY 26 Community Events Budget. Said payment shall be made within 30 days of the date of invoicing.

A second Planning, Licenses and Development Committee report was read, unanimously recommending The Elm City Rotary Club be granted permission to sponsor the Clarence DeMar Marathon on September 28, 2025, subject to the signing of a revocable license and indemnification agreement and the submittal of a certificate of liability insurance in the amount of $1,000,000 listing the City of Keene as an additional insured. This license is conditional upon the petitioner providing an adequate number of volunteer race marshals to ensure runner safety along the course, and submittal of signed letters of permission from any private property owners for the use of their property. Said permission is granted subject to obtainment of any necessary licenses or permits and compliance with all laws, including obtainment of any necessary licensing for the use of intellectual property; and compliance with any recommendations of City staff. The petitioner agrees to absorb the cost of any City services over and above any amount of City funding allocated in the FY 26 Community Events Budget. Said payment shall be made within 30 days of the date of invoicing.

A motion by Councilor Jones to carry out the intent of both Committee reports was duly seconded by Councilor Williams. The motion carried unanimously on a roll call vote with 14 Councilors present and voting in favor. Councilor Bosley was absent.

PLD REPORT - COUNCILOR JONES - REQUEST FOR RESOLUTION (DECLARATION) HONORING THE LGBTQIA+ COMMUNITY

A Planning, Licenses and Development Committee report was read, unanimously recommending the Request for a Declaration Honoring the LGBTQIA+ Community be accepted as informational. Mayor Kahn filed the report as Informational.

PLD REPORT - 2025 HAZARD MITIGATION PLAN

A Planning, Licenses and Development Committee report was read, unanimously recommending the City Council adopt the 2025 Hazard Mitigation Plan and that the City Manager be authorized to do all things necessary to execute the Plan. A motion by Councilor Jones to carry out the intent of the Committee report was duly seconded by Councilor Williams. The motion carried

unanimously on a roll call vote with 14 Councilors present and voting in favor. Councilor Bosley was absent.

PLD REPORT - WARRANT FOR UNLICENSED DOGS

A Planning, Licenses and Development Committee report was read, unanimously recommending the City Council issue a warrant for unlicensed dogs pursuant to NHRSA 466:14, and the Keene Police Department and the City Clerk's Office be directed to issue a civil forfeiture to those dog owners who have failed to license their dog by April 30, 2025. A motion by Councilor Jones to carry out the intent of the Committee report was duly seconded by Councilor Williams. The motion carried unanimously on a roll call vote with 14 Councilors present and voting in favor. Councilor Bosley was absent.

FOP REPORT - REQUEST TO TRANSFER FY 2025 FUNDS TO THE AMBULANCE CIP

A Finance, Organization and Personnel Committee report was read, unanimously recommending the City Manager be authorized to transfer available FY2025 operating funds in the amount of $39,564.00 from the Ambulance Transfer-Grant fund (line item 40200000-580080), to the FY2025 Ambulance Replacement Program CIP (#40M0002B). A motion by Councilor Powers to carry out the intent of the Committee report was duly seconded by Councilor Remy. The motion carried unanimously on a roll call vote with 14 Councilors present and voting in favor. Councilor Bosley was absent.

FOP REPORT - WRITTEN PUBLIC COMMENTS - PROPOSED FISCAL YEAR 2025-2026 OPERATING BUDGET

A Finance, Organization and Personnel Committee report was read, unanimously recommending the written public comments from Cameron Tease in support of Outside Agency funding for the Keene Senior Center be accepted as informational. Mayor Kahn filed the report as Informational.

FOP REPORTS - REQUEST TO EXPEND FUNDS FROM CDD PERSONNEL FUNDS TO PURCHASE A COMMUNITY DEVELOPMENT PERMITTING SOFTWARE PLATFORM; & REQUEST TO APPROVE A CHANGE ORDER TO THE OPENGOV (CARTEGRAPH) CONTRACT (PO20250067) FOR THE INCLUSION OF A CLOUD PERMITTING PLATFORM FOR THE PLANNING, BUILDING, CODE ENFORCEMENT AND HEALTH INSPECTION SERVICES OF THE CITY

The first Finance, Organization and Personnel Committee report was read, unanimously recommending the City Manager be authorized to expend $93,557 from FY25 Community Development Department (CDD) Personnel funds for the purchase of the OpenGov Permitting Software Platform.

A second Finance, Organization and Personnel Committee report was read, unanimously recommending the City Manager be authorized to do all things necessary to execute a change order to the existing contract the City has with OpenGov for the inclusion of a cloud permitting platform.

Appendix E: Community Lifelines Map and Appendix F: Other Assets Map and listed in Table 21 Asset Inventory.

Community Lifelines[65]	Assets
• **Safety and Security** - Law Enforcement/Security, Fire Service, Search and Rescue, Government Service, Community Safety • **Food, Hydration, Shelter** - Food, Hydration, Shelter, Agriculture • **Health and Medical** - Medical Care, Public Health, Patient Movement, Medical Supply Chain, Fatality Management • **Energy** - Power Grid, Fuel • **Communications** - Infrastructure, Responder Communications, Alerts Warnings and Messages, Finance, 911 and Dispatch • **Transportation** - Highway/Roadway/Motor Vehicle, Mass Transit, Railway, Aviation, Maritime • **Hazardous Materials** - Facilities, HAZMAT, Pollutants, Contaminants • **Water Systems** - Potable Water Infrastructure, Wastewater Management	• **P** (PEOPLE: residents, workers, visiting populations and socially vulnerable populations like seniors, individuals with disabilities, lower-income individuals, etc.) • **S** (STRUCTURES: like community centers, historic places, planned capital improvement) • **E** (ECONOMIC ASSETS: Major employers, primary economic sectors, key infrastructure like telecommunications networks) • **N** (NATURAL, HISTORIC & CULTURAL RESOURCES: Areas of conservation, beaches, parks, critical habitat) • **CF** (CRITICAL FACILITIES & INFRASTRUCTURE: Hospitals, law enforcement, water, power) • **CA** (COMMUNITY ACTIVITIES: Major local events such as festivals or economic events like farming or fishing)

Table 21 Asset Inventory

Facility Category	Name & Location	Owner	Back-Up Power	Community Lifeline(s)	Asset Type	What makes this asset vulnerable during hazards? Have there been issues with recovery after an event?
Assisted, Elderly, Senior Facilities	American House, 197 Water St.	Private	Yes	No	P	Vulnerable populations: senior/disabled
Assisted, Elderly, Senior Facilities	Covenant Living, 100 Wyman	Private	Yes	No	P	Vulnerable populations: senior/disabled
Assisted, Elderly, Senior Facilities	Ash Brook Apartments, 191 Key Rd.	Private	No	No	P	Vulnerable populations: senior/disabled (24 units)
Assisted, Elderly, Senior Facilities	Westwood Harborside, 298 Main St.	Private	No	No	P	Vulnerable populations: senior/disabled
Assisted, Elderly, Senior Facilities	Westmill Senior Housing, 110 Railroad St.	Private	No	No	P	Vulnerable populations: senior/disabled (26 units)

[65] Lifelines Implementation Toolkit v2.1

Facility Category	Name & Location	Owner	Back-Up Power	Community Lifeline(s)	Asset Type	What makes this asset vulnerable during hazards? Have there been issues with recovery after an event?
Assisted, Elderly, Senior Facilities	Stone Arch Senior Housing, 835 Court St.	Private	No	No	P	Vulnerable populations: senior/disabled (33 units)
Assisted, Elderly, Senior Facilities	Southwestern Community Services, 63 Community Way	Private	No	No		Vulnerable populations: Low Income/senior/disable
Assisted, Elderly, Senior Facilities	Railroad Square Senior Housing, 49 Community Way	Private	No	No	P	Vulnerable populations: senior/disabled (24 units)
Assisted, Elderly, Senior Facilities	Langdon Place, 136.5 Arch St.	Private	No	No	P	Vulnerable populations: senior/disabled (25 units)
Assisted, Elderly, Senior Facilities	Keene Eastside Senior Housing (KESSHA) 111 Railroad St.	Private	No	No	P	Vulnerable populations: senior/disabled (30 units)
Assisted, Elderly, Senior Facilities	Covenant Living, 95 Wyman Rd.	Private	No	No	P	Vulnerable populations: senior/disabled
Assisted, Elderly, Senior Facilities	Harper Acres, 104 Castle St.	Private	No	No	P	Vulnerable populations: senior/disabled (56 units)
Assisted, Elderly, Senior Facilities	Genesis, 677 Court St.	Private	No	No	P	Vulnerable populations: senior/disabled
Assisted, Elderly, Senior Facilities	Emerald Street House, 32 Emerald St.	Private	No	No	P	Vulnerable populations: senior/disabled (10 units)
Assisted, Elderly, Senior Facilities	Cleveland Place, 21 Roxbury Plaza	Private	No	No	P	Vulnerable populations: senior/disabled (74 units)
Assisted, Elderly, Senior Facilities	Central Square Terrace, 5 Central Square	Private	No	No	P	Vulnerable populations: senior/disabled (90 units)
Assisted, Elderly, Senior Facilities	Bennett Block, 32 Washington St.	Private	No	No	P	Vulnerable populations: senior/disabled (14 units)
Assisted, Elderly, Senior Facilities	Autumn Leaf Village, 17 Ivy Dr.	Private	No	No	P	Vulnerable populations: senior/disabled (56 units)

Facility Category	Name & Location	Owner	Back-Up Power	Community Lifeline(s)	Asset Type	What makes this asset vulnerable during hazards? Have there been issues with recovery after an event?
City Hall	Keene City Hall, 3 Washington St.	City	Yes	Safety and Security	CF	
Communication Infrastructure	City WIFI Network, Hub 3 Washington St	City	Yes	Communications	CF	Multi-hazards
Communication Infrastructure	City of Keene Fiber optics (wireless network)	City	Yes	Communications	CF	
Communication Infrastructure	Private Wireless Carrier	Private	Unknown	Communications	E	Multi-hazards
Communication Infrastructure	Consolidated Communications	Private	unknown	Communications	E	Towers and above ground wiring . Multi-hazardss
Communication Infrastructure	Spectrum (phone)	Private	Unknown	Communications	E	Above ground wiring. Multi-hazards
Communication Infrastructure	Keene Police Dispatch (Part of Police Station) 400 Marlboro St	City	Yes	Communications	CF	Urban Flooding
Communication Infrastructure	Keene Central Fire Department, 31 Vernon St.	City	Yes	Safety and Security	CF	Urban Flooding
Communication Infrastructure	SWNHDFMA 32 Vernon St. (Part of Central Fire Station)	Private	Yes	Communications	CF	Urban Flooding
Communication Infrastructure	Cheshire County Sheriff Comm. Dept. 12 Court St. (Courthouse)	County	Yes	Communication, Safety and Security	CF	Multi-hazards

Facility Category	Name & Location	Owner	Back-Up Power	Community Lifeline(s)	Asset Type	What makes this asset vulnerable during hazards? Have there been issues with recovery after an event?
Correctional Facility	Cheshire County Department of Corrections	County	Yes	Safety and Security	CF	
Daycare	UCC Nursery, 23 Central Square	Private	No	No	S	Vulnerable population
Daycare	Sue's House, 22 Eastern Ave.	Private	No	No	S	Vulnerable population
Daycare	Sophia's Hearth, 700 Court St.	Private	No	No	S	Vulnerable population
Daycare	Sapling Acres Preschool, 90 Base Hill Rd.	Private	No	No	S	Vulnerable population
Daycare	Rise for Baby and Family, 147 Washington St.	Private	No	No	S	Vulnerable population
Daycare	Montessori Schoolhouse of Cheshire County, 28 Hurricane Rd.	Private	No	No	S	Vulnerable population
Daycare	Kids R People 2, 28 Greenbrier Rd.	Private	No	No		Vulnerable population
Daycare	Keene State College CDC, 229 Main St.	State	No	No	S	Vulnerable population
Daycare	Keene Montessori School, 125 Railroad St.	Private	No	No	S	Vulnerable population
Daycare	Keene Family YMCA, 200 Summit Rd.	Private	No	No	S	Vulnerable population
Daycare	Keene Day Care Center, Inc., 312 Washington St. (Keene Recreation Center)	Private	Yes	No	S	Vulnerable population
Daycare	Keene Day Care Center, 86 Wood St.	Private	No	No	S	Vulnerable population
Daycare	Kathy Lehrman Family Child Care, 105 Old Walpole Rd.	Private	No	No	S	Vulnerable population

Facility Category	Name & Location	Owner	Back-Up Power	Community Lifeline(s)	Asset Type	What makes this asset vulnerable during hazards? Have there been issues with recovery after an event?
Daycare	Head Start, 64 Dunbar St.	Private	No	No	S	Vulnerable population
Daycare	Children's Learning Center, 548 Court St.	Private	No	No	S	Vulnerable population
Daycare	Growing Minds Preschool and Daycare, 69 Washington St.	Private	No	No	S	Vulnerable population
Daycare	Great Beginnings Infant & Toddler Program, 39 Old Homestead Highway	Private	No	No	S	Vulnerable population
Daycare	Footsteps Day Care & Learning Center, 407 Winchester St..	Private	No	No	S	Vulnerable population
Daycare	Cynthia King's FDC, 56 Woodbury St.	Private	No	No		Vulnerable population
Daycare	Castle Center - Adult Day Care, 312 Marlboro St.	Private	No	No	S	Vulnerable population
Emergency Fuel Station	State DOT, Base Hill Rd, Swanzey, NH	State	Yes	Energy	CF	
Emergency Fuel Station	City's contracts with several private gas stations - some with backup	Private/Mixed	Partial	Energy	CF	
Emergency Fuel Station	Keene Public Works Department, 350 Marlboro St. (Diesel)	City	Yes	Energy	CF	Urban Flooding
EMS	Fire Department, 31 Vernon St.	City	Yes	Health and Medical	CF	Potential Urban Flooding
EOC Primary	Keene City Hall, 3 Washington St.	City	Yes	Safety and Security	CF	
EOC Secondary	Keene Fire Department, 31 Vernon St.	City	Yes	Safety and Security	CF	Potential Urban Flooding
Evacuation Routes	Routes 9, 10, 12 and 101	n/a	n/a	n/a	n/a	Transportation incidents, Flooding

Facility Category	Name & Location	Owner	Back-Up Power	Community Lifeline(s)	Asset Type	What makes this asset vulnerable during hazards? Have there been issues with recovery after an event?
Fire Station	Fire Station 2, 110 Hastings Ave.	State	Yes	Safety and Security	CF	Potential Urban Flooding
Fire Station	Keene Central Fire Department, 31 Vernon St.	City	Yes	Safety and Security	CF	Potential Urban Flooding
Government Service	Cheshire County Registry of Deeds, 33 West St	County	Unknown	Safety and Security	CF	
Healthcare Facilities	VA-Keene Outpatient, 640 Marlboro Rd.	Dept. of Veterans Affairs	No	Health and Medical	CF	
Healthcare Facilities	Convenient MD, 351 Winchester St.	Private	No	Health and Medical	CF	
Healthcare Facilities	Cheshire Medical Center - West Campus, 62 Maple Ave	Private	Yes	Health and Medical	CF	
Healthcare Facilities	Cheshire Medical Center - 51 Railroad St.	Private	No	Health and Medical	CF	
Healthcare Facilities	Cheshire Medical Center - Main Campus, 580 Court St.	Private	Yes	Health and Medical	CF	
High Population Areas	Central Business District (Main St.)	Mixed	n/a	No	P, S	
High Population Areas	Keene State College	State of NH	Partial	No	P, S, E	
Historic Resources	Catherine Fiske Seminary for Young Ladies, 251 Main St.	Private	No	No	S	
Historic Resources	Sawyer Tavern, 63 Arch St.	Private	No	No	S	
Historic Resources	Noah Cooke House, Daniels Hill Rd.	Private	No	No	S	
Historic Resources	Cheshire County Historical	Private	No	No	S	

Facility Category	Name & Location	Owner	Back-Up Power	Community Lifeline(s)	Asset Type	What makes this asset vulnerable during hazards? Have there been issues with recovery after an event?
	Society, 246 Main St.					
Historic Resources	Grace United Methodist Church, 34 Court St.	Private	No	No	S	
Historic Resources	Elliot Mansion, 305 Main St.	KSC	No	No	S	
Historic Resources	Dr. Daniel Adams House, 324 Main St.	Private	No	No	S	
Historic Resources	Downtown Historic District	Mixed	n/a	No	S	
Historic Resources	Dinsmoor - Hale House, Main & Winchester St.	KSC	No	No	S	
Historic Resources	Colony's Block, 4-7 Central Square	Private	No	No	S	
Historic Resources	City Clerk's Record Center (Historical records) 400 Marlboro St	City	Yes	Safety and Security	CF	
Historic Resources	Cheshire County Courthouse, 12 Court St.	Cheshire County	No	No	S	
Historic Resources	Wyman Tavern Museum, 339 Main St.	Private	Unknown	No	S	
Historic Resources	United Church of Christ, 23 Central Sq.	Private	No	No	S	
Historic Resources	Southwest Fire Mutual Aid building, 32 Vernon St.	City	Yes	No	S	
Hospital	Cheshire Medical Center, 580 Court St.	Private	Yes	Health and Medical	CF	Only two vehicle accesses, Court Street and Emergency access off NH rt 9/10.
Largest Employers	Timken Super Precision, Optical Ave	Private	No	No	E	267 employees
Largest Employers	National Grange Mutual	Private	No	No	E	311 employees - facility has become remote

Facility Category	Name & Location	Owner	Back-Up Power	Community Lifeline(s)	Asset Type	What makes this asset vulnerable during hazards? Have there been issues with recovery after an event?
	Insurance, West St.					
Largest Employers	City of Keene, multiple locations	City	Partial	Safety and Security	CF, E	360 employees
Largest Employers	Markem-Imaje Corporation, 150 Congress Street	Private	Private	No	E	400 employees
Largest Employers	Keene State College, Main St.-Winchester St.	State	Partial	No	CF, P, E	687 employees
Largest Employers	Keene School District, multiple locations	City	Varies	No	CF, P, E	846 employees
Largest Employers	C&S Wholesale Grocers, Optical Ave	Private	No	No	E	1200 employees
Largest Employers	Cheshire Medical Center/Dartmouth Hitchcock Clinic, multiple locations	Private	Yes	Health and Medical	E, CF	1531 employees
Police Station	Keene Police Department, 400 Marlborough St.	City	Yes	Safety and Security	CF	Potential Urban Flooding
Police Station	State Police Barracks Troop C, 15 Ash Brook Ct	State	Yes	Safety and Security	CF	
Public Utilities	Liberty Utilities - gas	Private	n/a	Energy	CF	Multiple hazards. Subject to loss of power, severe wind, snow, ice and flooding threats.
Public Utilities	Spectrum - communications	Private	n/a	Communication	E	Multiple hazards. Subject to severe wind, snow, ice and flooding threats.
Public Utilities	Eversource - electric (Transmission, distribution, Substation Locations)	Private	n/a	Energy	CF	Multiple hazards. Subject to severe wind, snow, ice and flooding threats.
Public Works	Supply Yard, 580 Main St.	City	n/a	Transportation	CF	Flooding

Facility Category	Name & Location	Owner	Back-Up Power	Community Lifeline(s)	Asset Type	What makes this asset vulnerable during hazards? Have there been issues with recovery after an event?
Public Works	Public Works Department, 350 Marlboro St.	City	Yes	Transportation	CF	Potential Urban Flooding
Recreation Areas	Drummer Hill Recreation Area, Old Gilsum Rd/Drummer Hill Rd.	City	n/a	No	N	
Recreation Areas	Central Business District	Mixed	n/a	No	CA	
Recreation Areas	City Tennis Courts, Knight St.	City	No	No	CA	
Recreation Areas	City Skate Park, Carpenter St.	City	n/a	No	CA	
Recreation Areas	Mayor Patricia Russell Park (formerly Carpenter St. Field)	City	n/a	No	N	
Recreation Areas	Bretwood Golf Course, East Surry Rd.	Private	n/a	No	CA	
Recreation Areas	Beech Hill Recreation Area, Chapman Rd.	City	n/a	No	N	
Recreation Areas	Ashuelot River Park, 273 West St.	City	n/a	No	N, CA	
Recreation Areas	American Legion Ball Fields, 797 Court St.	Private	n/a	No		
Recreation Areas	Beaver Mills, 93 - 115 Railroad St.	Private	Unknown	No		
Recreation Areas	Wheelock Park, 101 Park Ave.	City	n/a	No	N, S, CA	
Recreation Areas	Water St. Basketball Court, 152 Water St.	City	n/a	No		
Recreation Areas	Stearns Hill Nature Preserve, Hurricane Hill Rd.	City	n/a	No	N	

Facility Category	Name & Location	Owner	Back-Up Power	Community Lifeline(s)	Asset Type	What makes this asset vulnerable during hazards? Have there been issues with recovery after an event?
Recreation Areas	Shadow Lake Park, Kendall Rd.	City	n/a	No	N	
Recreation Areas	School Recreational Facilities	Keene Union School District	n/a	No	S	
Recreation Areas	Robin Hood Park, Reservoir St.	City	n/a	No	N	
Recreation Areas	Recreation Center, Washington St.	City	Yes	Food, Hydration, Shelter	S, CF	Surge Capacity
Recreation Areas	Owl Stadium/recreational fields, Krif Rd.	KSC	n/a	No	CA	
Recreation Areas	Otter Brook Recreation Area, Route 9	US-ACOE	n/a	No	N	
Recreation Areas	Ladies Wildwood Park, Park Ave & Arch St.	City	n/a	No	N	
Recreation Areas	Keene State College, athletic field (soccer), Main St.	KSC	Partial	No	CA	
Recreation Areas	Keene Ice, 380 Marlboro St.	City	Yes	No	S	Surge Capacity
Recreation Areas	Keene Family YMCA, 200 Summit Rd.	Public	No	No	N, S	
Recreation Areas	Keene Country Club Golf Course, 755 West Hill Rd.	Private	n/a	No	N, S	
Recreation Areas	Horatio Colony Preserve, Daniels Hill Rd.	Private	n/a	No	N	
Recreation Areas	Goose Pond Nature Preserve, East Surry Rd.	City	n/a	No	N	
Schools	Trinity Christian School, 100 Maple Ave.	Private	No	No	S	Vulnerable population - young children
Schools	Our Lady Of Mercy, 161 Main St.	Private	No	No	S	Vulnerable population - young children

Facility Category	Name & Location	Owner	Back-Up Power	Community Lifeline(s)	Asset Type	What makes this asset vulnerable during hazards? Have there been issues with recovery after an event?
Schools	St. Joseph School, 92 Wilson St. (Part of church at 161-183 Main St.)	Private	No	No	S	Vulnerable population - young children
Schools	Cedarcrest Private School, 91 Maple Ave.	Private	Unknown	Health and Medical	P, CF	Vulnerable population - young children/disabled
Schools	Mt. Prospect Academy, 31 Washington St.	Private	No	No	S	Vulnerable population - young children
Schools	MC2 Charter School, 310 Marlboro St. #115	Public-Charter	No	No	S	Vulnerable population - young children
Schools	River Valley Comm. College, 88 Winchester St.	State of NH	No	No	S	
Schools	Antioch NH University, 40 Avon St.	Private	No	No	S	
Schools	Keene State College, 251 Main St.	State	Partial	Food, Hydration, Shelter	S, CF, E	
Schools	Keene Montessori School, 125 Railroad St. (Part of 139 Railroad St.)	Private	No	No	S	Vulnerable population - young children
Schools	Montessori Schoolhouse of Cheshire County (preschool), 28 Hurricane Rd.	Private	No	No	S	Vulnerable population - young children
Schools	Gathering Waters Charter School (Lower), 98 South Lincoln St.	Public - Charter	No	No	S	Vulnerable population - young children
Schools	Gathering Waters Charter School (Upper), 31 Washington St.	Public - Charter	No	No	S	Vulnerable population - young children

Facility Category	Name & Location	Owner	Back-Up Power	Community Lifeline(s)	Asset Type	What makes this asset vulnerable during hazards? Have there been issues with recovery after an event?
Schools	Surry Village Charter School, 146 School St.	Private	No	No	S	Vulnerable population - young children
Schools	Spring Hill Children's Center (nursery & kindergarten), 424 Old Walpole Rd.	Private	No	No	S	Vulnerable population - young children
Schools	Keene Middle School, Maple Ave.	Keene Union School District	Yes	Food, Hydration, Shelter	S, CF	Vulnerable population - young children
Schools	Keene High School, 43 Arch St. (including Cheshire Career Center)	Keene Union School District	Yes	Food, Hydration, Shelter	S, CF	Vulnerable population - young children
Schools	Wheelock School, 24 Adams St.	Keene Union School District	No	No	S	Vulnerable population - young children
Schools	Symonds Elementary, 79 Park Ave.	Keene Union School District	No	No	S	Vulnerable population - young children
Schools	Jonathan Daniels Preschool, 227 Maple Ave.	Keene Union School District	No	No	S	Vulnerable population - young children
Schools	Fuller Elementary School, 422 Elm St.	Keene Union School District	No	No	S	Vulnerable population - young children
Schools	Franklin Elementary School, 217 Washington St.	Keene Union School District	No	Not Applicable	S	Vulnerable population - young children
Sewer Treatment	Waste Water Treatment Plant, Airport Rd., Swanzey, NH	City	Yes	Water Systems	CF	Located in flood plain

Facility Category	Name & Location	Owner	Back-Up Power	Community Lifeline(s)	Asset Type	What makes this asset vulnerable during hazards? Have there been issues with recovery after an event?
Sewer Treatment	Sewer pump station, Martel Court	City	Yes	Water Systems		Located in Flood Plain
Shelters (Primary)	Keene Recreation Center, 312 Washington St.	City	Yes	Food, Hydration, Shelter	S	
Shelters (Secondary)	Keene High School, 53 Arch St.	Keene Union School District	Yes	Food, Hydration, Shelter	S	
Shelters (Secondary)	First Baptist Church, 105 Maple Ave	Private	No	Food, Hydration, Shelter	S	
Shelters (Secondary)	Keene Middle School, 167 Maple Ave.	Keene Union School District	Yes	Food, Hydration, Shelter	S	
Shelters (Student/Staff)	Keene State College, Spaulding Gym,102 Appian Way	KSC	Yes	Food, Hydration, Shelter	S	
Transportation	Dillant-Hopkins Airport, 80 Airport Rd. (Swanzey)	City	Yes	Transportation	CF	
Transportation	Vermont Transit, 67 Main St. - Greyhound bus	Private	n/a	Transportation	CF	
Transportation	Thomas Transportation, Swanzey	Private	n/a	Transportation	CF	
Transportation	City Express, 312 Marlborough St.	Private	n/a	Transportation	CF	
Transportation	First Student Bus Transportation	Private	n/a	Transportation	CF	
Vulnerable Populations	Stone Arch Family Housing, 829 Court St.	Private	No	No	P	Vulnerable populations: family (24 units)
Vulnerable Populations	North and Gilsum Street Apartments, 28 North St.	Private	No	No	P	Vulnerable populations: family (29 units)

Facility Category	Name & Location	Owner	Back-Up Power	Community Lifeline(s)	Asset Type	What makes this asset vulnerable during hazards? Have there been issues with recovery after an event?
Vulnerable Populations	Meadow Road Apartments, 74 Meadow Rd.	Private	No	No	P	Vulnerable populations: family (18 units)
Vulnerable Populations	Keene Highland Housing, 11 Citizen Way	Private	No	No	P	Vulnerable populations: family (240 units)
Vulnerable Populations	Hundred Nights Shelter, 122 Water Street	Private	Yes	No	P	Vulnerable populations: family (38 Units)
Vulnerable Populations	Harper Acres, 104 Castle St.	Private	No	No	P	Vulnerable populations: family (56 units)
Vulnerable Populations	Forest View Apartments, 8 Harmony Ln.	Private	No	No	P	Vulnerable populations: family (38 Units)
Vulnerable Populations	City Side Housing, 92 Water St.	Private	No	No	P	Vulnerable populations: family (24 units)
Vulnerable Populations	Brookbend West, 82 Meadow Rd.	Private	No	No	P	Vulnerable populations: family (35 units)
Vulnerable Populations	Brookbend East, 27 Ivy Dr.	Private	No	No	P	Vulnerable populations: family (40 units)
Water Supply/ Treatment	Water Treatment Facility, 555 Roxbury Rd.	City	Yes	Water System	CF	
Water Supply/ Treatment	4 public wells: 3 on Court St. and 1 on West St.	City	Portable	Water System	CF	Court St - Located in Flood Plain
Water Supply/ Treatment	Water Tanks/Pump Stations (Drummer Hill, Marlboro Rd, Timberlane Dr, Meetinghouse)	City	Portable and Stationary	Water System	CF	
Water Supply/ Treatment	Babbidge and Woodward Dams Surface Water, Roxbury	City	n/a	Water System	CF	

6.6 Risk Analysis and Risk Assessment Matrix

6.6.1 Methodology

The vulnerability and risk assessment provides information to enable the city to identify and prioritize appropriate mitigation actions to reduce losses from the identified natural hazards. For each hazard

type shown in the table below, the Planning Team assigned a value (1-5) to reflect the Human, Property and Business impact of each hazard to determine the vulnerability. Then, the Planning Team assigned a probability value (1-5) reflecting the likelihood that this hazard will occur in the next 25 years. The severity and risk was calculated from the inputted values. The final column indicates the risk of each hazard, allowing the Planning Team to see which hazards pose the greatest risk to the community. Very Low to Very High risk was assigned as shown below. Appendix A defines the terms used in the Risk Assessment.

6.6.2 Historical Analysis (Repetitive & Severe Repetitive Loss Structures)

Repetitive Loss

FEMA monitors properties that have been subject to continued flooding claims through the NFIP. These properties are designated as "Repetitive Loss" properties, which are defined as "a building covered by a contract for flood insurance that has incurred flood related damages on 2 occasions during a 10-year period ending on the date of the event for which a second claim is made, in which the cost of repairing the flood damage, on the average, equaled or exceeded 25% of the market value of the building at the time of each such flood event." The City of Keene currently has 15 NFIP & FMA repetitive loss structures combined. Eleven of these are residential properties, and three are listed as non-residential.

Properties and Structures at Risk

The City of Keene has made extensive use of Geographic Information Systems to map municipal properties and a wide variety of other assets. To identify properties and structures at risk of flooding, SWRPC conducted a series of overlay analyses using City-provided tax parcels, building footprints, and the special flood hazard areas according to the December 5, 2024 preliminary flood insurance rate maps (FIRM). Less than 1% or 165 of parcels of land were found to be totally within the special flood hazard area and almost 16% (1,083) of all parcels of land within the City have at least some exposure to the special flood hazard area. To better understand the exposure of buildings at risk, SWRPC conducted a third analysis. This final model includes parcels with at least one building either partially or entirely within the special flood hazard area. A summary of the results of this analysis is indicated below.

Table 22 Parcels and Structures in Special Flood Hazard Area

Description	# of Parcels	% of All Parcels	Land Area of Parcels (acres)	% of All Parcel Land Area
Parcels partially within the special flood hazard area	1,083	15.7%	4,971.3	22.4%
Parcels entirely within the special flood hazard area	165	2.4%	74.8	0.3%

Parcels with at least one building partially or entirely within the special flood hazard area	519	7.5%	1,913.7	8.6%
Not within the flood hazard area	5,794	84.3%	17,223.3	77.6%
All Parcels	6,877	100%	22,194.6	100%

Note: Figures rounded.

Of the three methods above for evaluating the extent of properties at risk of flooding, the third model was selected for an analysis of land use and value. The following table presents a summary of the land use of parcels with at least one building partially or entirely within the special flood hazard area. Because assessment data is provided at the parcel level rather than for individual buildings, the table includes the total assessment for a given parcel regardless of whether each and every structure was within or partially within the special flood hazard area. The structures and properties included in this analysis are depicted on the Appendix G: Past and Potential Hazards Map.

Table 23 Assessed Value in Special Flood Hazard Area

	Parcels	Acres	Building Value	Land Value	Total Parcel Value
Commercial	2	565.6	$ 88,323,700	$ 32,841,470	$ 136,960,770
Residential	13	283.0	$ 92,959,011	$ 22,936,960	$ 117,885,771
Industrial	2	230.5	$ 24,110,800	$ 8,414,800	$ 37,263,100
Other	11	534.3	$ 6,174,800	$ 16,366,700	$ 23,830,000
City	2	269.1	$ 1,928,000	$ 2,608,600	$ 4,614,400
Residential/ Commercial	1	31.2	$ 1,243,900	$ 908,200	$ 2,322,700
Grand Total	31	1,913.7	$ 214,740,211	$ 84,076,730	$ 322,876,741

6.6.3 Changes in Development

Development in Hazard Areas

Hazards identified in this plan are regional risks and, as such, all new development falls into the hazard area. The exception to this is flooding. While the population and number of housing units has increased since the previous hazard mitigation plan, it is anticipated that the disaster risk has not increased due to the efforts by the city to reduce flooding by replacing and upsizing some culverts, bridge replacement, tree removal, and other actions that have been taken to reduce the loss of life and property.

Essentially all new development in the City of Keene needs to meet our higher regulatory standards. With Keene's participation in FEMA's Community Rating System (CRS) is a voluntary program aimed at reducing flood risk in flood hazard areas through enhanced regulatory standards, as outlined in Article 24 of the Keene Land Development Code.[66] These standards exceed the minimum requirements set by the National Flood Insurance Program (NFIP). Below are some examples of how Keene has helped reduced flood risk when developing in the floodplain or floodway:

- **Compensatory Storage:** Compensatory storage ensures that the flood storage capacity of a site is maintained. For example, if fill is placed on a site, an equal volume of material must be excavated, either on the same property or through the purchase of credits from an adjacent property within the same watershed.
- **Elevation of Structures:** To reduce flood risk, structures must be elevated at least one foot above the base flood elevation (BFE). This requirement applies to new buildings as well as substantially damaged or substantially improved buildings.
- **Mitigation Measures:** When making improvements to existing structures, the affected parts must be either elevated (such as installing a new furnace or oil tank) or constructed with flood-resistant materials. Flood-proofing is an option for commercial buildings, but it is not available for residential structures.

[66] City of Keene, NH - Land Development Code

- **Development in the Floodway:** New development is prohibited in the floodway. However, provisions exist for the improvement of existing structures in the floodway, provided that certain criteria are met to minimize flood risks.
- **LOMA, LOMA-F, and CLOMA:** The City also recognizes the importance of Letters of Map Amendment (LOMA), Letters of Map Amendment-Floodway (LOMA-F), and Conditional Letters of Map Amendment (CLOMA). These are issued by FEMA to formally remove a property or structure from the floodplain or floodway designation based on specific criteria, such as the elevation of the land or structure. Properties with a LOMA or CLOMA are not subject to floodplain development regulations unless the property is re-mapped in future flood studies.
- **Elevation Certificates:** For most development projects in flood-prone areas, an Elevation Certificate is required to confirm the elevation of a building relative to the base flood elevation (BFE). These certificates are crucial for determining compliance with floodplain management regulations and are also essential when securing flood insurance. Additionally, Elevation Certificates provide valuable site-specific data that can contribute to flood modeling, which is particularly useful when new flood studies and mapping updates are conducted. This helps improve the accuracy of flood risk assessments in future planning efforts.

Developments in flood-prone areas, particularly residential and commercial projects within the 100-year floodplain, are not expected to increase flood risk. Keene's implementation of sound construction techniques and adoption of effective floodplain management policies have helped mitigate these risks. Proposed developments in high-risk flood zones will continue to be subject to stringent building codes and flood mitigation measures, reducing the potential for increased vulnerability.

6.6.4 Vulnerability Summary

Human Impact, Property Impact, Business Impact and Probability rating scale:

Table 24 Natural Hazard Risk Assessment Table

Natural Hazards	Human Impact	Property Impact	Business Impact	Probability	Severity	Risk	Risk Level
	Probability of death or injury	Physical losses and damages	Interruption of service	Likelihood this will occur in 25 years	Average of impacts	Severity x Probability	
Flooding	4	5	5	5	4.67	23.3	Very High
Tornado / Downburst / Extreme Wind	4	5	4	5	4.33	21.7	Very High
Hurricane / Tropical Storm	4	5	4	5	4.33	21.7	Very High
Extreme Heat (Extreme Temperature)	4	2	4	5	3.33	16.7	High
Lightning Strikes	3	4	3	5	3.33	16.7	High
Severe Winter Weather	4	2	4	5	3.33	16.7	High
Extreme Cold (Extreme Temperature)	4	3	3	5	3.33	16.7	High
Drought	2	3	3	5	2.67	13.3	Medium
Wildfire	2	3	3	5	2.67	13.3	Medium
Earthquake	4	4	4	3	4.00	12.0	Medium
Infectious Disease	4	1	4	3	3.00	9.0	Low
Dam Failure	4	4	4	2	4.00	8.0	Low
Erosion / Landslide	2	2	2	2	2.00	4.0	Very Low
Solar Storms & Space Weather	1	1	3	2	1.67	3.3	Very Low

Risk Level: 1-5 Very Low 6-10 Low 11-15 Medium 16-20 High 21-25 Very High

Human Caused Risks: In addition to the risk potential from naturally occurring hazards, the Planning Team identified human caused hazards that pose a risk to the city. For each hazard type shown in the table below, the Planning Team assigned a value (0-4) to reflect the potential severity of each hazard if it were to occur in Keene. Then, the Planning Team assigned a probability value (0-4) reflecting the likelihood that this hazard will occur in the next 25 years. The risk was calculated based on the severity and probability values. The final column indicates the risk of each hazard, allowing the Planning Team to see which hazards pose the greatest risk to the community. *Low* to *Severe* risk was assigned as shown below.

Table 25 Human Caused Hazards Table

Human Caused Hazards	Severity 0: n/a 1: Low 2: Moderate 3: High 4: Catastrophic	Probability *In 25 years* 0: Improbable 1: Remote 2: Occasional 3: Probable 4: Frequent	Risk *Severity x Probability*	Risk Level 0 -5: Low Hazard 6 - 11: Moderate Hazard 12 -16: High Hazard
Cyber Event	3	4	12	High
Known and Emerging Contaminants	3	4	12	High
Haz Mat *(Transport)*	3	3	9	Moderate
Utility Interruption	3	3	9	Moderate
Haz Mat *(Fixed)*	3	3	9	Moderate
Mass Casualty *(Trauma or Medical)*	3	3	9	Moderate
Transport Incident *(plane, auto, etc.)*	2	3	6	Moderate
Urban Fire	3	2	6	Moderate
Aging Infrastructure	2	3	6	Moderate
Armed Attack *(assault, sniper, vehicle)*	4	1	4	Low Risk
Bomb / Explosion	4	1	4	Low Risk
Biological Terrorism	4	1	4	Low Risk
Terrorist Attack *(WMD)*	4	1	4	Low Risk
Civil Disorder	1	2	2	Low Risk
Radiological	2	1	2	Low Risk

Existing and future assets have the potential of being affected by some of the hazards identified in this plan. Some hazards identified in this plan are regional or citywide risks and, as such, all structures, infrastructure, assets, and critical facilities fall into the hazard area.

In order to determine estimated losses due to natural and man-made hazards in Keene, each hazard area was analyzed; results are shown below. Human losses were not calculated during this exercise, but could be expected to occur depending on the type and severity of the hazard. These figures exclude both the land value and contents of the structure. Monetary values associated with vulnerability were assigned in the 2018 Plan Update. The value of all structures, including exempt structures such as schools and churches, was $1,876,512,800, according to the City Assessing records as of March 8, 2018, and the median value of a home in Keene was $183,300. The data below was calculated using FEMA's *Understanding Your Risks: Identifying Hazards and Estimating Losses*. Since hazard vulnerability assessment is dependent on a range of variables, such as the type, magnitude and precise location of a future hazard, these assessments are far from an exact science. Therefore, it is understood that the monetary values arrived at through these assessments represent gross estimates.

The Planning Team reviewed problem statements included in this vulnerability summary for natural hazards that were included in the 2018 Plan Update and concurred that representative language still

applies to the 2025 Plan Update. Sections have been added for Infectious Disease, Solar Storms & Space Weather, and Extreme Temperature.

Infectious Disease – Low Risk (High Threat Infection)**:** The magnitude, severity and impact of an infectious disease is described by its speed of onset (how quickly people or animals become sick or cases are reported) and how widespread the infection is. Illnesses with notable recent impacts in Keene include COVID-19 (6,990 cases in Keene and 139 deaths in Cheshire County), and Lyme Disease (2024 1,457 case in NH).[67]

- Those with compromised immune systems are at greater risk during these events.
- Children, elderly, individuals with chronic and special health conditions are at greater risk during these events.
- There is a potential for injury or death to people, domestic animals and wildlife.
- There is a potential for risk to waterbodies and wildlife habitat.
- There is a potential for loss of crops and vegetation, and economic disparity.

Solar Storms & Space Weather – Very Low Risk: The entire city of Keene is at risk of solar storms and space weather.

Problem statements:

- There is a potential for interruption of communication service.
- Solar storms and space weather can impact the communication connections for emergency services (EMS/Fire/Police).
- Solar storms and space weather can impact the communication connections for critical infrastructure operations that depend on communication service. Communication between water supplies, pumps and storage facilities can be disrupted placing the public at risk.

Flood - Very High Risk: There is great potential for annual flood incidents in Keene due to the community's topography and numerous watercourses and water bodies. The City of Keene is a very complex hydrologic system. The City's floodplain, due to its size and complexity, may be one of the most important in New England. The complexity arises from the fact that 12 steep rivers and streams from 6 major watersheds eventually drain into the City. The outlet of the Keene floodplain is a flat stretch of river, which does not gain any significant slope for about 25 miles at the Town of Winchester. The result of having large volumes of water flowing into a flat bowl is frequent flooding. During major region-wide rainstorms or during spring snowmelt there can be basin-wide flooding. Since only so much water can flow past Winchester and Hinsdale to the Connecticut River, the City has experienced backwater flooding, as water backs up from Winchester and Swanzey northward into the Keene basin. However, flooding can occur along any one of the rivers or brooks, and there may be significant flooding on the east side of Keene (due to a local rainstorm in the Beaver Brook watershed, for example), while there is no flooding on the west side of the City. That is why the Keene floodplain is so complex, in terms of forecasting and in terms of management. The area most susceptible to major flooding is that portion of the City which extends southward from the Colony

[67] NH DHHS Data Portal

dam just north of West Street (next to Starbucks Coffee) down into Swanzey, and in a swath along each of the rivers and streams. The general extent of the floodplain is shown on the Hazard Identification Map at the end of this plan. In total, the 100-year floodplain extends over 1,400 acres. The extent of damage caused by any flood depends on the depth and duration of flooding, the topography of the area flooded, velocity of flow, rate of rise, and the amount and form of development in the floodplain. Deep floodwater carrying floating debris would create hazardous conditions for people and vehicles attempting to cross flooded areas. In depths of greater than 3 feet or in areas where the flow attains faster velocity, an adult could be swept off balance creating the danger of injury or drowning. Damaged sewer lines or septic systems could pollute floodwaters, creating a health hazard or contaminating City well fields. Hazardous or toxic materials could be released, causing pollution or injury. The provision of emergency medical, fire or police assistance could be seriously restricted or delayed due to obstructed access routes. Death or injury could occur. There could be significant damage to buildings. Many utilities could be damaged, including gas, electric, drainage, telephone, sewer and water lines. A major electrical substation and local propane gas company on Emerald Street are located within the floodplain. Many people could be out of work as the result of damage to local businesses and industries. In general, a major flood could affect the whole city, either directly or indirectly. In 1989, the U.S. Army Corps of Engineers estimated that a 100-year flood could cause at least $5 million worth of damage in Keene, and that a 500-year flood could result in at least $10.5 million worth of damage. Using an inflation calculator, these amounts in 2025 currency would be approximately $12,786,636 (100-year flood) and $26,851,939 (500-year flood).

Flooding on the Branch River, Beaver Brook, and Ash Swamp Brook may be caused by runoff from the upstream drainage areas and by backwater flooding from the Ashuelot River. Flooding on Otter Brook is largely controlled by regulated outflow from Otter Brook Dam. Flooding can occur from the runoff from the watershed below Otter Brook Dam or from backwater from the Branch River. Flooding in the Minnewawa Brook basin can occur during all seasons of the year.

Drought - **Medium Risk: No estimate of cost** - Keene has had limited experience with severe drought conditions. Drought will increase the risk for wildfires, especially in forested areas. Drought could affect wells and irrigation in Keene.

- The entire city could be affected by drought;
- Forested areas with high fuel content have more potential to burn; and
- Recent drought from 2015 to 2017 - some wells have gone dry. There is no documentation and no count available.

Extreme Temperatures – High Risk:

Extreme Cold – High Risk: Extreme cold events can adversely affect human health, especially children, elderly, individuals with chronic and special health conditions, and the unsheltered population.

- Approximately 18% of the city population is 65 and over and can be impacted by extreme cold;
- Due to the overburden and lack of shelter spaces the unsheltered population is at risk;
- There is the potential for damage to residential, commercial, and industrial structures from freezing pipes;
- Potential damage to underground infrastructure;
- There is a potential for injury or death.

Extreme Heat - High Risk: No estimate of cost. Extreme heat events can adversely affect human health, especially children, seniors and people with respiratory illnesses. In the framework of climate change forecasting, the City of Keene has been participating in the "Climate Resilient Communities Program", which resulted in the Climate Change Adaptation Plan (2007). This Plan includes a review of the impacts of extreme heat events on public health, energy needs and agriculture. The Plan includes a summary of testimony by Dr. Cameron Wake of the University of New Hampshire which states "that if the world remains on a pathway of using fossil fuels as it does now, New Hampshire will be a very different place, with sixty summer days over 90°, and 50% less snowfall. Wake says New Hampshire weather will be like a very dry North Carolina."

- The elderly are at risk. Approximately 16 % of the city population is 65 and over;
- Power outages could occur due to excessive use of air conditioners and fans; and
- The entire city could be affected by extreme heat.

Wildfire - **Medium Risk: Estimated cost (2018)** - **Approximately $1,000/acre**

The potential for wildfire depends on terrain, the fuel load, the humidity and other characteristics of the area. Previous ice storms and high wind events have left a significant amount of woody debris in the forests that may fuel future wildfires. Fires in New Hampshire are predominantly human-caused, and roughly half of the total fire activity is in the most populous three southern counties. The proximity of many populated areas to the local and state forested lands exposes these areas and their populations to the potential impact of wildfire. There is a higher risk for urban fires in the downtown area where older homes have been converted to business offices.

- Entire city is at risk; A wildfire can strike at any time and in any place;
- There is a potential for interruption of service and damage to structures;
- There is a potential for injury or death; and
- Risk increases for wooded areas with higher elevation.

Lightning Strike - **High Risk: No estimate of cost** - Residents and visitors to the New Hampshire area are more vulnerable to being struck by lightning because of the activities with which they are involved, particularly on those warm summer days when lightning is most likely to occur. More likely to be affected are structures and utilities, often resulting in structure fires and power outages. High elevations and areas around water and wetlands may be more susceptible to lighting strike

incidents. Lightning could strike tall trees anywhere in Keene and could potentially start wildfires in periods of drought, or create telephone and power outages. Church steeples are also at risk.

- This could occur citywide;
- There is a potential for interruption of service, and damage to structures;
- There is a potential for injury or death.
- Areas of high fuel load are at higher risk;
- Antennas and towers are at higher risk; and
- Hikers, fishermen and boaters are at higher risk.

Tornado/Downburst/Severe Wind - **High Risk**: **estimated cost (2018) - $37,530,256.** Severe wind events (downburst, tornadoes or high winds associated with thunderstorms) can occur anywhere in Keene. Generally the higher elevations, such as Beech Hill, are more susceptible as well as more vulnerable due to the fact that they are home to many communication towers, including emergency response/mutual aid towers. Due to the sporadic nature of Tornados, they could occur anywhere in the City of Keene. Such events can cause small blocks of downed timber. Downbursts are sometimes mistaken for tornados and can cause very similar damage.

Tornadoes rarely occur in this part of the country; therefore, assessing damage is difficult. The estimated damages to 10% of structures with 20% damage is approximately $37,530,256 ($47,689,746 - 2025 cost adjusted with inflation calculator). The estimated cost does not include building contents, land values or damages to utilities.

- The potential for damage to structures from severe wind, downbursts, and tornados is citywide;
- There is a potential for interruption of service and damage to utilities; and
- There is a potential for injury or death.

Hurricane/Tropical Storm - **Very High Risk: estimated cost (2018)** - **$46,912,820.** Keene's location in southwestern New Hampshire reduces the risk of extremely high winds that are associated with hurricanes. Hurricanes can, and do create flooding. The estimated wind damage of 5% of the structures with 10% damage is approximately $9,382,564. The estimated flood damage of 10% of the structures with 20% damage is approximately $37,530,256. The cost of repairing or replacing the roads, bridges, utilities and contents of structures is not included.

- The potential for damage to structures is citywide;
- There is a potential for injury or death;
- Damaged power lines could disrupt services; and
- Flooding could wash out evacuation routes.

Earthquake - **Low Risk: estimated cost (2018)** – **$375,302,560**. According to the NH State Hazard Mitigation Plan, New Hampshire is considered to lie in an area of "Moderate" seismic

activity with respect to other areas of the United States and is bordered to the North and Southwest by areas of "Major" activity. There are no identified fault lines for the entire state, therefore, an earthquake could occur and/or affect any location in the City. Keene is located on a lake bed (Connecticut River valley) that has high liquefaction factor which increases the impact of an earthquake. It is assumed that all of the buildings in the City have not been designed to withstand seismic activity. More specifically, the older historic buildings that are constructed of non-reinforced masonry are especially vulnerable to any moderate sized earthquake. If a strong earthquake were to occur, there is the potential for an estimated loss of 20% of city assessed structural valuation which is approximately $375,302,560. The costs for repairing or replacing roads, bridges, power lines, or the contents of the structures area not included.

- There is the potential for damage to structures from earthquakes;
- There is a potential for injury or death.
- Damaged power lines could disrupt services; and
- The entire city is at risk.

Severe Winter Weather - **High Risk: No estimate of cost.** Three types of winter events are heavy snow, ice storms and extreme cold; all which cause concern for Keene. Heavy snow can collapse buildings and ice storms can disrupt power and communication services. Extreme cold affects the elderly. Keene's recent history has not recorded any loss of life due to extreme winter weather. These random events are difficult to set a cost to repair or replace any of the structures or utilities affected.

- There is the potential for damage to structures from heavy snow, and freezing pipes;
- There is a potential for injury or death;
- Power outages could occur due to heavy snow and ice on power lines; and
- The entire city is at risk.

Erosion/Landslide - **Very Low Risk** - **No estimate of cost:** There is a potential for erosion of the river banks and steep slopes by heavy rain and/or spring runoff if it is not vegetated or supported by other methods.

- There is a potential for mud and debris to enter the streams;
- There is a potential for mud and debris onto roads; and
- This can occur on steep slopes and riverbanks anywhere in the City.

Hazardous Materials Spills - **High Risk** - **No estimate of cost:** Public transportation of fuel and other hazardous materials through Keene on State highways is a concern. Any road with hills where oil, fuel, and propane trucks deliver is a concern.

- A spill could cause serious or life threatening health concerns;

- A spill could contaminate drinking water sources;
- This could occur citywide, however, the State highways are heavier truck routes and, therefore, pose a greater risk.

Dam Failure/Breach - **Low Risk** - **No estimate of cost:** The Planning Team determined that dam failure or breach is a low risk and, therefore, they do not consider any cost estimate for potential losses.

After careful review of the historical natural disasters in and near the City of Keene, the planning team determined that the risk of snow avalanches do not pose enough of a risk to the city to include in this plan.

7 CAPABILITY ASSESSMENT

7.1 PURPOSE

The purpose of the capability assessment is to help the Planning Team evaluate Keene's existing resources, policies, and programs that can support hazard mitigation. This assessment identifies current planning, regulatory, administrative, technical, financial, and outreach capabilities that may be used to implement mitigation strategies and reduce risk. By understanding these capabilities, the Planning Team can determine where Keene has strengths to build on, where gaps exist, and how best to integrate mitigation actions into existing efforts and structures.

7.2 TYPES AND EVALUATION OF CAPABILITIES

This section examines the existing mitigation capabilities or strategies being implemented throughout the city and considers areas that need improvements or where there may be gaps in coverage. The following is a list of current policies, regulations and plans that Keene currently has in place to help reduce the loss of life and property due to hazard events.

7.2.1 Existing Programs

This matrix identifies and evaluates the mitigation strategies and city programs that are currently in place. It also outlines those programs and recommends improvements to ensure the highest quality emergency services possible. Effectiveness of the existing protection is rated Poor, Average, or Good: Poor - needs improvements; Average - meets most expectations; Excellent - meets or exceeds expectations. The Planning Team considered the City's ability to expand on or improve the capabilities listed. Areas of improvement are listed as identified by the Team. The Team also considered the City's lack of ability or authority to expand and/or improve their capabilities. Where appropriate, the lack of ability or authority is listed.

Table 26 Existing Protection Matrix

Existing Program or Activity [*Hazard Addressed]*	Description/Area Covered	Department or Local Contact	Effectiveness (Historic Performance)	Improvements or Changes Needed/Comments identified in previous update? Can this be improved or expanded?
Bridge Maintenance Prog.	Inspection and clean-up occur annually. The state inspects all bridges every other year. Red listed bridges are inspected annually.	DPW	Poor	9 out of 32 vehicle bridges are on the State's Red List. a decrease in 4 bridges since 2018. Increasing the number of bridge replacement projects subject to additional funding..
Building Code [Multi-Hazard]	The City complies with the State of New Hampshire Building Code.	Health & Code Enforcement Director	Average	Currently under 2021 ICC Building Codes updated on July 1st 2024
Capital Improvement Program	A decision making tool used to plan and schedule city improvements over a six-year period. The CIP provides a suggested timeline for budgeting and implementing needed capital improvements.	Finance Department	Average	For full implementation of the Plan will require additional funding.
Climate Change Action Plan	Identifies actions to reduce greenhouse gas emissions.	Community Development	Average	Implementing some of the recommendations to improve implementation and monitoring will need additional funding and staff availability.
Climate Change Adaptation Plan	2007 Plan assessed the vulnerability to climate impacts and identifies actions to enhance resiliency.	Community Development	Average	Implementing some of the recommendations to improve implementation will need additional funding and staff availability.

Existing Program or Activity [*Hazard Addressed]*	Description/Area Covered	Department or Local Contact	Effectiveness (Historic Performance)	Improvements or Changes Needed/Comments identified in previous update? Can this be improved or expanded?
Community Rating System [Flood]	A voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk.	Community Development Director	Excellent	Continue to participate in the Community Rating System. No changes needed at this time. No barriers to monitoring.
Comprehensive Master Plan (CMP) (2025)	The Comprehensive Master Plan serves as the guiding document for future development in Keene and assists the Planning Board as it updates the Subdivision & Site Plan Regs.	Community Development./ Planning Board & City Council	Average	Update of the CMP.is anticipated to be complete in calendar year 2025. Implementation of recommendations will require additional funding and staff availability.
Cybersecurity Controls	Organizational Cybersecurity	Information Technology	Excellent	Basic cyber security protocols have been successfully implemented. Expansion of program including exercise and additional software and hardware will require additional funding and staff availability.
Dam Emergency Action Plans [Dam Breach]	The dam emergency plans establish evacuation and emergency response procedures for potential dam failure.	DPW, Parks & Rec Director, EMD	Average	Improvement or expansion of the program is subject to additional funding.

Existing Program or Activity [*Hazard Addressed]*	Description/Area Covered	Department or Local Contact	Effectiveness (Historic Performance)	Improvements or Changes Needed/Comments identified in previous update? Can this be improved or expanded?
Dam Master Plan [Dam Breach]	A report that evaluates and sets priorities for dam improvements.	DPW, Parks & Rec Director	Average	Update to the Dam Master Plan is needed to revie remaining High and Low hard dams. Update is subject to additional funding and staff time availability.
Earth Excavation	Earth Excavation Regulations	DPW, Community Development	Average	Updated in 2021. Review and updating of ordinance will require additional funding and time availability.
Elevation Certificates Maintained [Flood]	For all development (new or substantially improved) in 100 year Floodplain. **Area:** Floodplain	Community Development Director	Average	Continue to enforce NFIP by requiring elevation certificates. No barriers to maintaining
Emergency Notification System [Multi-Hazards]	Emergency apparatus with bullhorns, signs, use of local media, message boards. Recently started to use Reverse 911 and social media.	EMD	Average	Basic implementation of State's ENS in calendar year 2025. Barriers to expanded or improved use is funding and staff time..
Emergency Operations Plan (2016) [Multi-Hazard]	City-wide emergency response plan that identifies the response procedures and capabilities of the City in the event of a natural or man-made disaster.	EMD	Average	To be updated in the next 3 years. Shifting to Agency/Department format. Staffing availability is the barrier.
Fire Code	The City meets or exceeds the State of New Hampshire Fire Code.	Fire Chief	Excellent	NFPA Codes updated in 2024.

Existing Program or Activity [*Hazard Addressed]*	Description/Area Covered	Department or Local Contact	Effectiveness (Historic Performance)	Improvements or Changes Needed/Comments identified in previous update? Can this be improved or expanded?
Floodplain Development Ordinance [Flood]	An ordinance has been adopted as part of the City zoning ordinance to control development in the 100-year floodplain. This was a requirement to become a member of the NFIP. Area: Floodplain	Community Development Director	Excellent	Ordinance last updated in 2021, New updates expected for 2026 with adoption of new FEMA Flood Plain mapping. May take a significant time to update due to available staff time.
GIS	Keene Planning department provides mapping capabilities for natural and human caused mitigation planning.	IT	Average	Additional funding and staff time is required to develop additional layers and obtain data.
Hazardous Materials Plan/Team [Hazmat]	City of Keene HazMat Team & current HazMat Plan.	Fire Chief/Fire Department	Excellent	Continue ongoing training and updating. Expansion of program requires additional funding.
Hillside Protection	Hillside Protection Overlay District	Community Development	Average	Updated in 2021. Review and updating of ordinance will require additional funding and time availability.
Land Development Regulations	Subdivision regulations provide for the orderly present and future development of the City by promoting the public health, safety, convenience and welfare of the City's residents.	Community Development Director	Average	inland regulation were updated in 2021. Expanded/improvement subject to funding and staff time availability.

Existing Program or Activity [*Hazard Addressed]*	Description/Area Covered	Department or Local Contact	Effectiveness (Historic Performance)	Improvements or Changes Needed/Comments identified in previous update? Can this be improved or expanded?
Mitigation Grants	Federal grants to assist with funding of mitigation projects.	Multi-Agency	Average	Barrier to application is the lack of data and staff time to be able to develop Benefit Cost Assessments for projects. Additional funding is needed for application development.
National Flood Insurance Program (NFIP) [Flood]	A federally backed program that encourages communities to enact and enforce floodplain regulations. **Area:** Floodplain	Community Development Director	Average	Continue outreach efforts to homeowners on the benefits of the program and encourage participation. Maintaining current level of effort is possible. Improvement or expansion subject to additional funding/staff time.
Natural Resources Protection Ordinance	National Flood Insurance Program (NFIP) requirements have been adopted as part of the City's Zoning Ordinance. This regulates all new and substantially improved structures located in the 100-year floodplain, as identified on the FEMA Flood Maps.	Health & Code Enforcement Director	Excellent	Ordinance was updated in 2021. Staff time is a barrier for the next update after FEA Map revision are issued in 2025.

Existing Program or Activity [*Hazard Addressed]*	Description/Area Covered	Department or Local Contact	Effectiveness (Historic Performance)	Improvements or Changes Needed/Comments identified in previous update? Can this be improved or expanded?
Public Education Programs [All Hazards]	Multiple City departments conduct periodic public education programs pertaining to natural, human caused and public health emergencies.	Multi - agency	Poor	Expansion or improvement of existing program requires additional funding and staff time/availability.
Public Improvement Standards (infrastructure)	City Code includes road design and stormwater design standards.	DPW	Average	Updated standards were updated in 2021. Improvement/expanded standards subject to funding and staff availability.
Shelters with Emergency Back-up Power	Keene High School and Middle School, Keene Recreation Center, First Baptist Church, and Keene State College (Spaulding Gym).	Fire Chief/EMD	Poor	Additional funding is required for generators.
Shoreland Protection Prog. [Erosion]	Designates a protective buffer along shorelines in accordance to NHDES regulations.	NH DES	Average	Additional education and expansion of program requires additional funding and staff availability.
Storm Drain/Culvert Maintenance [Flood]	Keene Public Works and the State DOT clean one quarter of the drainage basins once a year and after major flooding events. Culverts are repaired as needed.	DPW	Average	Storm water Phase 2 needs to be evaluated.
Sustainable Development	Sustainable Energy Efficient Development	Community Development	Average	Updated in 2021. Review and updating of ordinance will require additional funding and time availability.

Existing Program or Activity [*Hazard Addressed]*	Description/Area Covered	Department or Local Contact	Effectiveness (Historic Performance)	Improvements or Changes Needed/Comments identified in previous update? Can this be improved or expanded?
Telecommunications	Telecommunications Overlay District	Community Development	Average	Updated in 2021. Review and updating of ordinance will require additional funding and time availability.
Tree Maintenance [Severe Wind]	Citywide	Public Works	Poor	Development of a City-wide program requires additional funding. Implementation of a program will require additional funding.
Water Supply Shortage Plan	An ordinance that outlines methods of water supply rationing.	DPW	Unknown	Additional funding to develop and exercise the plan.
Wetlands Protection	Surface Water Protection Overlay District	Code Officer/ Community Development	Average	Ordinance updated and Adopted in 2013. Review and updating of ordinance will require additional funding and time availability.
Zoning Ordinance [Multi-Hazard]	The City has adopted a zoning ordinance and map to protect the health, safety and welfare of the residents from the effects of ill-considered and indiscriminate use of land.	Zoning Administrator	Average	Portions of zoning code was updated in through 2025. Available staff time is a barrier.

7.3 Integration with Existing Plans and Local Processes

In addition to work by the Hazard Mitigation Planning Team and city departments, several other mechanisms exist which will ensure that the Keene Hazard Mitigation Plan Update 2025 receives the attention it requires for satisfactory use.

Capital Improvements Plan (CIP)

Many of the projects found within the Action Plan of this update are incorporated with newer projects needing to be incorporated into the Capital Improvements Plan. It is there that the funding of the projects will be reviewed and determined to be included in future budget considerations by the City. The CIP review serves as an annual review of this plan.

Comprehensive Master Plan

Implementation of the Comprehensive Master Plan was updated in 2010. An update to the Comprehensive Master Plan is underway and expected to be completed by the end of calendar year 2025. It is an intention of this plan that the Planning Board considers incorporation of this plan by reference into its Comprehensive Master Plan and through the annual update to the City's CIP. The Emergency Management Director presented the Keene Hazard Mitigation Plan Update 2025 project to the Master Plan Steering Committee on February 6, 2025. The Local Hazard Mitigation Planning Team and City Department Heads will continue working with the Planning Board to incorporate strategies outlined in this plan into the Master Plan update.

Zoning Ordinance and Development Regulations

Some of the implementation strategies proposed involve revisions to the Land Development Code (LDC), Subdivision Regulations and/or the Site Plan Review Regulations as well as the Zoning Ordinance. The Emergency Management Director will work with the Community Development Director and the Planning Board to develop appropriate language for the recommended modifications.

City of Keene Housing Needs Assessment and Strategy

Chapter 8 of the City of Keene Housing Needs Assessment and Strategy discusses housing resiliency within the city, specific to flooding vulnerability. The Emergency Management Director will work with the Community Development Director as this plan is updated to encourage the addition of mitigation strategies into the resiliency discussions of this document.

7.4 Capability Needs / Challenges Summary

Keene's capability assessment reveals a well-established foundation of hazard mitigation programs and plans, yet several critical needs and challenges remain. While many capabilities, such as the floodplain ordinance, GIS, and fire code enforcement, are rated as excellent, others - like bridge maintenance, shelter power infrastructure, and tree maintenance - are rated poor and require improvement. The Planning Team identified gaps in program effectiveness, capacity for updates, and the City's authority or ability to expand certain initiatives. Integration with existing plans - like the Capital Improvement Plan, Comprehensive Master Plan, and Housing Needs Assessment - presents opportunities to strengthen mitigation efforts. However, consistent updates, expanded outreach, and targeted resource allocation are needed to address aging infrastructure, improve emergency preparedness, and enhance climate adaptation measures.

8 MITIGATION STRATEGY

8.1 GOALS

The Planning Team reviewed and revised the goals for this hazard plan update. Revised goals are listed in Section 5.4.1 of this plan.

8.2 DEVELOPMENT AND UPDATE OF STRATEGY AND ACTIONS

The development and update of Keene's hazard mitigation strategies involved a comprehensive review of existing actions and the identification of new strategies to address evolving risks. The Planning Team systematically assessed current mitigation efforts, identifying gaps and areas for improvement across four key categories: prevention, property protection, emergency services, and public information. This process included an evaluation of climate adaptation strategies, infrastructure resilience, and new threats such as cyber incidents and emerging contaminants. Through stakeholder engagement and the application of the STAPLEE prioritization method, realistic and actionable strategies were selected for inclusion. The revised mitigation actions reflect a shift toward proactive adaptation, with an emphasis on floodplain management, community outreach, and technological preparedness to enhance Keene's overall resilience.

8.2.1 Types of Mitigation Actions

In addition to the programs and activities that Keene is currently undertaking to protect its residents and property from natural and manmade disasters, a number of additional strategies were identified by the Planning Team for consideration. The process of compiling a comprehensive list of all mitigation strategies currently in place throughout the city helped the Planning Team to identify gaps in the existing coverage and improvements which could be made to the strategies. Existing and potential strategies were identified for each general hazard type using the following categories: Prevention (programs and policies), Property Protection, Emergency Services, and Public Information. Each strategy was discussed to determine realistic strategies to be included in the STAPLEE chart.

Table 27 Potential Strategies Matrix

Hazard Type	Prevention	Property Protection	Emergency Services	Public Information
Flooding	Floodplain Development Ordinance	Upsize culverts/bridges included in the CIP.	Continue to participate in NFIP trainings/workshops offered by the State and/or FEMA (or in other training) that addresses flood hazard planning and management.	Provide information to the public about NFIP and other flood management strategies.
	Storm drain/culvert maintenance.	Develop a citywide emergency warning system.		Continue utilizing the Community Rating System.

Hazard Type	Prevention	Property Protection	Emergency Services	Public Information
Drought	Implementation of the Climate Change Adaptation Plan.	Implement a Water Emergency Plan.	Develop water distribution plan for low pressures and rural areas.	Provide information to residents on water conservation/drought resistant landscaping and/or rain gardens.
Extreme Heat	Implementation of the Climate Change Adaptation Plan.	Public education about benefits of landscaping, construction techniques to address heat, and site selection when building a home.	Identify cooling centers through working with NGO's to increase the number of centers.	Public education about benefits of landscaping, use of sunshades and other devices to reduce solar heating of residents and buildings, and site selection when construction a building.
Wildfires	Follow building codes and best management practices. Work with planning standards on new construction & site work.	Public education programs on techniques to reduce the effects of wildfires on residents and buildings.	Continue wildfire training for firefighters along with equipment updates. Identify alternative rural water supply opportunities to be accessed during an event.	Provide fire prevention training in schools, at local service club meetings and for the general public. Provide information on techniques that will reduce the vulnerability of properties for the spread of wildfires.
Lightning	Coordinate with utility companies to trim tree branches near power lines to reduce outages due to tree branches.	Install grounding equipment on public and historic buildings.	Maintain shelters with emergency back-up power.	Provide outreach material on safety during lightning and storm events. Include a link of FEMA's website on the city website.
Tornados/ Severe Wind/ Downbursts	Coordinate with local power and communication companies to trim tree branches near power and communication lines.	Trim tree branches near critical facilities, city structures, and roadways.	Maintain shelters with emergency back-up power. Continue to provide training for emergency responders.	Provide the public with information on the hazards associated with severe weather and ways to mitigate the impact.
Hurricanes/ Tropical Storms	Coordinate with local power and communication companies to trim	Consider the requirement for new construction to	Maintain shelters with emergency back-up power. Continue to	Continue to provide information to the public about NFIP.

Hazard Type	Prevention	Property Protection	Emergency Services	Public Information
	tree branches near power and communication line	withstand severe wind speeds.	provide training for emergency responders.	
Severe Winter Weather	Coordinate to utilize the Emergency Snow & Ice Response Plan.	Coordinate with utility and communication companies to trim tree branches near power lines to reduce outages due to tree branches. Trim tree branches near critical facilities, city structures, and roadways.	Review current and future needs for emergency backup power. Maintain shelters with emergency back-up power. Include warming centers in the Emergency Operations Plan.	Disseminate information to residents about the proper use of heating sources and installation of generators.
Earthquakes	Building Codes.	Retrofit public buildings with earthquake standard techniques.	Maintain shelters with emergency back-up power. Retrofit public buildings with earthquake standards.	Provide information to the public about reducing damage due to earthquakes.
Landslide/ Erosion	Steep Slopes Ordinance and Road Design Standards.	Inspect road embankments periodically for signs of erosion and undermining of roadway. Stabilize steep slopes with plantings, retaining walls, and rip rap.	Implementation of search and rescues, and evacuation plans when needed.	Provide information to the public on stormwater management methods including how to stabilize steep slopes.
Hazardous Materials	Spill Prevention Control and Counter Measures Plans.	Update Hazardous Materials Handling and Management Plans.	Maintain and updated Hazardous Materials Plan.	Disseminate outreach material on proper disposal of hazardous household materials and medicines.
Dams	Inspect dams, bridges and culverts prior to heavy rain events.	Maintain Dam Emergency Action Plans.	Provide information to the public on emergency evacuation routes and shelters with emergency backup power.	Provide information to the public on emergency evacuation routes.
Solar Storms and Space Weather	Plan for the continuity of City Continuity of Operations in particular		Prepare communication equipment for possible disruption.	Educate the community about space weather and appropriate preparedness

Hazard Type	Prevention	Property Protection	Emergency Services	Public Information
	communications during a future solar storm.			actions to mitigate secondary impacts including power outages and loss of water supply.
Infectious Disease	Plan for the Continuity of Government Operations during a future pandemic. Obtain an inventory of masks, wipes, hand sanitizer and other appropriate personal protective equipment.	Prepare government facilities to be able to have isolated areas or other work environments/options for protection of workers.	Ensure that emergency response staff (Including Fire, Police, Public Works, and other essential employees) have the proper personal protection equipment.	Provide educational materials to the public on the importance of vaccinations and how to minimize exposure. Provide information on how to prepare for a potential infectious disease out.

8.2.2 Analysis of Mitigation Actions

Each proposed mitigation strategy identified in the previous section was ranked in order to determine a prioritized list of strategies to implement. The methods of ranking used for this Hazard Mitigation Plan included STAPLEE and relative hazard risk ratings according to the Vulnerability Summary (6.6.4).

STAPLEE is an acronym for a general set of criteria common to public administration officials and planners. It stands for the Social, Technical, Administrative, Political, Legal, Economic and Environmental criteria for making planning decisions. The Keene Hazard Mitigation Planning Team assigned a score (Good or Above Average=3, Average=2, Poor or Below Average=1) to each strategy for its effectiveness related to the critical evaluation factors listed above. The values were totaled, and the mitigation priorities were listed according to the scores.

Questions that were asked and evaluated included:

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

Hazard Risk was evaluated according to the risk ratings according to the Vulnerability Summary (6.6.4). Actions were awarded points on a the following scales:

- Natural Hazard Risk
    - Very Low: 1
    - Low: 2
    - Medium: 3
    - High: 4
    - Very High: 5
- Manmade Hazard Risk
    - Low: 1
    - Medium: 3
    - High: 5

Together, all analyzed mitigation actions that address multiple hazards address all hazards in the Risk Analysis and were awarded the maximum of 5 points.

Table 28 STAPLEE Chart: Prioritization of Mitigation Actions

Proposed Mitigation Strategy	**Hazard Risk**	**S**ocial	**T**echnical	**A**dministrative	**P**olitical	**L**egal	**E**conomic	**E**nvironmental	**Total Score**	**Hazard(s)**
Conduct tabletops, drills and exercises for all hazards.	5	3	3	3	3	3	3	3	26	Multiple Hazards
Continue Incident Command System (ICS) training for all staff.	5	3	3	3	3	3	3	3	26	Multiple Hazards
Continue outreach efforts to homeowners on the benefits of NFIP and encourage participation in the program.	5	3	3	3	3	3	3	3	26	Flooding
Continue to enforce NFIP by requiring elevation certificates.	5	3	3	3	3	3	3	3	26	Flooding
Develop and maintain Continuity of Operations Plan (COOP) for the City Departments.	5	3	3	3	3	3	3	3	26	Multiple Hazards
Implement emergency notification systems (i.e. reverse notification, social media and City website) to educate and prepare residents, businesses and others.	5	3	3	3	3	3	3	3	26	Multiple Hazards
Obtain alternative energy back-up systems for critical facilities and infrastructure.	5	3	3	3	3	3	3	3	26	Multiple Hazards
Tanglewood Estates: Develop a program to assess flood risks and potential secondary hazards for the approximate 80 manufactured homes in the 100-year floodplain. Seek ways to fund a manufactured home mitigation program to ensure homes and fuel tanks are securely anchored in place.	5	3	3	3	3	3	3	3	26	Flooding

Proposed Mitigation Strategy	Hazard Risk	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Hazard(s)
Update communications and data equipment to ensure inter-operability for all City personnel.	5	3	3	3	3	3	3	3	26	Multiple Hazards
Update the Emergency Operations Plan.	5	3	3	3	3	3	3	3	26	Multiple Hazards
Annually review and update the floodplain development ordinance.	5	3	3	3	2	3	3	3	25	Flooding
Continue to review, update and obtain additional GIS data layers, specifically digital orthophotos, to be used for natural and human-caused hazard mitigation planning.	5	3	3	2	3	3	3	3	25	Multiple Hazards
Develop a grant program Offer grants to retrofit older buildings for improved resilience by improving minimum safety standards, heating, ventilation, air conditioning, electrical panels and fuel storage.	5	3	3	3	3	3	3	2	25	Multiple Hazards
Develop strategies to acquire the necessary rights from the following properties and others that may be identified for the purpose of protecting and preserving floodplain storage: - Realities Inc. parcel - behind Hannaford - Parcel along Ashuelot - south of Tanglewood - Beaver Brook north of NH 101 - Pearl Street parcel - Silent Way/Lower Main Street parcel - Wyman Road parcel - Lower Production Avenue	5	3	3	3	2	3	3	3	25	Flooding
Evaluate and floodproof, if necessary, Court Street Lift Station, Martell Court Pump Station, Bradco Lift Station and Well numbers one and four.	5	3	3	3	3	3	3	2	25	Flooding

Proposed Mitigation Strategy	**Hazard Risk**	**S**ocial	**T**echnical	**A**dministrative	**P**olitical	**L**egal	**E**conomic	**E**nvironmental	**Total Score**	**Hazard(s)**
Implement stormwater-related programs from the Capital Improvement Plan.	5	3	3	3	3	3	3	2	25	Flooding
Modification of Beaver Brook Bridges: In 1994, the Soil Conservation Service suggested that removal of flow constrictions caused by bridges could significantly reduce flooding, without causing additional problems downstream. Initial grant funds would be used for an engineering study to validate the impacts of this approach. Subsequent grants would be applied for to fund bridge modification.	5	3	3	3	3	3	3	2	25	Flooding
Road and Bridge Repair: many bridges are red listed and need to be replaced. Repair or replace culverts & bridges associated with road flooding as identified by City PWD.	5	3	3	3	3	3	3	2	25	Flooding
Continue ongoing update of the Hazardous Materials Plan and training of the team.	3	3	3	3	3	3	3	3	24	Hazardous Materials Spills
Implement projects as identified in the Keene Comprehensive Master Plan.	5	3	3	3	2	3	3	2	24	Multiple Hazards
Implement recommendations and projects identified in the Beaver Brook *Escherichia coli* Impairment Investigation and Remediation, and Habitat Restoration Project.	5	3	3	3	2	3	3	2	24	Flooding
Implement strategies in the Climate Change Adaptation Plan.	5	3	3	3	2	3	3	2	24	Multiple Hazards

Proposed Mitigation Strategy	**Hazard Risk**	**S**ocial	**T**echnical	**A**dministrative	**P**olitical	**L**egal	**E**conomic	**E**nvironmental	**Total Score**	**Hazard(s)**
Increase participation to develop and sustain a community outreach program to discuss mitigation and emergency preparedness with schools, businesses, the hospital, and colleges.	5	3	3	2	3	2	3	3	24	Multiple Hazards
Update and continue enforcement of building codes.	5	2	3	3	2	3	3	3	24	Multiple Hazards
Collect data and install remote monitoring equipment at Three Mile Reservoir, Babbidge, Woodard and Robin Hood Dams.	2	3	3	3	3	3	3	3	23	Dam Failure, Flooding
Continue annual exercising & updating of all Emergency Action Plans for all dams.	2	3	3	3	3	3	3	3	23	Dam Failure, Flooding
Review and update road and utility design standards.	5	3	3	3	3	3	2	1	23	Flooding
Three Mile Reservoir: Existing impoundment at Three Mile Swamp is rated to mitigate against 10 to 25 year storm event. Assess feasibility to enlarge storage capacity to reduce flood potential in the Beaver Brook watershed.	2	3	3	3	3	3	3	3	23	Dam Failure, Flooding
Develop and implement a citywide tree maintenance program.	5	2	3	3	1	3	2	3	22	Severe Wind, Tornado
Develop and promote an education and outreach program focused on improving awareness of risks and prevention of infectious diseases.	2	3	3	3	2	3	3	3	22	Infectious Disease

Proposed Mitigation Strategy	Hazard Risk	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Hazard(s)
Update and continue enforcement of fire codes.	3	2	3	3	2	3	3	3	22	Wildfire
Partner with local and regional organizations to promote vaccination campaigns, especially in schools, community centers, and other high-traffic areas.	2	2	3	3	2	3	3	3	21	Infectious Disease
Develop and conduct public outreach on the inundation pathway for High Hazard Dams and develop emergency evacuation strategies for properties within the pathway.	2	3	2	2	3	3	2	3	20	Dam Failure

8.2.3 Previous Actions

The following table provides a status update for the Priority Mitigation Actions identified in the previous Hazard Mitigation Plan. Previously identified mitigation actions are noted as *completed, deleted*, *deferred* or *completed & ongoing* to the updated Plan's new mitigation strategies list.

Table 29 Status of Previous Action Plan

Mitigation Action	Who (Leadership)	Status	Discuss Status and Progress
Develop and conduct public outreach on inundation pathway for High Hazard Dams and develop emergency evacuation strategies for properties within the pathway.	Emergency Management Director, Fire Chief, Public Works Director, and Parks and Recreation Director	Not Started	This action is still relevant and was considered for the updated Action Plan.
Increase participation to develop and sustain a community outreach program to discuss mitigation and emergency preparedness with schools, businesses, hospitals, and colleges.	Emergency Management Director	Started	EMD participates with State on reviews of schools emergency operations plans.

Mitigation Action	Who (Leadership)	Status	Discuss Status and Progress
Road and Bridge Repair: 13 out of 22 bridges are red listed and need to be replaced. Repair or replace culverts & bridges associated with road flooding as identified by City PWD.	Public Works Director	Started	4 Bridges have been replaced since 2018. Additional funding will be required to keep this effort up.
Continue outreach efforts to homeowners on the benefits of NFIP and encourage participation in the program.	Community Development Director	Started	Increase in effort from the providing of brochures will need additional funding.
Tanglewood Estates: Develop a program to assess flood risks and potential secondary hazards for the approximate 80 mobile homes in the 100-year floodplain. Seek ways to fund a mobile homeowner mitigation program to ensure mobile homes and fuel tanks are securely anchored in place.	Community Development Director	Not Started	Additional funding and staff availability is required for this action.
Develop strategies to acquire the necessary rights from the following properties for the purpose of protecting and preserving floodplain storage: • Realities Inc. parcel - behind Hannaford • Parcel along Ashuelot - south of Tanglewood • Beaver Brook north of NH 101 • Pearl Street parcel • Silent Way/Lower Main Street parcel • Wyman Road parcel Lower Production Avenue	Community Development Director and Public Works Director	Not Started	Additional funding and staff availability is required for this action.
Collect additional data and install monitoring equipment at Three Mile Reservoir, Babbidge, Woodard and Robin Hood Dams.	Public Works Director	Not Started	Additional funding and staff availability.
Evaluate and floodproof, if necessary, Court Street Lift Station, Bradco Lift Station and Well numbers one and four.	Public Works Director	Started	Additional funding will be need to accomplish program.

Mitigation Action	Who (Leadership)	Status	Discuss Status and Progress
Implement recommendations and projects identified in the Beaver Brook *Escherichia coli* Impairment Investigation and Remediation, and Habitat Restoration Project.	Community Development Director and Public Works Director	Started	Small projects have been integrated into infrastructure work. Additional funding and staff availability will be required for full implantation.
Continue to review, update and obtain additional GIS data layers, specifically digital orthophoto, to be used for natural and human-caused hazard mitigation planning.	Community Development Director	Started	Additional funding and staff availability will be required to develop and implement additional layers.
Implement projects as identified in the Keene Comprehensive Master Plan.	Department Heads	Started	Some recommendations are being implemented through the City's CIP. Additional funding and staff availability will be required for full implementation.
Develop a Continuity of Operations Plan (COOP) for the City.	Emergency Management Director	Started	Departments have drafted individual COOP. Will continue to review and refine plans.
Continue Incident Command System (ICS) training for all staff.	Emergency Management Director	Started	In 2024 Department Heads received basic ICS training. Periodic trainings needs to be scheduled.
Conduct tabletops, drills and exercises for all hazards.	Emergency Management Director	Not Started	Difficult to schedule time due to staff availability. Goal is to develop and implement a tabletop exercise every other year.
Review and implement emergency notification systems (i.e. reverse notification, social media and City website.)	Emergency Management Director	Started	City has signed up for the use of the State's ENS . Policy and operating procedure development and training schedule for 2025. Implementation in late 2025.
Update communications and data equipment to ensure inter-operability for all City personnel.	Emergency Management Director	Not Started	Communication equipment needs to be reviewed, and cost estimates developed. Will be funded through grants.

Mitigation Action	Who (Leadership)	Status	Discuss Status and Progress
Modification of Beaver Brook Bridges: In 1994, the Soil Conservation Service suggested that removal of flow constrictions caused by bridges could significantly reduce flooding, without causing additional problems downstream. Initial grant funds would be used for an engineering study to validate the impacts of this approach. Subsequent grants would be sought to fund bridge modification.	Public Works Director	Started	Four bridges over Beaver Brook have been replaced. The remaining bridges are programmed in the Bridge Repair/Replacement program in the City's CIP. Funding is the constraint for the completion of the bridges in a reasonable period.
Three Mile Reservoir: Existing impoundment at Three Mile Swamp is rated to mitigate against 10 to 25 year storm event. Assess feasibility to enlarge storage capacity to reduce flood potential in Beaver Brook Watershed.	Public Works Director	Not Started	Funding source needs to be identified for accomplishment of project.
Obtain alternative energy back-up systems for critical facilities and infrastructure.	Public Works Director, Emergency Management Director, Deputy City Manager - Facilities	Started	City Hall/EOC, Martell Pump Station and WWTP generators have been replaced. Additional funding sources will be required to replace/install generators.
Evaluate the Storm Water Phase 2.	Public Works Director	Not Started	Funding sources needs to be identified.
Continue ongoing updates of the Hazardous Materials Plan and training of the team.	Fire Chief	In Progress	The Fire Department maintains the Plan and training on a continual basis.
Update the Emergency Operations Plan in 2021.	Emergency Management Director	Not started.	Funding and staff availability have been an issue. Goal is to start an update in 2026.
Continue annual exercising & updating of all Dam Action Plans.	Emergency Management Director, Parks and Recreation Director	In Progress	Plans have been updated with Babbidge and Woodard being the most recently completed. Annual exercise of at least one Dam EAP a year.

Mitigation Action	Who (Leadership)	Status	Discuss Status and Progress
Review the Climate Change Adaptation Plan and Action Plan, and implement strategies.	All Department Heads	Started	During the City's CIP Development Department Heads are reviewing plan to identify projects meeting the goals of the plan.
Review and update the floodplain development ordinance as needed.	Community Development Director	Not Started	In 2025 FEMA updated the City's Flood Mapping. Review and updating of the Flood Plain Ordinance will be accomplished by 2028 subject to funding and staff availability.
Continue enforcement of building codes.	Community Development Director	On-going	Construction is being reviewed in accordance with the latest adopted building codes.
Continue enforcement of fire codes.	Fire Chief	In Progress	This activity is continuous and should be continued in the next Action Plan.
Review and update the Keene Fire Code in 2020.	Fire Chief	Complete	This activity was completed by the Fire Department.
Review and update road and utility design standards.	Public Works Director	On-going	Standards were reviewed and updated in 2021 with the adoption of the City's Land Development Code.
Develop and implement a citywide tree maintenance program.	Public Works Director	Not Started	Funding sources needs to be identified and staff availability has impacted the ability to start the project.

8.2.4 Action Plan

The following questions were asked to develop an implementation schedule for the identified priority mitigation strategies:

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

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

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

As additional information becomes available regarding project leadership, timeline, funding sources, and/or cost estimates, the plan will be reviewed and amended accordingly.

The Planning Team prioritized projects based on the risk rating of the hazard(s) addressed and the results of Analysis of Mitigation Actions. The following terms are used to provide a general timeframe to complete the actions: Short term: 1 - 2 years; Mid-term: 3 - 4 years; Long term: 4- 5 years. Some actions do not have a completion date and are considered to be ongoing actions that will continue through the duration of the plan.

Table 30 - Action Plan

Proposed Mitigation Strategy	Score	Priority	Hazard(s)	Who	When	How
Continue outreach efforts to homeowners on the benefits of NFIP and encourage participation in the program.	26	High	Flooding	Community Development Code Enforcement	Long term	Grants/City Budget $50,000
Continue to enforce NFIP by requiring elevation certificates.	26	High	Flooding	Community Development Code Enforcement	Long term	Grants/City Budget $50,000
Tanglewood Estates: Develop a program to assess flood risks and potential secondary hazards for the approximate 80 manufactured homes in the 100-year floodplain. Seek ways to fund a manufactured home mitigation program to ensure homes and fuel tanks are securely anchored in place.	26	High	Flooding	Community Development Director	Long term	Grants/City Budget $100,000-$200,000
Develop and maintain Continuity of Operations Plan (COOP) for the City Departments.	26	High	Multiple Hazards	Emergency Management Director	Mid-term	Grants/City Budget $30,000
Continue Incident Command System (ICS) training for all staff.	26	High	Multiple Hazards	Emergency Management Director	Long term	Grants/City Budget $5,000-10,000
Conduct tabletops, drills and exercises for all hazards.	26	High	Multiple Hazards	Emergency Management Director	Long term	Grants/City Budget $50,000-75,000
Implement emergency notification systems (i.e. reverse notification, social media and City website) to educate and prepare residents, businesses and others.	26	High	Multiple Hazards	Emergency Management Director	Mid-term	City Budget $5,000-10,000
Update communications and data equipment to ensure inter-operability for all City personnel.	26	High	Multiple Hazards	Emergency Management Director	Long term	Grants/City Budget $100,000-200,000
Obtain alternative energy back-up systems for critical facilities and infrastructure.	26	High	Multiple Hazards	Public Works Director, Emergency Management Director, Facilities Director	Mid-term	Grants/City Budget $1,000,000
Update the Emergency Operations Plan.	26	High	Multiple Hazards	Emergency Management Director	Mid-term	Grants/City Budget $20,000-$30,000

Proposed Mitigation Strategy	Score	Priority	Hazard(s)	Who	When	How
Road and Bridge Repair: many bridges are red listed and need to be replaced. Repair or replace culverts & bridges associated with road flooding as identified by City PWD.	25	High	Flooding	Public Works Director	Long term	Grants/City Budget $9,000,000
Develop strategies to acquire the necessary rights from the following properties and others that may be identified for the purpose of protecting and preserving floodplain storage: - Realities Inc. parcel - behind Hannaford - Parcel along Ashuelot - south of Tanglewood - Beaver Brook north of NH 101 - Pearl Street parcel - Silent Way/Lower Main Street parcel - Wyman Road parcel - Lower Production Avenue	25	High	Flooding	Community Development Director and Public Works Director	Long term	Grants/City Budget $1,000,000-$2,000,000
Evaluate and floodproof, if necessary, Court Street Lift Station, Martell Court Pump Station, Bradco Lift Station and Well numbers one and four.	25	High	Flooding	Public Works Director	Mid-term	Grants/City Budget $250,000 - $1,000,000
Continue to review, update and obtain additional GIS data layers, specifically digital orthophotos, to be used for natural and human-caused hazard mitigation planning.	25	High	Multiple Hazards	Community Development Director	Mid-term	Grants/City Budget $250,000
Modification of Beaver Brook Bridges: In 1994, the Soil Conservation Service suggested that removal of flow constrictions caused by bridges could significantly reduce flooding, without causing additional problems downstream. Initial grant funds would be used for an engineering study to validate the impacts of this approach. Subsequent grants would be applied for to fund bridge modification.	25	High	Flooding	Public Works Director	Long term	Grants/City Budget $9,000,000
Annually review and update the floodplain development ordinance.	25	High	Flooding	Community Development Director	Long term	City Budget $30,000
Increase participation to develop and sustain a community outreach program to discuss mitigation and emergency preparedness with schools, businesses, the hospital, and colleges.	24	High	Multiple Hazards	Emergency Management Director	Long term	Grants/City Budget $100,000
Implement recommendations and projects identified in the Beaver Brook *Escherichia coli* Impairment Investigation and Remediation, and Habitat Restoration Project.	24	High	Flooding	Community Development Director and Public Works Director	Long term	Grants/City Budget $1,000,000 or greater

Proposed Mitigation Strategy	Score	Priority	Hazard(s)	Who	When	How
Implement projects as identified in the Keene Comprehensive Master Plan.	24	High	Multiple Hazards	Department Heads	Mid-term	Grants/City Budget $5,000,000
Implement strategies in the Climate Change Adaptation Plan.	24	High	Multiple Hazards	All Department Heads	Long term	Grants/City Budget $100,000-$1,000,000
Update and continue enforcement of building codes.	24	High	Multiple Hazards	Code Enforcement	Mid-term	City Budget $250,000
Collect data and install remote monitoring equipment at Three Mile Reservoir, Babbidge, Woodard and Robin Hood Dams.	23	High	Dam Failure, Flooding	Public Works Director	Mid-term	Grants/City Budget $250,000
Continue annual exercising & updating of all Emergency Action Plans for all dams.	23	High	Dam Failure, Flooding	Emergency Management Director, Parks Director	Mid-term	City Budget/Grants $15,000
Review and update road and utility design standards.	23	High	Multiple Hazards	Public Works Director	Mid-term	City Budget $25,000-$100,000
Update and continue enforcement of fire codes.	22	High	Wildfire	Fire Chief	Mid-term	City Budget $250,000
Implement stormwater-related programs from the Capital Improvement Plan.	25	Medium	Flooding	Public Works Director	Long term	Grants/City Budget $10,000,000
Develop a grant program Offer grants to retrofit older buildings for improved resilience by improving minimum safety standards, heating, ventilation, air conditioning, electrical panels and fuel storage.	25	Medium	Multiple Hazards	Community Development Director	Long term	Grants $250,000
Continue ongoing update of the Hazardous Materials Plan and training of the team.	24	Medium	Hazardous Materials Spills	Fire Chief	Short term	Grants/City Budget $60,000 annually
Three Mile Reservoir: Existing impoundment at Three Mile Swamp is rated to mitigate against 10 to 25 year storm event. Assess feasibility to enlarge storage capacity to reduce flood potential in the Beaver Brook watershed.	23	Medium	Dam Failure, Flooding	Public Works Director	Long term	Grants/City Budget $5,000,000
Develop and promote an education and outreach program focused on improving awareness of risks and prevention of infectious diseases.	22	Medium	Infectious Disease	Health Officer, Emergency Management Director	Long term	Grants/City Budget $50,000
Develop and implement a citywide tree maintenance program.	22	Medium	Severe Wind, Tornado	Public Works Director	Long term	Grants/City Budget $100,000-$250,000
Partner with local and regional organizations to promote vaccination campaigns, especially in schools, community centers, and other high-traffic areas.	21	Medium	Infectious Disease	Health Officer, Emergency Management Director	Long term	Grants/City Budget $10,000

Proposed Mitigation Strategy	Score	Priority	Hazard(s)	Who	When	How
Develop and conduct public outreach on the inundation pathway for High Hazard Dams and develop emergency evacuation strategies for properties within the pathway.	20	Low	Dam Failure	Emergency Management Director, Public Works Director, and Parks Director	Mid-term	Grants/City Budget $50,000

9 MOVING TOWARD A SAFE, RESILIENT, AND SUSTAINABLE COMMUNITY

9.1 EVALUATION: PROGRESS AND CHALLENGES FOR THE PLAN UPDATE

Updating the City of Keene Hazard Mitigation Plan presented some challenges, incorporating new file sharing technology with an accelerated timeline. The planning team worked diligently to meet these challenges, dedicating significant time and effort to ensuring a thorough and comprehensive update. Despite the demanding schedule, the team remained committed to maintaining the integrity of the planning process, carefully assessing risks, identifying mitigation strategies, and integrating the latest data and best practices to enhance the city's resilience.

A key factor in the success of this effort was the willingness of city departments and stakeholders to engage beyond the formal planning meetings. Recognizing the importance of this update, various departments took the initiative to discuss special topics, provide critical insights, and contribute valuable expertise outside of scheduled sessions. This collaborative approach strengthened the plan's effectiveness and ensured that all key considerations were addressed. Ultimately, through strong coordination, dedication, and teamwork, the planning team successfully met all of its targets, delivering an updated plan that reflects Keene's commitment to proactive resilience planning.

Flooding remains the greatest hazard facing Keene, existing protections and regulations are sufficient to ensure that new development is built safely and does not exacerbate flood risks. Older neighborhoods and building stock built prior to the adoption of current flood regulations have the higher risk of damage and loss due to flooding. As the city grows, continued attention to stormwater management, infrastructure resilience, and land use planning will be essential to maintaining these protections and mitigating potential impacts from future development.

The updated plan reflects an expanded understanding of risk, including the potential impacts of solar storms and space weather on critical infrastructure, as well as the increasing threat of infectious diseases. These hazards, while less traditionally considered, highlight the need for proactive planning to protect communications, power systems, and public health in the face of emerging challenges.

9.2 CHANGES IN PRIORITIES

Since the last update, the City of Keene has expanded its hazard mitigation priorities to address emerging risks and evolving community needs. The 2025 plan places a greater emphasis on climate adaptation, cybersecurity, and public health hazards, recognizing the increasing impact of extreme weather events, infrastructure vulnerabilities, and technological threats. Newly identified hazards, such as infectious diseases, solar storms and space weather, aging infrastructure, cyber events, and emerging contaminants, reflect a broader approach to risk assessment and mitigation.

Additionally, the City has continued to prioritize flood resilience and infrastructure improvements, including securing floodplain properties, reinforcing manufactured homes in flood-prone areas, and

assessing the feasibility of bridge modifications to reduce flood risks. Community engagement and public outreach have also taken on a more significant role, with a focus on collaborating with schools, businesses, healthcare facilities, and the general public to strengthen emergency preparedness. These shifts ensure that Keene remains proactive in mitigating both traditional and emerging hazards while enhancing the resilience of its residents, economy, and environment.

APPENDICES

APPENDIX A: RISK ASSESSMENT METHODOLOGY

The following terms are used to analyze the hazards considered. *Very Low, Low, Medium, High*, or *Very High* are synonymous with 1, 2, 3, 4 and 5, respectively.

VULNERABILITY - An adjective description (Very Low, Low, Medium, High, and Very High) of the potential impact a hazard could have on the town relating to human, business and property impacts. It is the ratio of population, property, commerce, infrastructure and services at risk relative to the entire town. Vulnerability is an estimate generally based on a hazard's characteristics, information obtained by the various town departments.

VERY LOW (1): Little or no area or segment of population, property, commerce, infrastructure or service is exposed to the effects of a hazard. In a worst case scenario there could be a disaster of minor proportions.

LOW (2): A limited area or segment of population, property, commerce, infrastructure or service is exposed to the effects of a hazard. In a worst case scenario there could be a disaster of minor to moderate proportions.

MEDIUM (3): (1) The total population, property, commerce, infrastructure and services of the town are exposed to the effects of a hazard of moderate influence; or (2) the total population, property, commerce, infrastructure and services of the town are exposed to the effects of a hazard, but not all to the same degree; or (3) an important segment of population, property, commerce, infrastructure or service is exposed to the effects of a hazard. In a worst case scenario there could be a disaster of moderate proportions.

HIGH (4): The total population, property, commerce, infrastructure and services of the town are exposed to some effects of a hazard of potentially moderate to great magnitude. In a worst case scenario there could be a disaster of major proportions.

VERY HIGH (5): The total population, property, commerce, infrastructure and services of the town are exposed to the effects of a hazard of potentially great magnitude. In a worst case scenario there could be a disaster of major to catastrophic proportions.

PROBABILITY OF OCCURRENCE - An adjective description (Very Low, Low, Medium, High, and Very High) of the probability of a hazard impacting the town within the next 25 years. Probability is based on a limited objective appraisal of a hazard's frequency using information provided by relevant sources, observations and trends.

VERY LOW (1): There is very little likelihood that a hazardous event will occur within the next 25 years (1 event in 25 years), however, the potential still exists.

LOW (2): There is little likelihood that a hazardous event will occur within the next 25 years (1 event in 25 years).

MEDIUM (3): There is moderate likelihood that a hazardous event will occur within the next 25 years (1 - 2 events each 5 - 10 years).

HIGH (4): There is good likelihood that a hazardous event will occur within the next 25 years (1 - 2 events within 5 years).

VERY HIGH (5): It is highly likely that a hazardous event will occur within the next 25 years (1 - 2 events each year).

SEVERITY - Calculated by taking the average of the vulnerability for human, business and property impacts of each hazard type.

RISK LEVEL - An adjective description (Very Low, Low, Medium, High, or Very High) of the overall threat posed by a hazard over the next 25 years. It is calculated by multiplying the probability of occurrence and vulnerability. The result is then compared to a scale from 1 - 25 to determine the level of risk for each hazard.

VERY LOW (1 - 5): There is very little potential for a disaster during the next 25 years. The threat is so minor that it warrants no special effort to prepare for, respond to, recover from, or mitigate against this hazard. This hazard need not be specifically addressed in the town's emergency management training and exercise program except as generally dealt with during hazard awareness training.

LOW (6 - 10): There is little potential for a disaster during the next 25 years. The threat is such as to warrant no special effort to prepare for, respond to, recover from, or mitigate against this hazard. This hazard need not be specifically addressed in the town's emergency management training and exercise program except as generally dealt with during hazard awareness training.

MEDIUM (11 - 15): There is moderate potential for a disaster of less than major proportions during the next 25 years. The threat is great enough to warrant modest effort to prepare for, respond to, recover from, and mitigate against this hazard. This hazard should be included in the town's emergency management training and exercise program.

HIGH (16 - 20): (1) There is moderate to strong potential for a disaster of major proportions during the next 25 years; or (2) history suggests the occurrence of multiple disasters of moderate proportions during the next 25 years. The threat is significant enough to warrant major program effort to prepare for, respond to, recover from, and mitigate against this hazard. This hazard should be a major focus of the town's emergency management training and exercise program.

VERY HIGH (21 - 25): (1) There is strong potential for a disaster of major proportions during the next 25 years; or (2) history suggests the occurrence of multiple disasters of moderate to severe proportions during the next 25 years. The threat is significant enough to warrant serious program effort to prepare for, respond to, recover from, and mitigate against this hazard. This hazard should be a priority focus of the town's emergency management training and exercise program.

APPENDIX B: RESOURCES

New Hampshire Homeland Security and Emergency Management (HSEM) 603 271-2231

Field Representative Hillsborough County 603 271-2231

Field Representative Cheshire County.....603 271-2231

Federal Emergency Management Agency (FEMA) 877-336-2734

NH Regional Planning Commissions:

Central NH Regional Planning Commission 603 226-6020

Lakes Region Planning Commission 603 279-8171

Nashua Regional Planning Commission 603 424-2240

North Country Council 603 444-6303

Rockingham Planning Commission 603 778-0885

Southern New Hampshire Planning Commission 603 669-4664

Southwest Region Planning Commission 603 357-0557

Strafford Regional Planning Commission 603 994-3500

Upper Valley Lake Sunapee Regional Planning Commission 603 448-1680

NH Executive Department:

Governor's Office of Energy and Community Services 603 271-2611

NH Department of Cultural Resources: 603 271-2540

Division of Historical Resources 603 271-3483

NH Department of Environmental Services: 603 271-3503

Air Resources 603 271-1370

Air Toxins Control Program.....603 271-0901

Asbestos Program 603 271-1373

Childhood Lead Poisoning Prevention Program 603 271-5733

Environmental Health Tracking Program 603 271-4072

Environmental Toxicology Program 603 271-3994

Health Risk Assessment Program 603 271-6909

Indoor Air Quality Program 603 271-3911

Occupational Health and Safety Program.....603 271-2024

Radon Program.....603 271-4764

Geology Unit 603 271-3503

Pollution Preventive Program 603 271-6460

Waste Management 603 271-2900

Water Supply and Pollution Control 603 271-3414

Rivers Management and Protection Program 603 271-8801

NH Office of Strategic Initiatives (OSI).....603 271-2155

Jennifer Gilbert, State Coordinator, Floodplain Management.....603 271-1762

NH Municipal Association 603 224-7447

NH Fish and Game Department 603 271-3421

Region 1, Lancaster.....603 788-3164

Region 2, New Hampton 603 744-5470

Region 3, Durham.....603 868-1095

Region 4, Keene 603 352-9669

NH Department of Business and Economic Affairs:

Economic Development.....603 271-2591

Travel and Tourism 603 271-2665

NH Department of Natural and Cultural Resources:

Division of Forests and Lands.....603 271-2214

Division of Parks and Recreation 603 271-3556

NH Department of Transportation 603 271-3734

Northeast States Emergency Consortium, Inc. (NESEC).....(781) 224-9876

US Department of Commerce: .....(202) 482-2000

NOAA: National Weather Service; Gray, ME .....(207) 688-3216

US Department of the Interior: 202-208-3100

US Fish and Wildlife Service 603 225-1411

US Geological Survey 603 225-4681

US Army Corps of Engineers.....(978) 318-8087

US Department of Agriculture:

Natural Resource Conservation Service 603 868-7581

Cheshire County, Walpole 603 756-2988

Sullivan County, Newport 603 863-4297

Hillsborough County, Milford ..... 603 673-2409 Ext. #4

Mitigation Funding Resources

404 Hazard Mitigation Grant Program (HMGP) ..... NH Homeland Security and Emergency Management

406 Public Assistance and Hazard Mitigation ..... NH Homeland Security and Emergency Management

Community Development Block Grant (CDBG) ..... NH HSEM, NH OSI, also refer to RPC

Dam Safety Program ..... NH Department of Environmental Services

Emergency Generators Program by NESEC‡ ..... NH Homeland Security and Emergency Management

Emergency Watershed Protection (EWP) Program ..... USDA, Natural Resources Conservation Service

Flood Mitigation Assistance Program (FMAP) ..... NH HSEM, NH OSI

Flood Plain Management Services (FPMS) ..... US Army Corps of Engineers

Mitigation Assistance Planning (MAP)..... NH Homeland Security and Emergency Management

Mutual Aid for Public Works..... NH Municipal Association

National Flood Insurance Program (NFIP) † ..... NH OSI, NH HSEM

Power of Prevention Grant by NESEC‡ ..... NH Homeland Security and Emergency Management

Project Impact..... NH Homeland Security and Emergency Management

Roadway Repair & Maintenance Program(s) ..... NH Department of Transportation

Section 14 Emergency Stream Bank Erosion & Shoreline Protection ..... US Army Corps of Engineers

Section 103 Beach Erosion ..... US Army Corps of Engineers

Section 205 Flood Damage Reduction..... US Army Corps of Engineers

Section 208 Snagging and Clearing ..... US Army Corps of Engineers

Shoreline Protection Program ..... NH Department of Environmental Services

Various Forest and Lands Program(s) ..... NH Department of Natural and Cultural Resources

Wetlands Programs ..... NH Department of Environmental Services

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

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

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

NH Office of Strategic Initiatives can provide additional information regarding participation in the NFIP-CRS Program.

FEMA Region 1 Mitigation Planning Webliography
Hazard Mitigation is sustained action taken to reduce or eliminate risk to people and their property from natural hazards over the longest possible term.

REGULATORY INFORMATION

Final Rule

44 CFR 201.6

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

Disaster Mitigation Act of 2000 (DMA 2K)

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

DISASTERS AND NATURAL HAZARDS INFORMATION

FEMA-How to deal with specific hazards

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

Natural Hazards Center at the University of Colorado

http://www.colorado.edu/hazards

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

http://www.websites.noaa.gov

National Climatic Data Center active archive of weather data.

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

Northeast Snowfall Impact Scale

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

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

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

FLOOD RELATED HAZARDS

FEMA Coastal Flood Hazard Analysis & Mapping

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

Floodsmart

http://www.floodsmart.gov/floodsmart/

National Flood Insurance Program (NFIP)

http://www.fema.gov/nfip

Digital quality Level 3 Flood Maps

http://msc.fema.gov/MSC/statemap.htm

Flood Map Modernization

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

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

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

FIRE RELATED HAZARDS

Firewise

http://www.firewise.org

NOAA Fire Event Satellite Photos

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

U.S. Forest Service, USDA

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

Wildfire Hazards - A National Threat

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

GEOLOGIC RELATED HAZARDS

USGS Topographic Maps

http://topomaps.usgs.gov/

Building Seismic Safety Council

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

Earthquake hazard history by state

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

USGS data on earthquakes

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

USGS Earthquake homepage

http://quake.wr.usgs.gov

National Cooperative Geologic Mapping Program (NCGMP)

http://ncgmp.usgs.gov/

Landslide Overview Map of the Conterminous United States

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

Kafka, Alan L. 2008. Why Does the Earth Quake in New England? Boston College, Weston

Observatory, Department of Geology and Geophysics

http://www2.bc.edu/~kafka/Why_Quakes/why_quakes.html

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

http://magic.lib.uconn.edu/connecticut_data.html

2012 Maine earthquake

http://www.huffingtonpost.com/2012/10/17/maine-earthquake-2012-new-england_n_1972555.html

WIND-RELATED HAZARDS

ATC Wind Speed Web Site

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

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U.S. Wind Zone Maps

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

Tornado Project Online

http://www.tornadoproject.com/

National Hurricane Center

http://www.nhc.noaa.gov

Community Hurricane Preparedness Tutorial

http://meted.ucar.edu/hurrican/chp/hp.htm

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

http://www.nssl.noaa.gov/primer/tornado/tor_basics.html

DETERMINING RISK AND VULNERABILITY

HAZUS

http://www.hazus.org

FEMA Hazus Average Annualized Loss Viewer

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

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

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

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

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

GEOGRAPHIC INFORMATION SYSTEMS (GIS) AND MAPPING

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

http://www.fgdc.gov

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

http://www.opengis.org

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

http://www.nesec.org

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

http://igems.doi.gov/

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

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

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DATA GATHERING

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

http://nisconsortium.org/

The Hydrologic Engineering Center (HEC), an organization within the Institute for Water Resources, is the designated Center of Expertise for the US Army Corps of Engineers

http://www.hec.usace.army.mil/

National Water & Climate Center

http://www.wcc.nrcs.usda.gov/

WinTR-55 Watershed Hydrology

http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/?&cid=stelprdb1042901

USACE Hydrologic Engineering Center (HEC)

http://www.hec.usace.army.mil/software/

Stormwater Manager's Resource Center SMRC

http://www.stormwatercenter.net

USGS Current Water Data for the Nation

http://waterdata.usgs.gov/nwis/rt

USGS Water Data for the Nation

http://waterdata.usgs.gov/nwis /

Topography Maps and Aerial photos

http://www.terraserver.com/view.asp?tid=142

National Register of Historic Places

http://www.nps.gov/nr/about.htm

National Wetlands Inventory

http://www.fws.gov/wetlands/ ICLUS Data for Northeast Region

http://www.epa.gov/ncea/global/iclus/inclus_nca_northeast.htm

PLANNING

American Planning Association

http://www.planning.org

PlannersWeb - Provides city and regional planning resources

http://www.plannersweb.com

FEMA RESOURCES

Federal Emergency Management Agency (FEMA)

www.fema.gov

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National Mitigation Framework

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

Federal Insurance and Mitigation Administration (FIMA)

http://www.fema.gov/fima

Community Rating System (CRS)

http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-rating-system

FEMA Building Science

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

National Flood Insurance Program (NFIP)

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

Floodplain Management & Community Assistance Program

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

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

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

National Disaster Recovery Framework

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

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

www.csc.com

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

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

Mitigation Best Practices Portfolio

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

FEMA Multi-Hazard Mitigation Planning Website

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

FEMA Resources Page

http://www.fema.gov/plan/mitplanning/resources.shtm

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Local Mitigation Plan Review Guide

http://www.fema.gov/library/viewRecord.do?id=4859

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

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

HAZUS

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

Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards

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

Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials

http://www.fema.gov/library/viewRecord.do?id=7130

IS-318

Mitigation Planning for Local and Tribal Communities

Independent Study Course

http://training.fema.gov/EMIWeb/IS/is318.asp

REGION I MITIGATION PLANNING CONTACTS

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Email: melissa.surette@fema.dhs.gov

Josiah (Jay) Neiderbach

FEMA Region I – Mitigation Division

Phone: 617-832-4926 desk / 202-285-7769 cell

Email: josiah.neiderbach@fema.dhs.gov

OTHER FEDERAL RESOURCES

U.S. Army Corps of Engineers: Provides funding for floodplain management planning and technical assistance and other water resources issues.

www.nae.usace.army.mil

Natural Resources Conservation Service: Technical assistance to individual land owners, groups of landowners, communities, and soil and water conservation districts.

www.nrcs.usda.gov

NOAA Coastal Services Center

http://www.coast.noaa.gov

Rural Economic and Community Development: Technical assistance to rural areas and smaller communities in rural areas on financing public works projects.

www.rurdev.usda.gov

Farm Service Agency: Manages the Wetlands Reserve Program (useful in open space or acquisition projects by purchasing easements on wetlands properties) and farmland set aside programs

www.fsa.usda.gov

National Weather Service: Prepares and issues flood, severe weather and coastal storm warnings. Staff hydrologists can work with communities on flood warning issues; can give technical assistance in preparing flood-warning plans.

www.weather.gov/gyx

Economic Development Administration (EDA): Assists communities with technical assistance for economic development planning

www.osec.doc.gov/eda/default.htm

National Park Service: Technical assistance with open space preservation planning; can help facilitate meetings and identify non-structural options for floodplain redevelopment.

www.nps.gov

Fish and Wildlife Services: Can provide technical and financial assistance to restore wetlands and riparian habitats.

www.fws.gov

Department of Housing & Urban Development

www.hud.gov

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

www.sba.gov/disaster

Environmental Protection Agency

www.epa.gov

SUSTAINABILTY/ADAPTATION/CLIMATE CHANGE

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

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

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

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

U.S. EPA

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

NOAA National Ocean Service (NOS)

http://oceanservice.noaa.gov/

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

NOAA RISA for the Northeast (Regional Integrated Sciences and Assessments)

http://ccrun.org/home

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

management

http://www.resilientus.org/library/FINAL_CUTTER_9-25-08_1223482309.pdf

National Fish, Wildlife and Plants Climate Adaptation Strategy

www.wildlifeadaptationstrategy.gov

ICLEI Local Governments for Sustainability

http://www.icleiusa.org/

Kresge Foundation Survey

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

New England's Sustainable Knowledge Corridor

http://www.sustainableknowledgecorridor.org/site/

The Strategic Foresight Initiative (SFI)

http://www.fema.gov/pdf/about/programs/oppa/findings_051111.pdf

Northeast Climate Choices

http://www.climatechoices.org/ne/resources_ne/nereport.html

Northeast Climate Impacts Assessment

http://www.northeastclimateimpacts.org/

Draft National Climate Assessment Northeast Chapter released early 2013

http://ncadac.globalchange.gov/

Northeast Chapter of the National Climate Assessment of 2009:

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

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NEclimateUS.org

ClimateNE

www.climatenortheast.com

Scenarios for Climate Assessment and Adaptation

http://scenarios.globalchange.gov/

Northeast Climate Science Center

http://necsc.umass.edu/

FEMA Climate Change Adaptation and Emergency Management

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

Climate Central

http://www.climatecentral.org

OTHER RESOURCES

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

www.nesec.org

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

www.floods.org

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

http://www.nvoad.org/

Selected Resources Used in the Preparation of this Plan

NH HSEM's New Hampshire State Hazards Mitigation Plan (2023)

FEMA's Understanding Your Risks: Identifying Hazards and Estimating Losses

FEMA's Local Hazard Mitigation Planning Policy Guide

Keene Hazard Mitigation Plan, 2018

Keene Comprehensive Master Plan, 2010

APPENDIX C: HAZARD MITIGATION RESOURCE PROFILES

The following are fact sheets about the various hazard mitigation grant program.

U.S. Army Corps of Engineers

Contacts:

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

Mike Keegan, Chief, Project Planning Section (for Section 14, 103, and 205 authorities),

Phone: (978) 318-8087, Fax: (978)318-8080, E-mail: Michael.F.Keegan@usace.army.mil

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

Description and Mission:

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

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

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

Flood Mitigation Involvement:

As a result of the catastrophic floods in 1936, 1938 and 1955, the Corps was called upon to undertake a comprehensive flood damage reduction program. Since then the Corps has built many flood control structures throughout New England. These include 35 dams and reservoirs, five hurricane protection barriers (two are operated by the Corps) and approximately 60 local flood

protection projects. The New England District has also completed two nonstructural projects involving the relocation of flood prone property and the acquisition of natural flood storage areas. The Corps also provides technical assistance to states and municipalities in locally constructed flood damage mitigation projects and to promote wise and informed use of floodplain and natural retention areas in order to minimize potential future flood damages.

Mitigation Goals and Objectives:

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

Projects Desired:

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

COE Resources with Respect to Hazard Mitigation:

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

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

Section 14 - Emergency Stream Bank & Shoreline Protection:

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

Section 103 - Beach Erosion:

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

Section 205 - Flood Damage Reduction:

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

Section 208 - Snagging and Clearing:

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

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

Planning Assistance to States Program (PAS):

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

Flood Plain Management Services (FPMS):

The FPMS Program is designed for the Corps to assist States and local communities improve management of flood plains by performing technical assistance and conducting special investigations. Cost recovery has been implemented in this program effective in FY 1991. Under cost recovery, assistance provided to Federal agencies and private interests must be fully reimbursed by those customers. States and local communities are still provided technical

assistance at 100 percent Federal cost. One of the major efforts being conducted under the FPMS program at this time is the preparation of Hurricane Evacuation Studies. These studies are jointly funded with the Federal Emergency Management Agency.

Ice Engineering Research Division

U.S. Army Cold Regions Research and Engineering Laboratory

Contact:

Dr. J-C Tatinclaux, Chief, Ice Engineering Research Division

Phone: (603) 646-4187 Fax: (603) 646-4477

E-mail: Jean-Claude.Tatinclaux@crl02.usace.army.mil

Website: http://www.crrel.usace.army.mil/ierd/

Address: US Army Cold Regions Research and Engineering Laboratory

Ice Engineering Research Division

72 Lyme Road

Hanover, NH 03755-1290

Description and Mission:

The US Army Cold Regions Research and Engineering Laboratory (CRREL) is a Corps of Engineers' research laboratory that is dedicated to multi-disciplinary engineering and research that addresses the problems and opportunities unique to the world's cold regions. CRREL exists largely to solve the technical problems that develop in cold regions, especially those related to construction, transport, and military operations. Most of these problems are caused by falling and blowing snow, snow on the ground, ice in the air and in the ground, river ice, ice on seas and lakes, and ice effects on manmade materials. CRREL serves the Corps of Engineers and its clients in three main areas:

Traditional military engineering, which deals with problems that arise during conflict;

Military construction and operations technology, i.e., the building and maintenance of military bases, airfields, roads, ports, and other facilities; and

Civil works, which involves the Corps in such things as flood protection, navigation on inland waterways and coastal engineering.

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

CRREL's Ice Engineering Research Division (IERD) was created to research, analyze and solve ice problems in and around water bodies, including ice jam flooding and ice accumulation in lock chambers, to ice buildup at water intakes and the destructive forces that moving ice exerts on riverine or coastal structures. In cooperation with the New England District (NAE) of the Corps of Engineers (located in Concord, MA), IERD personnel provide technical assistance before, during, and after ice jam flood emergencies. IERD research has resulted in the design and construction of a

number of low-cost ice control structures as well as nonstructural mitigation measures. IERD also provides instruction on dealing with river ice problems to local emergency management agencies.

Flood Mitigation Involvement:

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

Mitigation Goals and Objectives:

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

Projects Desired:

CRREL and IERD are a national resource ready to apply our unique facilities and capabilities to solve problems and conduct innovative, state-of-the-art research and technical support. There are a number of mechanisms that enable IERD and the rest of CRREL to partner with various Federal, non-DoD and private sector entities. The Federal Technology Transfer Act of 1986 (15 USC 3710a) allows CRREL to collaborate with any non-Federal partner on research and technical support consistent with the mission of the laboratory. The Intergovernmental Cooperation Act (31 USC 6505) lets CRREL work with state and local governments on a broad range of reimbursable projects. Under the "Authority to Sell" (10 USC 2539b), CRREL can provide test and evaluation services to the states and the private sector. This includes the testing and evaluation of materials, equipment, models, computer software, and other items. The laboratory can also provide support to other Federal agencies via the Economy in Government Act (31 USC 1535) through MOUs/MOAs that establish a framework for the partnership and provide a concise description of the planned work. CRREL's 35 active Cooperative Research and Development Agreements (CRADAs) with industry and academia and 17 Intergovernmental Cooperation Agreements with states and local governments in 1998 demonstrate a robust program in this area and the relevance of CRREL's research to many segments of American society beyond DoD.

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

206 Flood Plain Management Services (FPMS) program funded jointly with FEMA, and numerous instances of technical assistance.

CRREL IERD Resources with Respect to Hazard Mitigation:

Corps:

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

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

Section 205 - Flood Damage Reduction:

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

Section 22 - Planning Assistance to States Program (PAS):

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

Section 206 - Flood Plain Management Services (FPMS):

The FPMS Program is designed for the Corps to assist States and local communities improve management of flood plains by performing technical assistance and conducting special investigations. Cost recovery has been implemented in this program effective in FY 1991. Under cost recovery, assistance provided to Federal agencies and private interests must be fully reimbursed by those customers. States and local communities are still provided technical

assistance at 100 percent Federal cost. One of the major efforts being conducted under the FPMS program at this time is the preparation of Hurricane Evacuation Studies. These studies are jointly funded with the Federal Emergency Management Agency.

Personnel:

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

Equipment and Facilities:

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

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

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

Possibly the most versatile portion of the Ice Engineering Facility is the Research Area. This room is 80 by 160 feet clear span and has a temperature range of +65° to -10°F. Piping capable of providing a flow of 1, 2, 4 or 8 cubic feet per second is located on one side of the room, and a large drain trough is on the other. The floor is designed for loads up to 400 pounds per square foot. Models of reaches can be constructed in this area to test ways to alleviate ice jams through channel modification. Tests of the bearing capacity of large ice sheets and cold-testing of vehicles and structures are a few of the other potential uses of this space. Tests conducted in this room will help to alleviate much of the flooding caused by ice jams.

USDA, Natural Resources Conservation Service

Contacts:

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Address:

Federal Building

2 Madbury Road

Durham, NH 03824

Description and Mission:

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

Authorities and Funding:

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

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

watershed associations or groups to develop comprehensive plans for improving or protecting the watershed environment (water quality, flood reduction, wildlife habitat).

Mitigation Involvement:

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

Mitigation Goals and Objectives:

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

Projects/Planning Desired:

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

NRCS Resources with respect to Hazard Mitigation

Personnel:

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

Equipment, Physical Facilities and Other Capabilities:

All of our field offices and State office have computers and access to the internet. All of the field offices have survey equipment and all engineers have the use of CADD software. All field offices have access to small meeting rooms and access to the Federal Telecommunications System. Government vehicles are located at all field offices for use by government employees and could be made available in emergencies.

Northeast States Emergency Consortium (NESEC)

Contacts:

Edward S. Fratto, Executive Director: Phone: (781) 224-9876, Fax: (781) 224-4350

E-Mail: www.nesec.org

Address: Northeast States Emergency Consortium

1 West Water Street, Suite 205

Wakefield, MA 01880

Organization Description:

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

Organization Mission:

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

Mitigation Programs:

HAZUS:

NESEC assists FEMA PROJECT IMPACT Communities in the use of HAZUS as a planning platform for incorporating multi-hazard disaster prevention initiatives. NESEC can produce a HAZUS report using default data for each of the initial PROJECT IMPACT Communities. Priority is given to PROJECT IMPACT communities, however assistance may be provided to other communities as resources allow. This report provides an excellent starting point for communities wishing to utilize HAZUS to identify potential hazards. The NESEC HAZUS Report is multi-hazard and usually contains information on earthquakes, tornadoes, flood and wind.

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

Emergency Generators:

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

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

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

Federal Mitigation Grant Programs

I. Pre-Disaster Mitigation Grant Program

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. http://www.fema.gov/government/grant/pdm/index.shtm

II. Hazard Mitigation Grant Program

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

http://www.fema.gov/government/grant/hmgp/index.shtm

III. Flood Mitigation Assistance (FMA) Program

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

APPENDIX D: DOCUMENTATION OF THE PLANNING PROCESS

Planning Team Meeting Agendas

City of Keene

Hazard Mitigation Planning Team

Meeting 1

Agenda

2nd Floor Conference Room

3 Washington Street

January 6, 2025 at 1:00 p.m.

I. Welcome & Introductions

II. Project Administration

III. Project Overview & Planning Team Mission Statement

IV. Revisit Hazard Profiles
   a. Activity: Hazard Identification
   b. Activity: Review and Update Hazard Events Since Last Update

V. Critical Facilities, Assets & Community Lifelines
   a. Overview
   b. Activity: Identify Vulnerable Assets / Community Lifelines

VI. Public Engagement Strategies

VII. Next Steps

VIII. Next Meeting: February 5th at 9:00 a.m.

City of Keene

Hazard Mitigation Committee

Meeting 2

Agenda

2nd Floor Conference Room

3 Washington Street

February 5, 2025 at 9:00 a.m.

I. **Meeting #1 Recap and Notes - 10 minutes**

II. **Vulnerability Analysis (Risk Assessment) – 35 minutes**
   a. Development Changes in Hazard Prone Areas – 5 minutes
   b. Activity: Review and Update Problem Statements – 10 minutes
   c. Activity: Hazard Prioritization – 20 minutes

III. **Existing Capabilities & Previous Hazard Mitigation Actions – 30 minutes**
   a. Activity: Existing Capabilities and Protective Measures
   b. Activity: Review Previous Action Plan

IV. **General Description of Land Use & Development Trends – 5 minutes**

V. **Next Steps – 10 minutes**
   a. Public Meeting #1
   b. Recap of SWRPC, City Assignments
   c. Other

VI. **Next Meeting: March 5th at 9:00 a.m.**

City of Keene

Hazard Mitigation Planning Team

Meeting 3

2nd Floor Conference Room

3 Washington Street

March 5, 2025 at 9:00 a.m.

I. **Meeting #2 Recap – 5 minutes**

II. **Public Workshop Recap – 5 minutes**

III. **Review and Consider Updates to Hazard Mitigation Goals - 10 minutes**

IV. **List and Prioritize Mitigation Actions and Schedule – 60 minutes**

V. **Approaches to Monitoring, Evaluation, Update – 5 minutes**

VI. **Next Steps – 5 minutes**

VII. **Upcoming Meetings**

a. Final Planning Team Meeting: April 29 at 1:30 p.m.
b. MSFI Committee: May 21 at 6:00 p.m.
c. City Council: June 5

City of Keene

Hazard Mitigation Committee

Meeting 4

2nd Floor Conference Room

3 Washington Street

April 29, 2025 at 1:30 p.m.

I. Meeting #3 Notes – 10 minutes

II. Review of Draft Plan – 45 minutes

III. Comment Period and Outreach Strategies: ~May 13th-June 12th – 10 minutes

IV. Next Steps

a. Public Meeting 2: June 11th (Planning, Licenses and Development Committee)
b. City Council: June 19th City Council
c. Approval Process

Planning Team Meeting Notes

City of Keene Hazard Mitigation Planning Team
Meeting 1
Notes
1:00 p.m. January 6, 2025

Planning Team Members Present: Kürt Blomquist, *Emergency Management Director*, Mike Hagan, *Code Enforcement Officer*, Carrah Fisk-Hennessey, *Director of Parks and Recreation*, Rebecca Landry, *Deputy City Manager*, Jason Martin, *Fire Chief*, Will Schoefmann, *GIS Coordinator*, Mike Kopcha, *Police Chief*, Duncan Watson, *Assistant Public Works Director*

Others Present: Henry Underwood, *SWRPC*, Sarah Bollinger, *SWRPC*

Not present: Ryan Hornblower, *Cheshire Medical Center*

I. Welcome & Introductions

Planning team members introduced themselves.

II. Project Administration

K. Blomquist provided an overview of hazard mitigation planning in the City of Keene. This will be the third plan update. The previous update was completed in 2018. The City received a grant with an in-kind match. There will be three planning team meetings, each lasting 90 minutes. Two public meetings are proposed. One while the plan is in process and the second in front of PLD. R. Landry is working on surveys for public outreach.

III. Project Overview & Planning Team Mission Statement

H. Underwood presented a slide deck explaining to the team what hazard mitigation planning is, the project timeline, the hazards identified in the previous plan update vs. hazards included in the State of NH HMP, outcomes of the project, and a draft mission statement. R. Landry commented that the timeline will align with the new flood mapping. M. Hagan shared that they are in the midst of a CRS update. Underwood shared that mitigation actions are not limited to infrastructure changes and can include new or revised policy.

Draft mission statement: *To foster, promote, and implement actions to eliminate or reduce the long-term risk to human life and property from the effects of identified natural and manmade hazards*.

Landry would like to amend the mission statement to: *To foster, promote, and implement actions to eliminate or reduce the risk to human life and property from the effects of identified natural and manmade hazards*. The team agreed to revisit the mission statement at the next meeting.

IV. Revisit Hazard Profiles

a. Activity: Hazard Identification

Underwood provided an overview of the activity. The activity shows hazards included in the previous plan, hazards identified in the State plan, and recommendations from SWRPC on hazards to include in the plan update.

The team went through the list and determined that hail should fall under severe weather rather than winter weather because it can occur outside of the winter season. Landry asked about landslides verses avalanche and why we would include one and exclude the other. Discussion ensued about steep slopes and soils composition, mass wasting events and open bare top areas. It was determined to keep erosion in the plan update and continue excluding avalanches as the landscapes necessary for an avalanche to occur do not exist in Keene or nearby areas. Blomquist commented that the city has seen more drought: 2016, 2020, 2021. Hagan shared that an earthquake damaged a City Hall elevator shaft. Blomquist said we do not have expansive soils here. Hagan shared regarding extreme cold, that the city has had to activate warming shelters more than in the past.

Blomquist said regarding extreme heat, that this was not a concern in the past but should be considered for the plan update because the city has experienced longer periods of high temperatures without night cooling. This impacts emergency services and facilities. There are more domestic issues and heat stress emergencies than in the past. The city always has flooding. Infectious disease is a new area: Covid-19, RSV, influenza. For solar storms and space weather and communication interruptions, he asked if Fire and Police are discussing this. Blomquist asked the team to look at their department records and to discuss the hazards with staff.

Blomquist emphasized that a hazard does not need to have occurred within Keene to inform risk. Hazard events in nearby towns demonstrate that a hazard *could* happen in Keene. He added that the team should look at changes in zoning – reduced lot sizes for the rural areas may present a higher risk for wildfires or flood as these lots are developed. Blomquist emphasized that a hazard does not need to have occurred within Keene to inform risk. Hazard events in nearby towns demonstrate that a hazard *could* happen in Keene. He added that the team should look at changes in zoning – reduced lot sizes for the rural areas may present a higher risk for wildfires or flood as these lots are developed.

Underwood moved onto the manmade hazard section of the activity. These are not required to be profiled in the plan update by FEMA. He recommended that Keene add cyber events and aging infrastructure to the list of hazards previously included. Landry suggested changing *long-term utility outage* to *utility interruption* citing Liberty Gas outages that have occurred during the cold season. Short term utility interruptions can present a high level of risk for certain populations as well as interruptions to critical services. Watson recommended adding *known and emerging contaminants* to the list of manmade hazards as micro plastics and PFAS are a growing concern. He will speak with Aaron Costa regarding water contamination issues. Underwood, Hagan and Blomquist discussed updates to gas services in the city and scheduling a meeting with Liberty Gas to include stakeholders outside of the municipality in the plan update.

b. Activity: Review and Update Hazard Events Since Last Update

Underwood introduced the mapping activity, asking the team to draw hazard event locations on the map and provide dates as well as a brief description of the event's impact. He demonstrated using

a severe wind event from last July at Tanglewood mobile home park. Fisk-Hennessey shared that the July 16th event brought down many trees, but there was no tree budget to cover removal. Underwood said that the team should be considering both past and potential events for the mapping exercise. Schoefmann said Cartograph would have records of where crews went following storm events. Blomquist was unsure if the data would have been recorded in such a way as to be useful for this exercise.

Next, Underwood showed the team a multi-sheet workbook where hazard events have been recorded. The planning team was assigned to look through the workbook with their staff and update hazard events since 2018. The team will complete both the mapping task and the workbook task by January 13.

V. Critical Facilities, Assets & Community Lifelines

a. Overview

Underwood explained what critical facilities, assets and community lifelines are with emphasis given to assets known to be vulnerable to one or more hazards.

b. Activity: Identify Vulnerable Assets/Community Lifelines

Underwood shared another workbook with the team that recorded assets within the community, their location, changes to the asset since the previous plan update and new assets. Blomquist asked the team to review the list and amend as needed. Blomquist emphasized vulnerable populations to consider, such as Tanglewood, new low-income housing developments, new schools – charter schools in particular that may not have been accounted for in the previous update. He also mentioned the new substation behind Wheelock Park.
Underwood asked the team to focus on columns H & I of the workbook – what makes an asset vulnerable to hazards. Is it in the floodplain? Does the facility lack AC? Also list any issues with recovery from a hazard, if any are known – such as a road repeatedly washing out due to an undersized structure. Hagan shared that the Hundred Nights shelter will be in the floodway with the new flood maps. Hagan asked about permitted projects that may not be underway yet – should those be considered for this activity? Blomquist said they could be cautious about adding assets where there was uncertainty of completion.

VI. Public Engagement Strategies

Underwood shared that there will be two public engagement meetings; one next month and one when the plan draft is ready for review. Landry will be working with SWRPC to gather public input via a Flash Vote survey using an existing resident panel. The goal is to have the survey results back before the next planning team meeting in February. There will also be a page on the city website to access the draft plan. Direct contact will be made with certain groups / populations / organizations when the draft plan is ready. The planning team will help to develop the list of key players.

VII. Next Steps

Underwood requested that feedback on activities / assignments be returned by January 14, 2025. He requested that the past events exercise be filled in based on team member roles / departments. For assets – what facilities need to be eliminated.

VIII. Next Meeting: February 5th at 9:00 a.m.

Meeting adjourned at 2:40 p.m.

City of Keene Hazard Mitigation Planning Team
Meeting 2
Notes
9:00 a.m. February 5, 2025

Planning Team Members Present: Kürt Blomquist, *Emergency Management Director*, Carrah Fisk-Hennessey, *Director of Parks and Recreation*, Rebecca Landry, *Deputy City Manager*, Jason Martin, *Fire Chief*, Mike Kopcha, *Police Chief*, Duncan Watson, *Assistant Public Works Director,* Ryan Hornblower, *Manager of EMS and Emergency Management – Cheshire Medical Center*

Others Present: Henry Underwood, *SWRPC*, Sarah Bollinger, *SWRPC*

Not present: Mike Hagan, Will Schoefmann

I. Meeting 1 Recap and Notes

H. Underwood requested revisions or additions to the notes of last meeting – there were none. A brief summary of hazards added by the planning team at meeting 1 were summarized: Cyber Events, Known and Emerging Contaminants, Aging Infrastructure, Extreme Cold, Infectious Disease, and Solar Storms & Space Weather. K. Blomquist requests that R. Hornblower update the list of existing assets to reflect facility and vulnerable population changes in the area. He also shared that he presented the Hazard Mitigation Plan Update to the Master Plan Steering Committee on Feb. 4.

II. Vulnerability Analysis

H. Underwood shared that SWRPC is working with M. Hagan to inform the development changes in hazard prone areas criteria in the plan update. There was brief discussion about the proposed flood map changes and potential impacts to different areas of the city including the areas around Beaver Brook and areas around the Cheshire Medical Center on Court Street.

The group then discussed the problem statements included in the previous plan and new statements for the plan update. The planning team will revise previous problem statements on SharePoint. New problem statements were proposed. The planning team would like the following changes: for infectious disease, change “weakened immune system” to “compromised immune system,” look into incorporating a new title for infectious disease – the hospital is changing over to “high threat infection.” The team will follow up to determine if this change or inclusion is appropriate in the plan update.

Next the team went through a hazard prioritization exercise for all identified hazards. Flood risk was discussed – the team made no changes. Drought was discussed, although there is an increased frequency of drought, the team did not believe it would lead to any interruptions in water service, no changes were made. Extreme Heat was discussed – although we are seeing longer heat waves and more heat related injury (particularly among the unsheltered population), as well as the potential interruption of utility (electrical) service due to increased demand, the group proposed no change. No changes to Wildfire specific to Keene. No changes to Lightning. The team increased the Property Impact threat for Tornado / Downburst / Extreme Wind to “5” because of damages from

the microburst that impacted the Tanglewood Mobile Home Park last July. Hurricane / Tropical Storms were discussed at length, the team determined that hurricane event priority would remain unchanged because Keene is most likely to be impacted with flooding as a result of this threat. The team increased the probability of Earthquake to "3" citing recent earthquake activity felt in the city. The team discussed Erosion / Landslide and determined no change citing existing protections such as the Hillside Protection Ordinance. Severe Winter Weather was discussed and determined no change. The team agreed to remove HazMat Spills from the Natural Hazards table, as they are manmade hazards. Extreme Cold was discussed. The unhoused, elderly and low-income populations are all at risk from this hazard. Watermain breaks frequently occur during these events as well as the potential for electric utility interruption due to aging distribution infrastructure. New ratings created for Extreme Cold: Human Impact – 4; Property Impact – 3; Business Impact – 3; Probability – 5. Infectious Disease was discussed -team members listed infectious disease on the rise in our area (RSV, influenza, H5n1, EEE, lyme, measles, m. pox as well as the rise in TB in other states. In addition to the human impact, the team discussed service impact. The team rated Infectious Disease as follows: Human Impact – 4; Property Impact – 1; Business Impact – 4; Probability – 3. The group discussed Solar Storms and Space Weather and the 11-year cycle of these events. Solar Storms and Space Weather were rated as follows: Human Impact – 1; Property Impact – 1; Business Impact – 3; Probability – 2.

Moving onto manmade hazards, the planning team agreed to keep the risk level for previously identified hazards the same as in the previous plan update. Cyber Events were discussed; the team determined Severity as "3" and Probability as "4." A lengthy discussion ensued regarding Known and Emerging Contaminants – this hazard is emerging at a rapid rate and the human impacts are unknown at this time. The team rated the Severity as "3
and Probability as "4." Aging Infrastructure was discussed, the team determined Severity as "2" and Probability as "3."

III. Existing Capabilities & Previous Hazard Mitigation Actions

H. Underwood provided a brief overview of the activity for the team to participate in outside of the meeting. Emphasis was placed on the need to include the City's ability to expand or improve existing capabilities for this plan update – a new requirement from previous updates.
H. Underwood provided an overview of the Previous Action Plan Status activity for team members and requested that all activities be complete no later than February 19th.

IV. General Description of Land Use and Development Trends

Underwood explained that SWRPC staff are working with M. Hagan to complete this task.

V. Next Steps

The first public meeting will be scheduled for later in February – likely the 26th or 27th. The next Planning Team Meeting will be March 5th at 9:00 a.m.

Meeting adjourned at 10:30 a.m.

City of Keene Hazard Mitigation Planning Team
Meeting 3
Notes
9:00 a.m. March 5, 2025

Planning Team Members Present: Kürt Blomquist, *Emergency Management Director*, Jason Martin, *Fire Chief*, Duncan Watson, *Assistant Public Works Director,* Mike Hagan, *Code Enforcement Officer*

Others Present: Henry Underwood, *SWRPC*, Sarah Bollinger, *SWRPC*

Not present: Will Schoefmann, *GIS Coordinator*, Carrah Fisk-Hennessey, *Director of Parks and Recreation*, Rebecca Landry, *Deputy City Manager*, Mike Kopcha, *Police Chief*, Ryan Hornblower, *Manager of EMS and Emergency Management – Cheshire Medical Center*

I. Meeting 2 Recap and Notes

H. Underwood gave a brief overview of the February 5 meeting and requested revisions or additions to the notes of last meeting – there were none.

II. Public Workshop Recap

H. Underwood provided an overview of the public workshop. In addition to background information regarding the plan and the process, attendees were directed to participate in three activities: what are hazards of concern; where do hazards occur / where could hazards occur; what should the City do to mitigate the identified hazards? The event was promoted on the City website & social media, SWRPC's website, a City news release, and on the radio. There were 6-7 attendees including four City Councilors. Flood, wildfire, and severe wind events were the primary concerns of attendees. There was an emphasis on solutions for flooding. The City's plan update is in line with public input gathered at this event. D. Watson expressed concern regarding emerging contaminants and the desire to have the plan update capture the concern. He will forward studies regarding microplastics to be included in the update.

III. Review and Consider Updates to Hazard Mitigation Goals

The planning team reviewed the goals included in the previous plan update. Underwood reminded the team that the Hazard Mitigation Plan does not have an emergency response focus. The team agreed to revise Goal #1 to include underserved populations and businesses. The revised goal: *To improve upon the protection of the general and the underserved populations, the citizens and the businesses of the City of Keene and visitors, from all natural and man-made hazards*.

IV. List and Prioritize Mitigation Actions Schedule

The planning team reviewed the list of prioritized actions from the previous plan using a numbered printout supplied at the meeting and made the following amendments to the STAPLEE scoring chart:
#2 – change to long-term.
#3 – check number of bridges.

#7 – K. Blomquist will update property list with Public Works Director and Community Development Director.
#9 – Add Martell Ct. lift station.
#10 – fully name 2009 Bever Brook Restoration Plan.
#11 – include language for Forerunner Application to identify properties in flood areas.
#17 – KB will research updated cost of project.
#23 – *Update local Emergency Operations Plan*.
#25 - *Implement strategies in the Climate Change Adaptation Plan and Action Plan*.
#26 – *Continue to update the floodplain development ordinance*. Amend cost to $30,000
#27 – *Update and continue enforcement of building codes and Minimum Property Housing and Safety Standards*.
#28 – *Update and continue enforcement of fire codes*. Include Urban Fires as a hazard addressed.
#29 – remove as it has been completed.

New strategies include:
#32 – *Develop an education and outreach program focused on improving awareness of risks and prevention of infectious diseases*. It scored 20, with "2" in the Administratively Workable category. Applies to Infectious Disease Hazard; Health Officer is responsible party; long-term; $2,000 - $5,000.
#33 – *Working with partners, promote vaccination campaigns, especially in schools, community centers, and other high traffic areas*. Scored "2" in social & political categories, 3s elsewhere. Addresses Infectious Disease; Health Officer, Emergency Management Director, & Community Development Director are responsible parties; long-term; $2,000 - $5,000.
#34 – regarding space storms is covered in #16.
#35 – *Develop program for retrofit of older buildings for improved resilience*. Scored all 3s; multiple hazards; Community Development Director; long-term; $150,000 - $250,000.

It was discussed and agreed to make project language more action oriented rather than review where applicable.

V. Approaches to Monitoring, Evaluation, Update

Underwood noted that the 2018 plan has language about a Hazard Mitigation Committee who oversees maintenance and monitoring of the plan. Blomquist offered an update to this, it is not a formal committee, rather, the Emergency Management Director, Fire Chief, Community Development Director, Public Works Director, and Parks and Recreation Director include review of the Hazard Mitigation Plan as part of the biannual Capital Improvement Program review.

VI. Next Steps

Underwood asked the planning team to finalize any contributions to the SharePoint files by Tuesday, March 11. SWRPC will pull everything into a draft plan for initial review by Blomquist. It should be ready for the public comment period in early April. Public comments and planning team feedback will be addressed at the next Planning Team Meeting in April. Following the comment period will be formal adoption and FEMA review.

VII. Next Meeting

The next Planning Team Meeting will be April 29th at 1:30 p.m.

Meeting adjourned at 10:30 a.m.

City of Keene Hazard Mitigation Planning Team
Meeting 4
Notes
1:30 p.m. April 29, 2025

Planning Team Members Present: Kürt Blomquist, *Emergency Management Director*, Jason Martin, *Fire Chief*, Mike Hagan, *Code Enforcement Officer,* Carrah Fisk-Hennessey, *Director of Parks and Recreation*, Mike Kopcha, *Police Chief*

Others Present: Henry Underwood, *SWRPC*, Sarah Bollinger, *SWRPC*

Not present: Will Schoefmann, *GIS Coordinator*, Rebecca Landry, *Deputy City Manager*, Ryan Hornblower, *Manager of EMS and Emergency Management – Cheshire Medical Center,* Duncan Watson, *Assistant Public Works Director*

I. Meeting 3 Recap and Notes

H. Underwood gave a brief overview of the March 5 meeting and requested revisions or additions to the notes of last meeting – there were none.

II. Survey Recap

H. Underwood provided an overview of the survey response. Flooding was the main concern of respondents.

III. Review of Draft Plan

The planning team reviewed the list of prioritized actions from the draft plan based on input by the Planning Team. The STAPLEE rating was discussed. The plan update will include the risk rating with the STAPLEE scores to ensure that projects with higher risk hazards have more weight. H. Underwood explained to the Team that this also helps to prevent projects from scoring equally and makes for a better prioritized list.

Comments on Table 23 (Previous Action Plan) from the draft plan were requested. There was discussion regarding "not started" status and how the timeline is developed and where it will be recorded. The goal for new projects is to have action within 5 years. Progress is related to funding and staff capacity – this is reflected in the comments on the table.

Table 24 will be reorganized, high priority projects with be placed together and organized by their STAPLEE score, this will be repeated through all projects showing a clear priority within the table organization. The numerical column will be omitted from Table 24 because it implies a consecutive order of implementation.

There was discussion of incorporation of the Action Plan into the CIP followed by discussion regarding plan maintenance – specifically keeping track of progress on mitigation actions. C. Fisk-Hennessey requested a change to Action #33, to add the Parks Director as a responsible party on the Citywide Tree Program.

IV. Stakeholder Outreach Activity

Underwood asked the Team to brainstorm additional stakeholders who should be notified of the plan update and invited to review and comment on the draft plan. The draft plan will be posted on the Emergency Management page of the City website. The Team requested that Southern NH Red Cross, Habitat for Humanity, and Liberty Gas be added to the list of recipients.

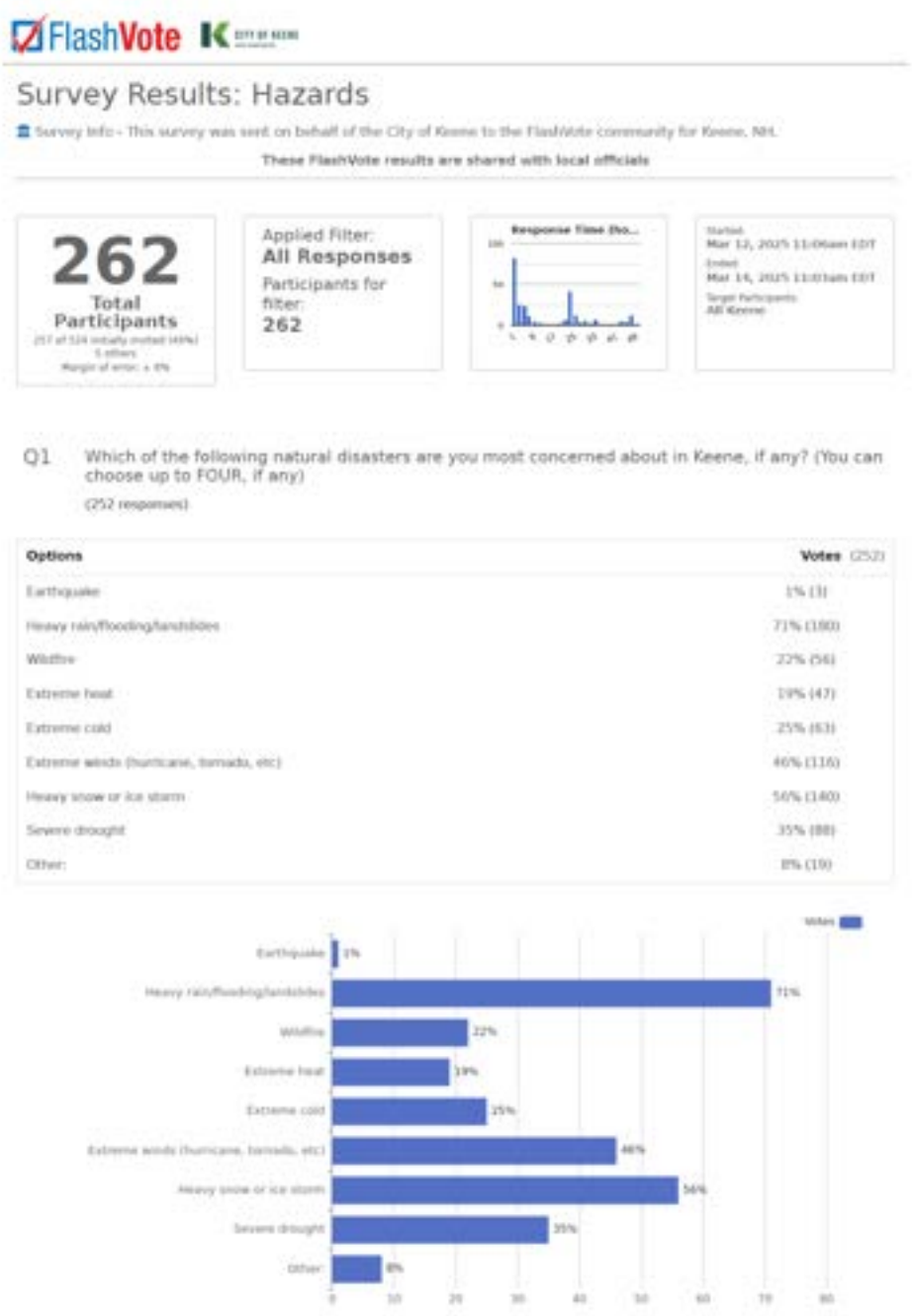
V. Next Steps

Blomquist reminded the Planning Team to complete their timesheets and submit them to him to capture the City's match on the grant. Final comments and review are requested to be returned by May 6 for inclusion in the plan.

The public comment period will be from May 13th to June 12th with SWRPC hosting comments. The second public meeting will be June 11 at the Planning, Licenses, and Development Committee meeting for a recommendation to City Council to adopt the plan at their June 19th meeting. Then the plan will be sent to FEMA for approval.

Meeting adjourned at 2:30 p.m.

Community Survey Results[68]



FlashVote

Survey Results: Hazards

Survey Info - This survey was sent on behalf of the City of Keene to the FlashVote community for Keene, NH.

These FlashVote results are shared with local officials

262
Total Participants

Applied Filter: All Responses
Participants for filter: 262

Q1 Which of the following natural disasters are you most concerned about in Keene, if any? (You can choose up to FOUR, if any)

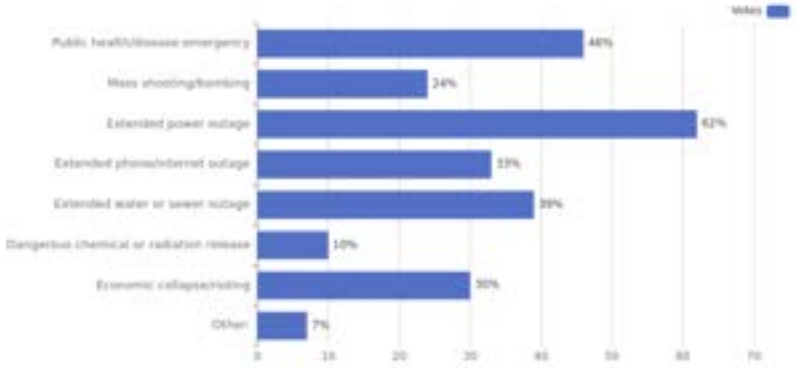
(252 responses)

Options	Votes (252)
Earthquake	1% (3)
Heavy rain/flooding/landslides	71% (180)
Wildfire	22% (56)
Extreme heat	19% (47)
Extreme cold	25% (63)
Extreme winds (hurricane, tornado, etc)	46% (116)
Heavy snow or ice storm	56% (140)
Severe drought	35% (88)
Other:	8% (19)

Q2 Which of the following other emergencies/disasters are you most concerned about in Keene, if any? (You can choose up to FOUR, if any)

(246 responses)

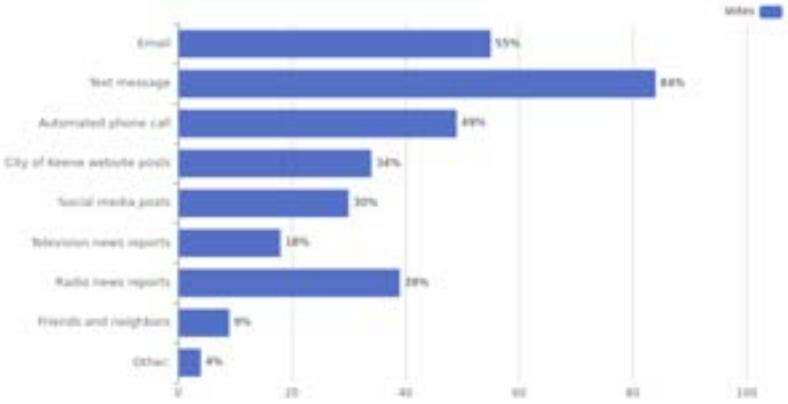
Options	Votes (246)
Public health/disease emergency	46% (114)
Mass shooting/bombing	24% (59)
Extended power outage	62% (153)
Extended phone/internet outage	33% (82)
Extended water or sewer outage	39% (95)
Dangerous chemical or radiation release	10% (24)
Economic collapse/rioting	30% (73)
Other:	7% (18)



Q3 How would you prefer to receive critical information during an emergency/disaster? (You can choose up to FOUR, if any)

(244 responses)

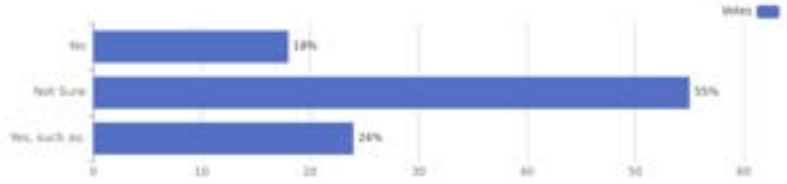
Options	Votes (244)
Email	55% (133)
Text message	84% (205)
Automated phone call	49% (119)
City of Keene website posts	34% (82)
Social media posts	30% (74)
Television news reports	18% (44)
Radio news reports	39% (96)
Friends and neighbors	9% (23)
Other:	4% (10)



Q4 Is there any potential hazard or disaster risk that you think we are especially unprepared for in Keene?

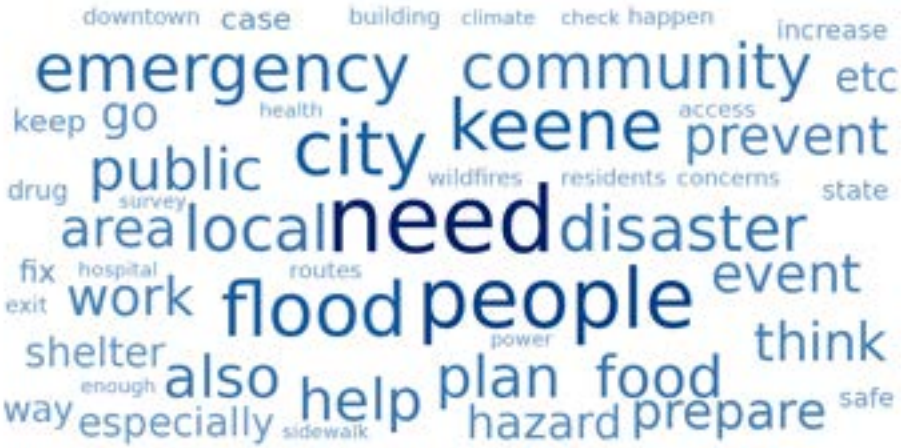
(250 responses)

Options	Votes (250)
No	18% (46)
Not Sure	55% (138)
Yes, such as:	24% (61)



Q5 Any other comments or suggestions about potential hazards in Keene, including any specific concerns or ideas related to preparing for natural or manmade hazards?

(59 responses)



Keene needs to be proactive in planning which can have numerous co-benefits when increasing resilience with adaptive capacity, social capital strengthening and green infrastructure for flooding.

Do we have posted emergency exit routes in the city? What about gas pipe leaks, that did happen a few years back. Health effects of smoke particles in the air from wildfires happening elsewhere, as happened when Canada was having lots of wildfires.

Our economy and housing is getting hit with the obvious downside in Keene. We need to stop the purchase of homes to use as drug, alcohol, forensic, and other housing rather than family homes. The more of those we allow, working people will start to move out of the area.

downtown sidewalks need to be lit up at dark. very dangerous now.

Don't forget about shortwave radio. It's still a mode of last chance, and there are still local amateur radio emergency services volunteers keeping at the ready.

If there were a natural disaster in Keene, is there a gathering location where people can check in or communicate they are safe?

Not enough is being done to deal with flooding or looking at safe routes in case of wild fires. Farmer needs not being addressed. what appears to be a city wide failure to address home code violations which increase the potential for fires.

Armed citizens are the best way to maintain public safety followed by KPD and KFD maintaining law and order in terms of loitering, homeless camps, safety checks on people who appear to be in distress due to alcohol or drugs, and keeping public spaces clean and safe so that people can relax and enjoy the town. Large gatherings of vagrants downtown and in the woods is bad for public safety and tourism. In terms of natural disasters, flood control and drainage should be top priorities. Clearing fallen trees and fire prevention measures in the woods to prevent forest fires is also important.

Contractors often take advantage of government contracts, view them as handouts (corrupt politicians find ways to increase their personal wealth through such contracts also) and way overcharge - how are you going to stop this?

Winter is tough on sidewalks. City snowplows pile snow at end of driveways. Private plowers pile snow on sidewalks. City's sidewalk plows try hard but leave snowfice on sidewalks.

Outreach

City of Keene
3 Washington Street, Keene NH 03431
Contact:
Kürt Blomquist, City of Keene Emergency Administrator
(603) 757-1887, kblomquist@keenenh.gov

PRESS RELEASE

Hazard Mitigation Plan Update Public Workshop on February 27th

Public input is encouraged as part of the plan update process.

Keene, NH, February 14, 2025:

The City of Keene will host a public workshop for the 2025 Keene Hazard Mitigation Plan Update. Hazard Mitigation Plans help residents and local officials understand what hazards affect the community, the risks of occurrence, the potential impacts, and what steps the community can take to lessen impacts in the future.

Join community members at Heberton Hall in the Keene Public Library at 60 Winter Street at 5:30 p.m. on February 27th to learn more about the City's Hazard Mitigation Plan Update and to participate in several activities. The activities will include identifying hazards, locations where a hazard has occurred and where it might occur in the future, and what actions the community could take to be better prepared. Public input is an essential and important step in this update process.

For Immediate Release

Figure 16 - Promotion of Public Meeting via SWRPC Website and Calendar

Figure 17 Advertising Comment Period on Website

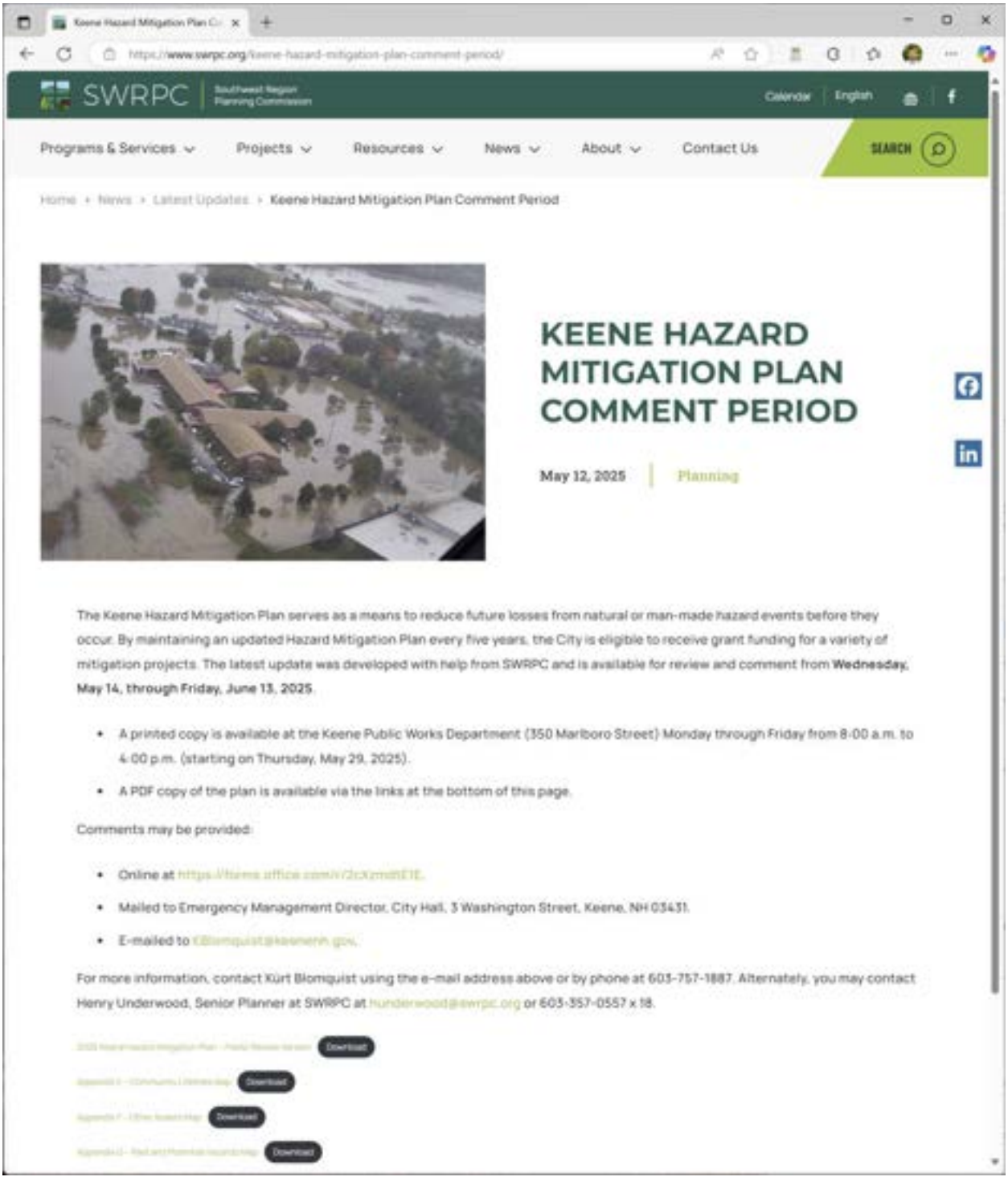


Figure 18 Southwest Region Planning Commission Highlights Newsletter

SWRPC

Commission Highlights

May 2025

Vol. 31 - No. 5

"Next Generation" Transit Project Advisory Task Force Update

The "Next Generation" Transit Project Advisory Task Force convened for the sixth time on May 7th. The primary purpose of the meeting was to gain consensus on the implementation plan and timeline for establishing expanded transit services in the Monadnock Region. Key elements of the plan include identifying a transit system operator, governance and operating model; solidifying a funding package to establish and sustain expanded services; and conducting a marketing campaign to promote the services. SWRPC has secured planning funds from the NH Department of Transportation for implementation assistance. Service expansion would begin with establishing a greater Keene on-demand microtransit service in the urbanized areas of Keene, Swanzey and Marlborough. The advisory task force also received updates on SWRPC outreach activities to transit operator candidates and prospective municipal contributors to match the federal funds that will be available to support the services. For more information, please contact Terry Johnson of SWRPC staff at tjohnson@swrpc.org.

2025 Complete Streets Implementation Grant Announced

Complete streets are those that are safe and accessible for users of all ages and abilities, regardless of how they choose to travel. It is a context-sensitive approach to transportation planning and design that balances the needs of people walking, bicycling, driving a car, riding public transit, and using wheelchairs or other mobility devices. For the ninth consecutive year, the Monadnock Alliance for Sustainable Transportation (MAST) is pleased to announce a Complete Streets Implementation Grant Program round! A total of $130,000 is available to support complete streets construction or non-infrastructure activities in the Monadnock Region of New Hampshire – an increase of $30,000 compared to 2024. Applicants are limited to municipalities in the Monadnock Region, and the application submission deadline is **September 15, 2025**. To learn more about complete streets, please visit mastnh.org/2025-complete-streets-grant or e-mail completestreets@mastnh.org. Interested communities and individuals are encouraged to attend an optional **virtual information session on Tuesday, June 17th at 12 p.m., Wednesday, June 18th at 9 a.m., Thursday, June 19th at 5 p.m.** SWRPC staff are available to jump-start and review your application.

Timber for Transit Project Nomination Form Announced

SWRPC is seeking nominations for transportation-related projects within Cheshire County that could be constructed with timber products and need engineering or other pre-development assistance. SWRPC is pleased to open this opportunity with support from Northern Border Regional Commission's Timber for Transit Program. Potential projects include new mass-timber bridges, bike/pedestrian infrastructure, rail trail recreation kiosks, and more. New advancements in wood technology have laid the foundation for timber to be used in large infrastructure projects such as modern bridges and multi-story buildings. The Monadnock Region's abundant timber resources and aging transportation infrastructure provide an excellent opportunity to explore the potential for using local timber resources in larger projects. By creating market demand, Monadnock Region communities help create fertile ground for the growing engineered wood industry to take root in New Hampshire. The nomination form is available at https://www.swrpc.org/featured-projects/timber-for-transit/ and applications will be considered on a rolling basis. For more information or questions, please contact Chloe Gross of SWRPC staff at cgross@swrpc.org.

Citizen Planner Peer-to-Peer Roundtable to be held in Chesterfield

The fourth Citizen Planner Peer-to-Peer Roundtable will be held in Chesterfield on June 26, 2025 from 5:30 p.m. to 7:30 p.m. at the Old Town Hall (490 Route 63). Like those before, this roundtable will be a way to build relationships across town lines, lend each other a hand, and offer new perspectives. Information and resources – including the Harrisville Roundtable Meeting Summary - can be found at www.swrpc.org/citizen-planner-peer-to-peer-roundtables. The agenda includes time to review Volunteer Recruitment and Retention techniques, brainstorm solutions to challenges facing citizen planners, and discuss current and upcoming legislation that could affect planning boards. The evening will begin with a half hour of socializing and informal networking over light refreshments. The facilitated discussion will begin promptly at 6:00 p.m. Please RSVP at https://bit.ly/p2pjune26. For more information or questions, please contact Chloe Gross of SWRPC staff at cgross@swrpc.org.

Hazard Mitigation and Emergency Operations Planning

A number of communities are concluding local hazard mitigation and emergency operations plan updates. In May, SWRPC staff held final work group meetings in Marlborough and Hinsdale relative to their emergency operation plan updates. On the hazard mitigation side, the City of Keene opened their plan update comment period on May 12th (www.swrpc.org/keene-hazard-mitigation-plan-comment-period). The Town of Hancock started the process to update their plan at a planning team meeting on May 29th. For more information, please contact Henry Underwood, hunderwood@swrpc.org, or Sarah Bollinger, sbollinger@swrpc.org, of SWRPC staff. Communities seeking to apply for funding to update their plans can start the process by contacting their Division of Homeland Security & Emergency Management Stakeholder Liaison via this website: www.hsem.dos.nh.gov/preparedness/stakeholder-liaisons.

Southwest Region Planning Commission
37 Ashuelot Street Keene, NH 03431 603-357-0557 www.swrpc.org

Figure 19 Advertising Plan Update Workshop

February 26, 2025

SWRPC | Southwest Region Planning Commission

Happenings

In This Issue

- Keene Hazard Mitigation Plan Update Workshop
- Funding for Energy Improvements in Rural or Remote Areas
- NBRC Funding Opportunity and Local Awards
- Water Cyber Response Workshop
- MRCC Seeks Public Comment On Coordinated Community Transportation Plan
- NH Housing Homeownership Conference
- SWRPC Blog Postings
- Upcoming Meetings

Dear Rebecca,

I hope this finds you well. The recent blasts of snow and cold have provided us with some winter enjoyment in addition to shivering and shoveling. For those of us who look forward to outdoor sports, it is nice to have a bit of natural snow on the slopes, additionally the snow does provide insulation for plants and burrowing creatures. This edition of

Happenings has meetings and grant opportunities. An event coming up on **Tuesday, March 18, 2025,** is the Homeownership Conference hosted by New Hampshire Housing at the Grappone Conference Center in Concord. The conference runs from **8:30 a.m. to 12:30 p.m**. For more information, please go to our sixth entry.

Enjoy the offerings!

Rich Clough

Office Support Specialist
Southwest Region Planning Commission
37 Ashuelot Street
Keene, NH 03431
(603) 357-0557

- **Jack Ahern, Associate Planner**
- **Becky Baldwin, Office Manager**
- **Sarah Bollinger, Senior Planner**
- **Rich Clough, Office Support Specialist**
- **Jason Cooper, Planner**
- **Chloe Gross, Planner**
- **Todd Horner, Executive Director**
- **Terry Johnson, Senior Project Manager**
- **J. B. Mack, Assistant Director**
- **Henry Underwood, Senior Planner**

Keene Hazard Mitigation Plan Update Workshop

The City of Keene will host a public workshop for the 2025 Keene Hazard Mitigation Plan Update at Heberton Hall in the Keene Public Library at 60 Winter Street **at 5:30 p.m.** on **Thursday, February 27, 2025**. Hazard Mitigation Plans help residents and local officials understand what hazards affect the community, the risks of occurrence, the potential impacts, and what steps the community can take to lessen impacts in the future. Join community members to learn more about the City's Hazard Mitigation Plan Update and to participate in several activities. The activities will include identifying hazards, locations where a hazard has occurred and where it might occur in the future, and what actions the community could take to be better prepared. Public input is an essential and important step in this update process. For more information, please contact Kürt Blomquist, City of Keene Emergency Administrator, at (603) 757-1887.

Funding for Energy Improvements in Rural or Remote Areas

On October 3, 2024, the U.S. Department of Energy's (DOE) Office of Clean Energy Demonstrations (OCED) opened applications for up to $400 million to spur innovative, community-focused,clean energy solutions in communities across the country with 10,000 or fewer people.
Applicant teams must address at least one of the following: improving overall cost-effectiveness of energy generation, transmission, or distribution systems; siting or upgrading transmission and distribution lines; reducing greenhouse gas emissions from energy generation in rural or remote areas; providing or modernizing electric generation facilities; developing microgrids; or increasing energy efficiency.

- Concept Paper Submission Deadline: **February 27, 2025 at 5:00 p.m.**
- Full Application Submission Deadline: **August 28, 2025 at 5:00 p.m.**

The following entities are eligible to apply: tribes and tribal organizations, state and local governmental entities, non-profit and for-profit entities, rural electric cooperatives, farming associations and cooperatives, labor unions, institutions of higher education, and both incorporated and unincorporated consortia. For more infromation, please douwnloard the funding information here.

NBRC Funding Opportunity and Local Awards

Northern Border Regional Commission

In 2024 our region was awarded over $6.4 million in funding for economic and community development projects by the Northern Border Regional Commission (NBRC) through their Catalyst and Timber for Transit Programs. The NBRC Service Area includes Belknap, Carroll, Cheshire, Coos, Grafton, Merrimack, and Sullivan counties. The NBRC Federal-State partnership is aided by regional organizations such as SWRPC, to provide technical assistance to applicants, assist the NBRC in its outreach activities, and generally administer NBRC investments for grantees.
The pre-application deadline for the Spring round of NBRC funding is **February 28, 2025**. For more information, please click these links: funding opportunities and important deadlines today.

Water Cyber Response Workshop

NH Department of Environmental Services (NHDES) invites you to join them at a *Water Cyber Response Workshop*, **Wednesday, March 5th,** from **8:30 a.m. to 3:30 p.m.** at 46 Donovan Street in Concord NH. Are you responsible for a drinking water or wastewater system? Are you a municipal government official, water system employee, or do you otherwise play a role in the security of New Hampshire's water and wastewater infrastructures? Cyber threats impact all of us professionally and personally. Come join NHDES to learn about cybersecurity - the importance of policy, partnerships, employee training, response plan development, and lessons learned from real local experiences. You will leave this workshop with free tools and resources so you can take action to become more cyber secure. To register, please click here.

MRCC Seeks Public Comment On Coordinated Community Transportation Plan

The Monadnock Regional Coordinating Council for Community Transportation (MRCC) seeks public comments on its Coordinated Community Transportation Plan for the Monadnock Region (Coordinated Plan). The Coordinated Plan provides an updated look at the transportation needs of seniors, individuals with disabilities, low-income households, youth, and other populations; strategies for meeting these needs, and prioritizes public transportation services for funding and implementation. Any individual, group, or agency may submit written comments on the Coordinated Plan to Terry Johnson, Mobility Manager/Senior Project Manager, Southwest Region Planning Commission, 37 Ashuelot Street, Keene, NH 03431. All comments received by **March 7, 2025**, will be considered by the MRCC prior to adoption of the Coordinated Plan.

NH Housing Homeownership Conference

On **Tuesday, March 18, 2025** New Hampshire Housing will host a Homeownership Conference at the Grappone Conference Center in Concord. The conference runs from **8:30 a.m. to 12:30 p.m.**

NEW HAMPSHIRE HOUSING

Agenda Highlights:

- **Opening Session: Housing Market & Policy Update** - Gain valuable insights from New Hampshire Housing, including an overview of the current housing market and updates on key state and federal policies.
- **AI and Digital Innovation in Real Estate & Lending** - Explore how AI and emerging digital tools are reshaping the industry - enhancing efficiency, reducing costs, and streamlining transactions for professionals in lending and real estate.
- **Economic Outlook: Market Trends & Interest Rates** - MBA's Chief Economist, Joel Kan, will provide expert analysis on economic trends, the direction of interest rates, and what to expect in the housing market in the months ahead.
- **Housing Solutions Panel: Innovation in Action** - A discussion with local leaders who are addressing housing challenges through innovative projects. Panelists will share their experiences, strategies, and insights on navigating today's housing landscape.

To register, please click here.

SWRPC Blog Postings

Please check-out recent SWRPC posts as follows:

- **2/19/25** - **Lack of EV Chargers Could Impact NH's Tourism Income**
- **2/18/25** - **Keene Hazard Mitigation Plan Update Public Workshop on February 27th**
- **2/3/25** - **MRCC Seeks Public Comment On Coordinated Community Transportation Plan**
- **1/27/25** - **Temple Peer to Peer Roundtable**

SWRPC Highlights

Please check-out recent SWRPC Highlights as follows:

January 2025 Highlights

SWRPC Meetings

Monday, March 3, 2025

The **SWRPC Transportation Advisory Committee** will be meet at 2:00 p.m. at the SWRPC offices located at 37 Ashuelot Street, Keene, NH. For the most up to date agenda, please visit the SWRPC Calendar. For more information, please contact J. B. Mack of SWRPC staff.

Saturday, March 8, 2025

The **Monadnock Region Accessory Dwelling Unit (ADU) Design Challenge Awards Celebration and Submission Showcase** will be held in Heberton Hall in the Keene Public Library Annex, 60 Winter Street, Keene from 5:00-7:00 p.m. To RSVP, please click here. For more information, please contact Chloe Gross of SWRPC staff.

Tuesday, March 25, 2025

The **SWRPC Board of Directors** will meet at 3:00 p.m. at Delegation Hall in the Historic Cheshire County Courthouse at 12 Court Street, Keene NH. For the most up to date agenda, please visit the SWRPC Calendar. For more information, please contact Becky Baldwin of SWRPC staff.

Other Meetings

Thursday, February 27, 2025

The **City of Keene Hazard Mitigation Plan Update Planning Team** will host a Public Workshop from 5:30 to 7:00 p.m. at Heberton Hall, in the Keene Public Library Annex, 60 Winter Street, Keene. For more information, please contact Henry Underwood or Sarah Bollinger of SWRPC staff.

Saturday, March 8, 2025

The **Build and Learn: Family ADU Event** will take place in Heberton Hall in the Keene Public Library Annex, 60 Winter Street, Keene from 2:00 to 4:00 p.m. This craft event will precede the Monadnock Region ADU Design Challenge Awards Celebration and Submission Showcase. To register, please click here. For more information, please contact Chloe Gross of SWRPC staff.

Tuesday, March 18, 2025

The **Monadnock Regional Coordinating Council for Community Transportation** will meet at 9:00 a.m. at the SWRPC offices located at 37 Ashuelot Street, Keene, NH. For the most up to date agenda, please visit the SWRPC Calendar. For more information, please contact Terry Johnson of SWRPC staff.

Thursday, March 20, 2025

A **Citizen Planner Peer-to-Peer Roundtable** will meet from 5:30 to 7:30 p.m. with a half hour of networking at the Community Church of Harrisville & Chesham (the brick church) in Harrisville. To RSVP, please click here. For more information, please contact Chloe Gross of SWRPC staff.

The Southwest Region Planning Commission (SWRPC) is one of New Hampshire's nine regional planning agencies. SWRPC is a membership organization that serves a planning district of 34 towns covering approximately 1,000 square miles and comprising the Southwest Region of the State.

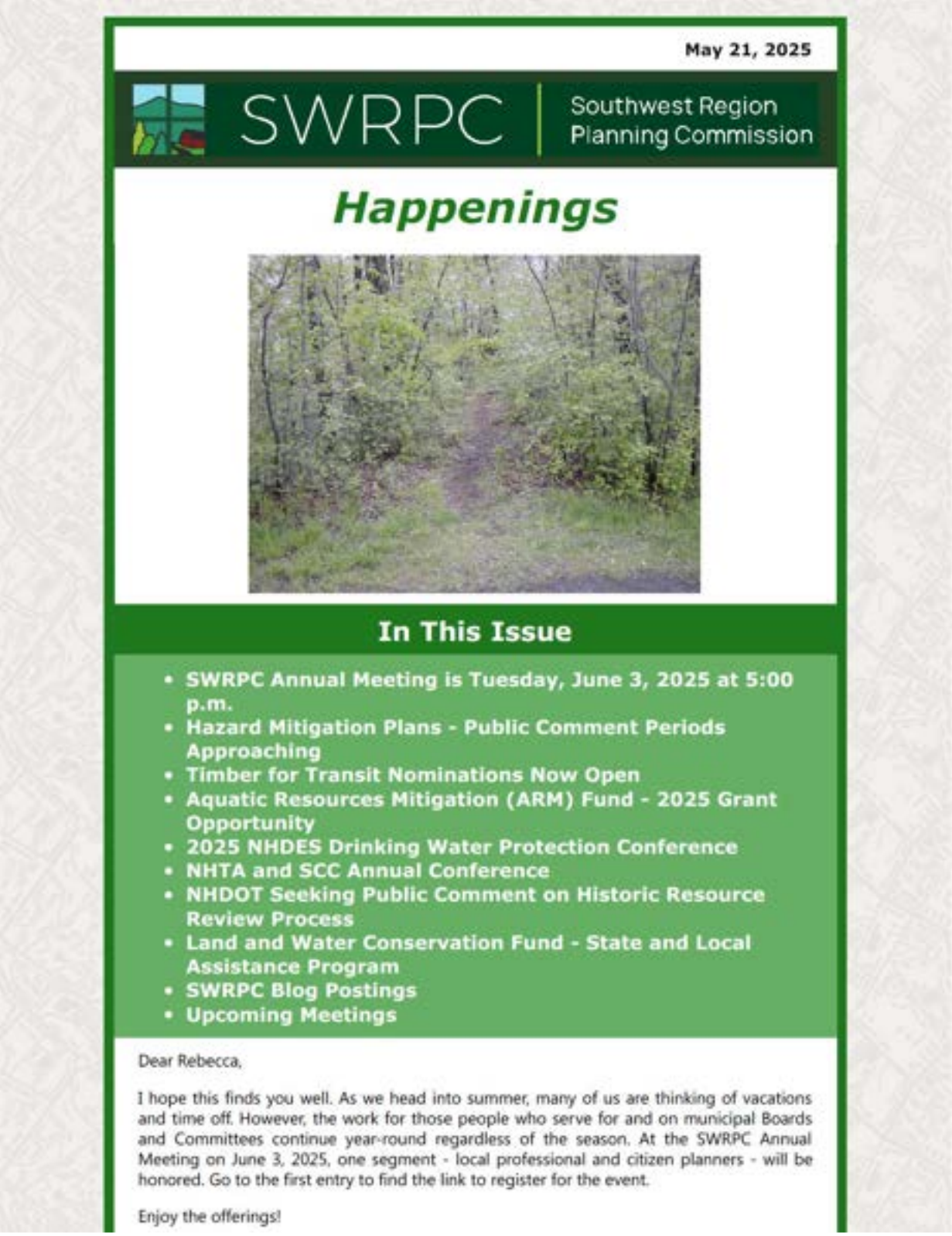
Through member support along with various federal, state, and local grants and contracts, SWRPC is able to assemble the resources and expertise needed to provide technical assistance and programs to which our member municipalities have direct access. This model represents efficiency through pooling the resources of many for the overall benefit of the Region.

SWRPC is governed by Commissioners appointed by member communities and a 15-member Board of Directors. The diversity of the agency work program reflects SWRPC's dynamic nature and ability to address new challenges and opportunities. For more information about SWRPC please visit our website at www.swrpc.org.

Visit the

Add me to the

Figure 20 Advertising Public Comment Period (May)



May 21, 2025

SWRPC | Southwest Region Planning Commission

Happenings

In This Issue

- SWRPC Annual Meeting is Tuesday, June 3, 2025 at 5:00 p.m.
- Hazard Mitigation Plans - Public Comment Periods Approaching
- Timber for Transit Nominations Now Open
- Aquatic Resources Mitigation (ARM) Fund - 2025 Grant Opportunity
- 2025 NHDES Drinking Water Protection Conference
- NHTA and SCC Annual Conference
- NHDOT Seeking Public Comment on Historic Resource Review Process
- Land and Water Conservation Fund - State and Local Assistance Program
- SWRPC Blog Postings
- Upcoming Meetings

Dear Rebecca,

I hope this finds you well. As we head into summer, many of us are thinking of vacations and time off. However, the work for those people who serve for and on municipal Boards and Committees continue year-round regardless of the season. At the SWRPC Annual Meeting on June 3, 2025, one segment - local professional and citizen planners - will be honored. Go to the first entry to find the link to register for the event.

Enjoy the offerings!

Rich Clough

Office Support Specialist
Southwest Region Planning Commission
37 Ashuelot Street
Keene, NH 03431
(603) 357-0557

- Jack Ahern, Associate Planner
- Becky Baldwin, Office Manager
- Sarah Bollinger, Senior Planner
- Rich Clough, Office Support Specialist
- Jason Cooper, Planner
- Chloe Gross, Planner
- Todd Horner, Executive Director
- Terry Johnson, Senior Project Manager
- J. B. Mack, Assistant Director
- Henry Underwood, Senior Planner

SWRPC Annual Meeting is Tuesday, June 3, 2025 at 5:00 p.m.

Join SWRPC for the 2025 Annual Meeting, scheduled for June 3, 2025 at Stonewall Farm, 242 Chesterfield Rd. Keene, NH. A social gathering will be from 5:00 to 5:30. with refreshments provided by CC&D's Kitchen Market. In addition to the Commission business agenda, the meeting will feature a celebration of local planners culminating in a Monadnock Region Planner of the Year Award. To register for the event, please go here. For more information, please contact Rich Clough of SWRPC staff.

Hazard Mitigation Plans - Public Comment Periods Approaching

The communities of Keene, Stoddard, Nelson, and Walpole are in the final stages of updating their Hazard Mitigation Plans. These plans identify local risks from natural and human-made hazards—such as flooding, severe storms, and extreme temperatures—and outline strategies to reduce potential impacts.

Draft plans will be available for public review in the coming days and weeks. Community members are encouraged to view the drafts and provide feedback during the designated public comment period. Links to each community's plan and instructions for submitting comments will be posted on the Southwest Region Planning Commission website: www.swrpc.org. Public input is a vital part of the planning process - your comments will help shape the final plans.

For more information, please contact Henry Underwood, or Sarah Bollinger of SWRPC staff.

Timber for Transit Nominations Now Open

SWRPC is seeking nominations for transportation-related projects within Cheshire County that could be constructed with timber products and are in need of engineering or other pre-development assistance. Potential projects include new mass-timber bridges, bike/pedestrian infrastructure, rail trail recreation kiosks, and more. SWRPC is glad to open this opportunity fo predevelopment assistance with support from Northern Border Regional Commission's Timber for Transit Program. The nomination form is available at https://www.swrpc.org/featured-projects/timber-for-

- SWRPC Blog Postings
- Upcoming Meetings

Dear Rebecca,

I hope this finds you well. For many of us the school year dictates our schedules. As local schools go on summer break please be aware of the added foot and bicycle traffic that may affect your town and keep a wary eye out. This is also the season for the NH Department of Transportation and local road agents to perform major and minor road repairs and resurfacing - so prepare for possible changes in traffic patterns that accomodate this work. This edition of *Happenings* has conferences, webinars, and grant opportunities.

Enjoy the offerings!

Rich Clough

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Hazard Mitigation Plans - Public Comment Periods

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Timber for Transit Nominations Now Open

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Figure 21 Advertising Public Comment Period (June)

June 6, 2025

SWRPC Southwest Region Planning Commission

Happenings

In This Issue

- Hazard Mitigation Plans - Public Comment Periods
- Timber for Transit Nominations Now Open
- Planning Lunches at Noon Monthly Webinar Series
- 2025 NHDES Drinking Water Protection Conference
- NHTA and SCC Annual Conference
- NHDOT Seeking Public Comment on Historic Resource Review Process
- Land and Water Conservation Fund - State and Local Assistance Program

Public Workshop Agenda

City of Keene
Hazard Mitigation Update

Public Workshop

Heberton Hall
Keene Public Library
60 Winter Street

February 27, 2025
5:30 p.m. to 7:00 p.m.

Agenda

I. Welcome & Introductions

II. Project Overview

III. Activities [~15 minutes at each activity]

a. Which three natural and manmade hazards are you most concerned about?
b. Where have you witnessed hazards? Which areas could be at risk in the future?
c. What actions could the City take to better prepare for hazards?

IV. Question & Answer

V. Next Steps: Draft Plan & Plan Adoption

Other Public Meetings

Master Plan Steering Committee

AGENDA

Tuesday, February 4, 2025 6:00 PM **City Hall, 2nd Floor Council Chambers**

I. Call to Order and Roll Call

II. Minutes of Previous Meeting – December 3, 2024

III. Update on Strategic Pillar Task Forces

a. Review of draft goal areas for each pillar

IV. Topical Presentations:

a. Keene Hazard Mitigation Planning & Floodplain Programs – Kürt Blomquist, Emergency Management Administrator & Mike Hagan, Floodplain Manager

b. Housing Vulnerability Analysis – Planning Staff

c. 21 in 21 Home Upgrade Program – Keith Thibault, Southwestern Community Services

V. New Business

VI. Next Meeting: Tuesday, March 4, 6:00 PM

PLANNING, LICENSES AND DEVELOPMENT COMMITTEE
Council Chambers A, Keene City Hall
June 11, 2025
6:00 PM

A. AGENDA ITEMS

1. Pablo Fleischmann/Keene Music Festival - Request to Use City Property - August 30, 2025
2. Keene Elm City Rotary Club - Request to Use City Property - Clarence DeMar Marathon - September 28, 2025
3. Councilor Jones - Request for Resolution (Declaration) Honoring the LGBTQIA+ Community
4. Presentation - 2025 Hazard Mitigation Plan - Emergency Management Administrator
5. Warrant for Unlicensed Dogs - City Clerk
6. Relating to Amendments to the Land Development Code, Feather Signs in Industrial Districts
   Ordinance O-2025-08-A
7. Relating to Amendments to Land Development Code - Single-Family Parking Requirements
   Ordinance O-2025-09
8. Relating to the Discharge of Fireworks
   Ordinance O-2025-19

B. MORE TIME ITEMS

1. Relating to Amendments to the Land Development Code to Encourage Housing Development in Keene
   Ordinance O-2025-15
2. Relating to Amendments to Definitions of the Land Development Code to Encourage Housing Development in Keene and the Definitions Relating to Charitable Gaming Facilities
   Ordinance O-2025-17
3. Relating to Setbacks and Build-to Dimensions
   Ordinance O-2025-20

4. Relating to Definitions for Accessory Structure, Setbacks and Build-to Dimensions
Ordinance O-2025-21

NON PUBLIC SESSION

ADJOURNMENT

KEENE CITY COUNCIL
Council Chambers, Keene City Hall
June 19, 2025
7:00 PM

ROLL CALL

PLEDGE OF ALLEGIANCE

MINUTES FROM PRECEDING MEETING

- June 5, 2025 Minutes

A. HEARINGS / PRESENTATIONS / PROCLAMATIONS

1. Community Recognition - Savings Bank of Walpole - 150th Anniversary

B. ELECTIONS / NOMINATIONS / APPOINTMENTS / CONFIRMATIONS

1. Nominations - Library Board of Trustees, Energy and Climate Committee
2. Confirmation - Trustees of Trust Funds and Cemetery Trustees

C. COMMUNICATIONS

1. Let It Shine - Request to Use City Property - 2025 Pumpkin Festival
2. Keene Pride - Request to Designate Keene a Sanctuary City for the LGBTQIA+ Community
3. United Church of Christ - Letter of Support for Keene Pride's Petition to be Designated a Sanctuary City for the LGBTQIA+ Community
4. BCM Environmental Land Law, PLLC - Request for City's Contribution to Monadnock Conservancy for Drainage Replacement at 0 Ashuelot Street
5. Councilor Remy - Proposed Amendments to Fiscal Year 2026 Operating Budget
6. Councilors Tobin and Williams - Proposed Amendment to Fiscal Year 2026 Operating Budget
7. Councilor Lake - Proposed Amendments to Fiscal Year 2026 Operating Budget

8. Councilor Favolise - Request to Place Keno Question on 2025 Municipal General Election Ballot
9. Councilor Haas - Availability of 2025 Hazard Mitigation Plan and Suggestions Related to Continuity of Operations Planning

D. REPORTS - COUNCIL COMMITTEES

1. Keene Music Festival - Request to Use City Property - August 30, 2025
2. Keene Elm City Rotary Club - Request to Use City Property - Clarence DeMar Marathon - September 28, 2025
3. Councilor Jones - Request for Resolution (Declaration) Honoring the LGBTQIA+ Community
4. 2025 Hazard Mitigation Plan
5. Warrant for Unlicensed Dogs
6. Request to Transfer FY 2025 Funds to the Ambulance CIP
7. Written Public Comments - Proposed Fiscal Year 2025-2026 Operating Budget
8. Request to expend funds from CDD Personnel funds to Purchase a Community Development Permitting Software Platform
9. Request to Approve a Change Order to the OpenGov (Cartegraph) contract (PO20250067) for the inclusion of a Cloud Permitting Platform for the Planning, Building, Code Enforcement and Health Inspection Services of the City
10. LWCF Grant Round 36 - Intent to Apply
11. Levitt Music Series Grant - Letter of Commitment
12. Acceptance of FAA AIP Grant for Airport – Airport Taxiway 'A' Reconstruction Project
13. Agreement for Construction Engineering Services with Greenman-Pedersen Inc, (GPI) for the Island Street Infrastructure Improvements Project

E. CITY MANAGER COMMENTS

F. REPORTS - CITY OFFICERS AND DEPARTMENTS

1. Municipal Investment Fund Grant - Request for Pre-Approval of Grant Acceptance

G. REPORTS - BOARDS AND COMMISSIONS

H. REPORTS - MORE TIME

1. Heritage Commission - City Support for a 250th Independence Day Celebration - July 4, 2026

I. ORDINANCES FOR FIRST READING

1. Relating to Prohibited Parking in Proximity to Driveways
   O-2025-22

J. ORDINANCES FOR SECOND READING

1. Relating to Amendments to the Land Development Code, Feather Signs in Industrial Districts
   Ordinance O-2025-08-A
2. Relating to Amendments to Land Development Code - Single-Family Parking Requirements
   Ordinance O-2025-09
3. Relating to the Discharge of Fireworks
   Ordinance O-2025-19

K. RESOLUTIONS

L. TABLED ITEMS

1. Relating to the 2025-2026 Operating Budget
   Resolution R-2025-12-B
2. Relating to Class Allocation and Salary Schedule
   Ordinance O-2025-18
3. Relating to the Appropriation of Funds for the FY 2025-2026 Bond Issues: Fire Apparatus Replacement Program; Lower Winchester Street Reconstruction Project; Roadway Preservation & Rehabilitation Project; Stormwater Resiliency Program; T-Hangar Apron Maintenance Project; Sewer Improvements Program; 3MG Water Tank Repairs; Water Distribution Improvements Program; Well Field Upgrade Program
   Resolution R-2025-13
   Resolution R-2025-14
   Resolution R-2025-15
   Resolution R-2025-16
   Resolution R-2025-17
   Resolution R-2025-18
   Resolution R-2025-19
   Resolution R-2025-20
   Resolution R-2025-21

NON PUBLIC SESSION

ADJOURNMENT

in locations where a minimum of six feet of clearance is maintained for pedestrian access. In addition, the applicant is permitted to close off a portion of Railroad Street from Main Street to Wells Street and a portion of Lamson Street from Main Street to Federal Street. This permission is granted subject to the following conditions: the signing of a revocable license and indemnification agreement; that the petitioner provide a certificate of liability insurance with the City of Keene listed as additional insured in the amount of $1,000,000; and submittal of signed letters of permission from any private property owners for the use of their property. In addition, the petitioner is granted use of the requested parking spaces free of charge under the provisions of the Free Parking Policy. Said permission is granted subject to obtainment of any necessary licenses or permits and compliance with all laws, including obtainment of any necessary licensing for the use of intellectual property, and compliance with any recommendations of City staff. The petitioner agrees to absorb the cost of any City services over and above any amount of City funding allocated in the FY 26 Community Events Budget. Said payment shall be made within 30 days of the date of invoicing.

A second Planning, Licenses and Development Committee report was read, unanimously recommending The Elm City Rotary Club be granted permission to sponsor the Clarence DeMar Marathon on September 28, 2025, subject to the signing of a revocable license and indemnification agreement and the submittal of a certificate of liability insurance in the amount of $1,000,000 listing the City of Keene as an additional insured. This license is conditional upon the petitioner providing an adequate number of volunteer race marshals to ensure runner safety along the course, and submittal of signed letters of permission from any private property owners for the use of their property. Said permission is granted subject to obtainment of any necessary licenses or permits and compliance with all laws, including obtainment of any necessary licensing for the use of intellectual property; and compliance with any recommendations of City staff. The petitioner agrees to absorb the cost of any City services over and above any amount of City funding allocated in the FY 26 Community Events Budget. Said payment shall be made within 30 days of the date of invoicing.

A motion by Councilor Jones to carry out the intent of both Committee reports was duly seconded by Councilor Williams. The motion carried unanimously on a roll call vote with 14 Councilors present and voting in favor. Councilor Bosley was absent.

PLD REPORT - COUNCILOR JONES - REQUEST FOR RESOLUTION (DECLARATION) HONORING THE LGBTQIA+ COMMUNITY

A Planning, Licenses and Development Committee report was read, unanimously recommending the Request for a Declaration Honoring the LGBTQIA+ Community be accepted as informational. Mayor Kahn filed the report as Informational.

PLD REPORT - 2025 HAZARD MITIGATION PLAN

A Planning, Licenses and Development Committee report was read, unanimously recommending the City Council adopt the 2025 Hazard Mitigation Plan and that the City Manager be authorized to do all things necessary to execute the Plan. A motion by Councilor Jones to carry out the intent of the Committee report was duly seconded by Councilor Williams. The motion carried

unanimously on a roll call vote with 14 Councilors present and voting in favor. Councilor Bosley was absent.

PLD REPORT - WARRANT FOR UNLICENSED DOGS

A Planning, Licenses and Development Committee report was read, unanimously recommending the City Council issue a warrant for unlicensed dogs pursuant to NHRSA 466:14, and the Keene Police Department and the City Clerk's Office be directed to issue a civil forfeiture to those dog owners who have failed to license their dog by April 30, 2025. A motion by Councilor Jones to carry out the intent of the Committee report was duly seconded by Councilor Williams. The motion carried unanimously on a roll call vote with 14 Councilors present and voting in favor. Councilor Bosley was absent.

FOP REPORT - REQUEST TO TRANSFER FY 2025 FUNDS TO THE AMBULANCE CIP

A Finance, Organization and Personnel Committee report was read, unanimously recommending the City Manager be authorized to transfer available FY2025 operating funds in the amount of $39,564.00 from the Ambulance Transfer-Grant fund (line item 40200000-580080), to the FY2025 Ambulance Replacement Program CIP (#40M0002B). A motion by Councilor Powers to carry out the intent of the Committee report was duly seconded by Councilor Remy. The motion carried unanimously on a roll call vote with 14 Councilors present and voting in favor. Councilor Bosley was absent.

FOP REPORT - WRITTEN PUBLIC COMMENTS - PROPOSED FISCAL YEAR 2025-2026 OPERATING BUDGET

A Finance, Organization and Personnel Committee report was read, unanimously recommending the written public comments from Cameron Tease in support of Outside Agency funding for the Keene Senior Center be accepted as informational. Mayor Kahn filed the report as Informational.

FOP REPORTS - REQUEST TO EXPEND FUNDS FROM CDD PERSONNEL FUNDS TO PURCHASE A COMMUNITY DEVELOPMENT PERMITTING SOFTWARE PLATFORM; & REQUEST TO APPROVE A CHANGE ORDER TO THE OPENGOV (CARTEGRAPH) CONTRACT (PO20250067) FOR THE INCLUSION OF A CLOUD PERMITTING PLATFORM FOR THE PLANNING, BUILDING, CODE ENFORCEMENT AND HEALTH INSPECTION SERVICES OF THE CITY

The first Finance, Organization and Personnel Committee report was read, unanimously recommending the City Manager be authorized to expend $93,557 from FY25 Community Development Department (CDD) Personnel funds for the purchase of the OpenGov Permitting Software Platform.

A second Finance, Organization and Personnel Committee report was read, unanimously recommending the City Manager be authorized to do all things necessary to execute a change order to the existing contract the City has with OpenGov for the inclusion of a cloud permitting platform.

APPENDIX E: COMMUNITY LIFELINES MAP

Please see the following page.

CITY OF

KEENE

NEW HAMPSHIRE

2025 HAZARD MITIGATION PLAN

COMMUNITY LIFELINES MAP

Legend

- Safety and Security
- Food, Hydration, Shelter
- Health and Medical
- Water Systems
- Energy
- Communications
- Transportation
- Hazardous Materials

0 0.25 0.5 0.75 1 Miles

0 1,000 2,000 3,000 4,000 Feet

Maps prepared by Southwest Region Planning Commission (SWRPC) are for planning purposes only. SWRPC used data from multiple sources at various scales of accuracies. No warranties, expressed or implied, are provided for the data herein, its use, or its interpretation.

Safety and Security

Name	Street	Lifeline Component	Lifeline Subcomponent
Cheshire Hospital Landing Zone	Court St		
Landing Zone	Route 9		
Landing Zone	Route 10 N		
Fire Station 2	110 Hastings Ave	Fire Services	Fire Stations
Keene Central Fire Department	31 Vernon St	Fire Services	Fire Stations
Ashuelot River Drafting Site	Surry Dam Rd	Fire Services	Firefighting Resources
Chesterfield Rd Drafting Site	Chesterfield Rd	Fire Services	Firefighting Resources
Crystal Dr Drafting Site	Crystal Dr	Fire Services	Firefighting Resources
Daniels Hill Rd Drafting Site	Daniels Hill Rd	Fire Services	Firefighting Resources
Darling Ct Cistern	Darling Ct	Fire Services	Firefighting Resources
Darling Rd Drafting Site	Darling Rd	Fire Services	Firefighting Resources
Ferry Brook Rd Drafting Site	Ferry Brook Rd	Fire Services	Firefighting Resources
Grimes Rd Drafting Site	Grimes Rd	Fire Services	Firefighting Resources
Gunn Rd Drafting Site	Gunn Rd	Fire Services	Firefighting Resources
Jordan Rd Cistern	359 Jordan Rd	Fire Services	Firefighting Resources
Langley Rd Drafting Site	Langley Rd	Fire Services	Firefighting Resources
Old Summit Rd Cistern	55 Old Summit Rd	Fire Services	Firefighting Resources
Seasonal Drafting Site	Aldrich Rd	Fire Services	Firefighting Resources
Stearns Rd Cistern	5 Stearns Rd	Fire Services	Firefighting Resources
Stonewall Farms Drafting Site	Chesterfield Rd	Fire Services	Firefighting Resources
Stonewall Farms Drafting Site	Chesterfield Rd	Fire Services	Firefighting Resources
Sullivan Rd Cistern	11 Sullivan Rd	Fire Services	Firefighting Resources
Sullivan Rd Drafting Site	Sullivan Rd	Fire Services	Firefighting Resources
West Surry Rd Cisterns	230-248 W Surry Rd	Fire Services	Firefighting Resources
Whitcomb Hill Rd Drafting Site	Whitcomb Hill Rd	Fire Services	Firefighting Resources
Whitcombs Mill Rd Cistern	85 Whitcombs Mill Rd	Fire Services	Firefighting Resources
Wyman Rd Drafting Site	Wyman Rd	Fire Services	Firefighting Resources
City Hall	3 Washington St	Government Services	Emergency Operation Centers
Keene Central Fire Department	31 Vernon St	Government Services	Emergency Operation Centers
Keene Recycling and Transfer Station	Old Summit Rd	Government Services	Essential Government Functions
City Hall	3 Washington St	Government Services	Government Offices
Cheshire County Registry of Deeds	33 West St	Government Services	Public Records
City Clerk's Record Center	400 Marlboro St	Government Services	Public Records
Cheshire County Department of Corrections	825 Marlboro Rd	Law Enforcement/Security	Correctional Facilities
Keene Police Department	400 Marlboro St	Law Enforcement/Security	Police Stations
State Police Barracks Troop C	15 Ash Brook Ct	Law Enforcement/Security	Police Stations

Food, Hydration, Shelter

Name	Street	Lifeline Component	Lifeline Subcomponent
Keene State College	251 Main St		
Hannaford	481 West St	Food	
Keene Community Kitchen	37 Mechanic St	Food	
Best Western Sovereign Hotel	401 Winchester St	Shelter	Commercial Facilities
E.F. Lane Hotel	30 Main St	Shelter	Commercial Facilities
Super 8 Motel	3 Ashbrook Rd	Shelter	Commercial Facilities
First Baptist Church	105 Maple Ave	Shelter	Housing
Keene High School	43 Arch St	Shelter	Housing
Keene Middle School	167 Maple Ave	Shelter	Housing
Keene Recreation Center	312 Washington St	Shelter	Housing
Keene State College Spaulding Gym	102 Appian Way	Shelter	Housing

Health and Medical

Name	Street	Lifeline Component	Lifeline Subcomponent
Cheshire Medical Center	51 Railroad St	Medical Care	
Cheshire Medical Center - Center at Keene	149 Emerald Street	Medical Care	
Cheshire Medical Center - West Campus	62 Maple Ave	Medical Care	
Convenient MD	351 Winchester St	Medical Care	
Fresenius Kidney Care Monadnock	14 Ash Brook Rd	Medical Care	Dialysis
Cheshire Medical Center - Main Campus	580 Court St	Medical Care	Hospitals
VA Keene Outpatient	640 Marlboro Rd	Medical Care	Veterans' Affairs Health System
Keene Fire Department	31 Vernon St	Patient Movement	Emergency Medical Services

Energy

Name	Street	Lifeline Component	Lifeline Subcomponent
Chabott Oil	Marlboro Rd (NH 101)	Fuel	Fuel Distribution
Cheshire Oil	Marlboro Rd (NH 101)	Fuel	Fuel Distribution
Discount Oil of Keene	11 Sheridan Ave	Fuel	Fuel Distribution
Froling Energy	17 Manchester St	Fuel	Fuel Distribution
Liberty Utilities	Emerald St	Fuel	Fuel Storage
NHDOT District 4	Base Hill Road	Fuel	Fuel Storage
Public Works Department	350 Marlboro St	Fuel	Fuel Storage
Electric Substation	Emerald St	Power Grid	Distribution Systems
Electric Substation		Power Grid	Distribution Systems
Marlboro St Substation	Marlboro St	Power Grid	Distribution Systems

Water Systems

Name	Street	Lifeline Component	Lifeline Subcomponent
Glen Rd Pump Station	Glen Rd	Potable Water Infrastructure	Distribution
Roxbury Rd Pump Station	Roxbury Rd	Potable Water Infrastructure	Distribution
Summit Rd Pump Station	Summit Rd	Potable Water Infrastructure	Distribution
Timberlane Dr Pump Station	Timberlane Dr	Potable Water Infrastructure	Distribution
Court Street Water Well	Surry Rd	Potable Water Infrastructure	Intake
Court Street Water Well	Surry Rd	Potable Water Infrastructure	Intake
Court Street Water Well	Surry Rd	Potable Water Infrastructure	Intake
West St. Water Wells	West St	Potable Water Infrastructure	Intake
Babbidge Reservoir	Dakin Rd	Potable Water Infrastructure	Storage
Beech Hill Water Tank	Chapman Rd	Potable Water Infrastructure	Storage
Drummer Hill Water Tank	Meetinghouse Rd	Potable Water Infrastructure	Storage
North Keene Water Tank	Rte 12	Potable Water Infrastructure	Storage
Roxbury Rd Water Tank	Roxbury Rd	Potable Water Infrastructure	Storage
Woodward Pond	Dakin Rd	Potable Water Infrastructure	Storage
Keene Water Treatment Facility	555 Roxbury Rd	Potable Water Infrastructure	Treatment
Bradco St Pump Station	Bradco St	Wastewater Management	Collection
Court St Pump Station	Court St	Wastewater Management	Collection
Farmstead Commons Pump Station	Farmstead Commons	Wastewater Management	Collection
Fox Ave Pump Station	Fox Ave	Wastewater Management	Collection
Martell Ct Sewer Pump Station	Martell Ct	Wastewater Management	Collection
Wyman Rd Pump Station	Wyman Rd	Wastewater Management	Collection
Cheshire Medical Center		Wastewater Management	Discharge
Cumberland Farms, Inc.-Keene Site		Wastewater Management	Discharge
J.A. WRIGHT & COMPANY		Wastewater Management	Discharge
Kingsbury Corporation		Wastewater Management	Discharge
Markem Corporation		Wastewater Management	Discharge
Markem Corporation		Wastewater Management	Discharge
Markem Corporation		Wastewater Management	Discharge
Zinn Groundwater Treatment System		Wastewater Management	Discharge
Wastewater Treatment Plant	Airport Road	Wastewater Management	Treatment

Transportation

Name	Street	Lifeline Component	Lifeline Subcomponent
Keene Dillant-Hopkins Airport	80 Airport Road	Aviation	General
Public Works Department	350 Marlboro St	Highway/Roadway	
City Express	312 Marlborough St	Mass Transit	Bus
First Student, Inc.	49 Whittemore Farm Rd	Mass Transit	Bus
Thomas Transportation	217 Old Homestead Hwy Suite T	Mass Transit	Bus
Vermont Transit	67 Main St	Mass Transit	Bus

Communications

Name	Street	Lifeline Component	Lifeline Subcomponent
Cheshire County Sheriff Communication Department	12 Court St	911 and Dispatch	Dispatch
Keene Police Dispatch	400 Marlboro St	911 and Dispatch	Dispatch
Southwestern New Hampshire District Fire Mutual Aid	32 Vernon St	911 and Dispatch	Dispatch
Arch St Crossbox	Arch St	Infrastructure	Cable Systems and Wireline
Ashuelot St Crossbox	Ashuelot St	Infrastructure	Cable Systems and Wireline
Beaver St Crossbox	Beaver St	Infrastructure	Cable Systems and Wireline
Consolidated Communications	64 Washington St	Infrastructure	Cable Systems and Wireline
Court St Crossbox	Court St	Infrastructure	Cable Systems and Wireline
Court St Crossbox	Court St	Infrastructure	Cable Systems and Wireline
Cross St Crossbox	Cross St	Infrastructure	Cable Systems and Wireline
Emerald St Crossbox	Emerald St	Infrastructure	Cable Systems and Wireline
Gates St Crossbox	Gates St	Infrastructure	Cable Systems and Wireline
Gilbo Ave Crossbox	Gilbo Ave	Infrastructure	Cable Systems and Wireline
Hurricane Rd Crossbox	Hurricane Rd	Infrastructure	Cable Systems and Wireline
Hurricane Rd Crossbox	Hurricane Rd	Infrastructure	Cable Systems and Wireline
Maple Ave Crossbox	Maple Ave	Infrastructure	Cable Systems and Wireline
Marlboro St Crossbox	Marlboro St	Infrastructure	Cable Systems and Wireline
Matthews Rd Crossbox	Matthews Rd	Infrastructure	Cable Systems and Wireline
Park Ave Crossbox	Park Ave	Infrastructure	Cable Systems and Wireline
Pitcher St Crossbox	Pitcher St	Infrastructure	Cable Systems and Wireline
Portland St Crossbox	Portland St	Infrastructure	Cable Systems and Wireline
Prospect St Crossbox	Prospect St	Infrastructure	Cable Systems and Wireline
Sesame St Crossbox	Sesame St	Infrastructure	Cable Systems and Wireline
Stonehouse Ln Crossbox	Stonehouse Ln	Infrastructure	Cable Systems and Wireline
Timberlane Dr Crossbox	Timberlane Dr	Infrastructure	Cable Systems and Wireline
Upper Knight St Crossbox	Upper Knight St	Infrastructure	Cable Systems and Wireline
Wagner St Crossbox	Wagner St	Infrastructure	Cable Systems and Wireline
Washington St Crossbox	Washington St	Infrastructure	Cable Systems and Wireline
Water St Cell Tower	Water St	Infrastructure	Cable Systems and Wireline
Water St Crossbox	Water St	Infrastructure	Cable Systems and Wireline
West Surry Rd Crossbox	West Surry Rd	Infrastructure	Cable Systems and Wireline
Winchester St Crossbox	Winchester St	Infrastructure	Cable Systems and Wireline
Beech Hill Cell Tower	Chapman Rd	Infrastructure	Wireless
Communications Facility		Infrastructure	Wireless
Rural Cellular Corporation		Infrastructure	Wireless
Rural Cellular Corporation	110 Krif Rd	Infrastructure	Wireless
Rural Cellular Corporation		Infrastructure	Wireless
Rural Cellular Corporation		Infrastructure	Wireless

Table 8: Hazardous Materials

Date: 4/30/2025
Project: C:\Users\henry\Southwest Region Planning Commission\SWRPC File Share - Documents\GIS Data\Projects2024\Keene\Hazard Mitigation Plan\Hazard Mitigation Plan Update.aprx
Layout: 2025 Community Lifelines Map

APPENDIX F: OTHER ASSETS MAP

Please see the following page.

CITY OF
KEENE
NEW HAMPSHIRE

2025 HAZARD MITIGATION PLAN

OTHER CRITICAL FACILITIES & ASSETS MAP

Legend

Other Assets
Owl Hill
79-E District
Evacuation Routes
Wetland

0 0.25 0.5 0.75 1 Miles

0 1,000 2,000 3,000 4,000 Feet

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Surry Mountain Lake
Rodgers Pond
Goose Pond
Otter Brook Lake
Shadow Lake
Wilson Pond
Harvey Pond
Babbidge Reservoir
Spectacle Pond
Pistaeen Mountain
Spofford Lake

Name	Street	FEMA Asset
C&S Wholesale Grocers	Optical Ave	Economic Assets
Innerpac	1 Partition Pl	Economic Assets
Key Road Plaza	63 Key Rd	Economic Assets
Kohl's Plaza	480 West St	Economic Assets
Markem-Imaje Corporation	150 Congress St	Economic Assets
Monadnock Marketplace	Ash Brook Rd	Economic Assets
National Grange Mutual Insurance	West St	Economic Assets
New Hampshire Forge	15 Forge St	Economic Assets
Precitech	44 Black Brook Rd	Economic Assets
Riverside Plaza	360 Winchester St	Economic Assets
Sims Portex	10 Bowman Dr	Economic Assets
The Center at Keene	149 Emerald St	Economic Assets
Timken Super Precision	7 Optical Ave	Economic Assets
West Street Shopping Center	401 West St	Economic Assets
Alumni Field	Arch St	Natural, Historic & Cultural Resources
American Legion Fields	797 Court St	Natural, Historic & Cultural Resources
Ashuelot River Park	273 West St	Natural, Historic & Cultural Resources
Beech Hill Recreation Area	Chapman Rd	Natural, Historic & Cultural Resources
Bretwood Golf Course	East Surry Rd	Natural, Historic & Cultural Resources
Catherine Fiske Seminary for Young Ladies	251 Main St	Natural, Historic & Cultural Resources
City Skate Park	Carpenter St	Natural, Historic & Cultural Resources
City Tennis Courts	Knight St	Natural, Historic & Cultural Resources
Drummer Hill Recreation Area	Drummer Hill Rd	Natural, Historic & Cultural Resources
Franklin Field	217 Washington St	Natural, Historic & Cultural Resources
Fuller School Fields	422 Elm St	Natural, Historic & Cultural Resources
Goose Pond Nature Preserve	East Surry Rd	Natural, Historic & Cultural Resources
Horatio Colony Preserve	Daniels Hill Rd	Natural, Historic & Cultural Resources
Jonathan Daniels Playground	Maple Ave	Natural, Historic & Cultural Resources
Keene Country Club Golf Course	755 West Hill Rd	Natural, Historic & Cultural Resources
Keene High School Athletic Fields	43 Arch St	Natural, Historic & Cultural Resources
Keene Ice	380 Marlboro St	Natural, Historic & Cultural Resources
Keene Middle School Athletic Field	17 Washington St	Natural, Historic & Cultural Resources
Keene Recreation Center	312 Washington St	Natural, Historic & Cultural Resources
Keene State College Athletic Complex	Krif Rd	Natural, Historic & Cultural Resources

Name	Street	FEMA Asset
Keene State College Athletic Field	Main St	Natural, Historic & Cultural Resources
Ladies Wildwood Park	Park Ave	Natural, Historic & Cultural Resources
Mayor Patricia Russell Park	Carpenter St	Natural, Historic & Cultural Resources
O'Neal Field at Wheelock Park	101 Park Ave	Natural, Historic & Cultural Resources
Otter Brook Recreation Area	Route 9	Natural, Historic & Cultural Resources
Owl Stadium	Krif Rd	Natural, Historic & Cultural Resources
Redfern Arts Center at Brickyard Pond	229 Main St	Natural, Historic & Cultural Resources
Robin Hood Park	Reservoir St	Natural, Historic & Cultural Resources
Shadow Lake Park	Kendall Rd	Natural, Historic & Cultural Resources
Stearns Hill Nature Preserve	Hurricane Rd	Natural, Historic & Cultural Resources
Symonds Field	79 Park Ave	Natural, Historic & Cultural Resources
Water St. Basketball Court	152 Water St	Natural, Historic & Cultural Resources
Wheelock Park	101 Park Ave	Natural, Historic & Cultural Resources
America House	197 Water St	People
Ash Brook Apartments	191-195 Key Rd	People
Autumn Leaf Village	17 Ivy Dr	People
Bennett Block	32 Washington St	People
Brookbend East	27 Ivy Dr	People
Brookbend West	82 Meadow Rd	People
Cedarcrest	91 Maple Ave	People
Central Square Terrace	5 Central Square	People
City Side Housing	92 Water St	People
Cleveland Building	21 Roxbury St	People
Cleveland Place	21 Roxbury Plz	People
Colony Mill	222 West St	People
Covenant Living	95 Wyman Rd	People
Forest View Apartments	8 Harmony Ln	People
Genesis	677 Court St	People
Harper Acres	104 Castle St	People
Holiday Inn Express	175 Key Rd	People
Hundred Nights Shelter	122 Water St	People
Keene Eastside Senior Housing	111 Railroad St	People
Keene Highland Housing	11 Citizen Way	People
Langdon Place	136A Arch St	People

Name	Street	FEMA Asset
Meadow Road Apartments	74 Meadow Rd	People
North and Gilsum Street Apartments	28 North St	People
Railroad Square Senior Housing	49 Community Way	People
Stone Arch Family Housing	829 Court St	People
Stone Arch Senior Housing	835 Court St	People
Valley Green Motel	379 West St	People
Westmill Senior Housing	110 Railroad St	People
Westwood Harborside	298 Main St	People
Ahavas Achim Synagogue	Hastings Ave	Structures
American Legion Post 4	797 Court St	Structures
Antioch University New England	40 Avon St	Structures
Assembly of God	121 Park Ave	Structures
Beaver Mills	93-115 Railroad St	Structures
Castle Center	312 Marlboro St	Structures
Cedarcrest Private School	91 Maple Ave	Structures
Cheshire Career Center	43 Arch St.	Structures
Cheshire Childrens Center	130 Martell Ct	Structures
Cheshire County Courthouse	12 Court St	Structures
Cheshire County Historical Society	246 Main St	Structures
Children's Learning Center	548 Court St	Structures
Church of Jesus Christ of Latter Day Saints	130 Summit Rd	Structures
Church of the Nazarene	55 Maple Ave	Structures
Colonial Theater	95 Main St	Structures
Colony's Block	4-7 Central Square	Structures
Cynthia King's FDC	56 Woodbury St	Structures
Dinsmoor-Hale House	Main & Winchester St	Structures
Douglas Cuddle Toys Factory	Krif Rd	Structures
Dr. Daniel Adams House	324 Main St	Structures
Elks Lodge	81 Roxbury St	Structures
Elliot Mansion	305 Main St	Structures
First Baptist Church	105 Maple Ave	Structures
Footsteps Day care & Learning Center	407 Winchester St	Structures
Footsteps Day Care & Learning Center	130 Martell Court	Structures
Franklin Elementary School	217 Washington St	Structures

Name	Street	FEMA Asset
Franklin Pierce College Annex	17 Bradco St	Structures
Gathering Waters Charter School (Lower)	98 South Lincoln St	Structures
Gathering Waters Charter School (Upper)	31 Washington St	Structures
Grace United Methodist Church	34 Court St	Structures
Great Beginnings Infant & Toddler Program	39 Old Homestead Hwy	Structures
Growing Minds Preschool and Daycare	69 Washington St	Structures
Head Start	64 Dunbar St	Structures
Home Depot	22 Ash Brook Rd	Structures
John H. Fuller Elementary School	422 Elm St	Structures
Jonathan Daniels Preschool	193 Maple Ave	Structures
Kathy Lehrman Family Child Care	105 Old Walpole Rd	Structures
Keene Day Care Center	86 Wood St	Structures
Keene Day Care Center, Inc.	312 Washington St	Structures
Keene Family YMCA	200 Summit Rd	Structures
Keene High School	43 Arch St	Structures
Keene Middle School	167 Maple Ave	Structures
Keene Montessori School	125 Railroad St	Structures
Keene Montessori School	125 Railroad St	Structures
Keene Public Library	60 Winter St	Structures
Keene Senior Center	70 Court St	Structures
Keene State College CDC	229 Main St	Structures
Keene State College Spaulding Gym	102 Appian Way	Structures
Kids R People 2	28 Greenbrier Rd	Structures
Knights of Columbus	372 Marlboro St	Structures
KSC Child Development Center	229 Main St	Structures
Loyal Order of Moose	Park Ave	Structures
MC2 Charter School	310 Marlboro St	Structures
Montessori Schoolhouse of Cheshire County	28 Hurricane Rd	Structures
Montessori Schoolhouse of Cheshire County	28 Hurricane Rd	Structures
Mt Prospect Academy	31 Washington St	Structures
Noah Cooke House	Daniels Hill Rd	Structures
Oddfellows Lodge	181 Marlboro St	Structures
Order of Eagles Lodge	115 Church St	Structures

Name	Street	FEMA Asset
Our Lady of Mercy	161 Main St	Structures
Rise for Baby and Family	147 Washington St	Structures
River Valley Community College	88 Winchester St	Structures
Sapling Acres Preschool	90 Base Hill Rd	Structures
Sawyer Tavern	63 Arch St	Structures
Scientist Church of Christ	74 Washington St	Structures
Sophia's Hearth	700 Court St	Structures
Southwest Fire Mutual Aid	32 Vernont St	Structures
Southwestern Community Services	63 Community Way	Structures
Spring Hill Children's Center	424 Old Walpole Rd	Structures
Spring Hill Children's Center	424 Old Walpole Rd	Structures
St George Greek Orthodox Church	70 West St	Structures
St. Bernard's Church	173 Main St	Structures
St. James Episcopal Church	44 West St	Structures
St. Joseph School	92 Wilson St	Structures
St. Margaret Mary Catholic Church	33 Arch St	Structures
Sturtevant Chapel	15 Washington Ave	Structures
Sue's House	22 Eastern Ave	Structures
Surry Village Charter School	146 School St	Structures
Symonds School	79 Park Ave	Structures
The Hope Chapel	667 Main St	Structures
Trinity Christian Church	100 Maple Ave	Structures
Trinity Christian School	100 Maple Ave	Structures
UCC Nursery	23 Central Sq	Structures
Unitarian Universalist Church	69 Washington St	Structures
United Church of Christ	23 Central Sq	Structures
United Church of Christ	23 Central Sq	Structures
VFW Post 799	459 Winchester St	Structures
West Keene Church of Christ	12 Arch St	Structures
Wheelock School	24 Adams St	Structures
Wyman Tavern Museum	339 Main St	Structures

Date: 4/24/2025
Project: C:\Users\henry\Southwest Region Planning Commission\SWRPC File Share - Documents\GIS Data\Projects\2024\Keene\Hazard Mitigation Plan\Hazard Mitigation Plan Update.aprx
Layout: 2025 Other Assets Map

APPENDIX G: PAST AND POTENTIAL HAZARDS MAP

Please see the following page.

CITY OF

KEENE

NEW HAMPSHIRE

2025 HAZARD MITIGATION PLAN

PAST AND POTENTIAL HAZARDS MAP

Legend

Past and Potential Hazards
- Flood
- High Wind
- Lightning
- Wildfire
- Dam Failure

NH Flood Hazard Geodatabase

Tornado Tracks

Dams (Active Status)

Hazard Classification
- High
- Significant
- Low
- Non-Menace
- Minnewawa Dam Innundation Area (100 year flood with breach)

Preliminary Flood Hazard Zones
- Regulatory Floodway
- 1% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Building on Parcel Partially within Special Flood Hazard Area
- Tax Parcel Partially or Entirely within Special Flood Hazard Area
- Wetland

0 0.13 0.25 0.5 0.75 1 Miles

0 500 1,000 2,000 3,000 4,000 Feet

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SY FIRE POND DAM
ANDERSON POND DAM
FIRE POND DAM
PIG PEN POND DAM
WILDLIFE POND DAM
RECREATION POND DAM
SURRY MOUNTAIN DAM
RODGERS POND DAM
NAMELESS BROOK DAM
WOODGATE DET POND DAM
GOOSE POND DAM
GOOSE POND DIKE
THREE MILE RESERVOIR DAM
FLOOD NOT APPLICABLE POTENTIAL
2652
HIGH WIND 2024 PAST AND POTENTIAL
FLOOD 2012 PAST AND POTENTIAL
HIGH WIND 2024 PAST AND POTENTIAL
FLOOD 2005 PAST AND POTENTIAL
1907
WRIGHT ESTATE DET POND 3 DAM
KATE TYLER RAVINE DAM
KATE TYLER RAVINE DAM
WILDFIRE NOT APPLICABLE POTENTIAL
2650
2649
OTTER BROOK DAM
FLOOD 2005 PAST AND POTENTIAL
FLOOD 2012 PAST AND POTENTIAL
WILSON POND DAM
FLOOD 2005 PAST AND POTENTIAL
DET POND 1 DAM
DET POND 2 DAM
FARM POND DAM
ASHUELOT RIVER DAM
1904
LIGHTNING 6/23/24 PAST AND POTENTIAL
1908
2962
DAM FAILURE NOT APPLICABLE POTENTIAL
ROBINHOOD PARK RESERVOIR DAM
1. Green Acres Rd
2. Evans Cir
3. Reservoir St
4. Carpenter St
5. Dunbar St
6. Fitch Ct
7. Lynwood Ave
1908
1905
FLOOD 7/18/21 PAST AND POTENTIAL
3019
2631
DAM FAILURE NOT APPLICABLE POTENTIAL
3646
2970
2969
2648
2976
2726
FLOOD 2012 PAST AND POTENTIAL
3647
FLOOD 2012 PAST AND POTENTIAL
FARM POND DAM
ROARING BROOK DAM
BABBIDGE RESERVOIR DAM
ROARING BROOK DAM
3018
1905
FLOOD 2005 PAST AND POTENTIAL
DAM FAILURE NOT APPLICABLE POTENTIAL
2975
2978
BRANCH RIVER DAM
LIGHTNING 7/8/2020 PAST AND POTENTIAL
UPPER WILSON POND DAM
DAM FAILURE NOT APPLICABLE POTENTIAL
WATER STREET DAM
TORNADO (1986-06-16)
LOWER WILSON POND DAM

Table 1: Past and Potential Hazards

Hazard	Location	Description	Status	Date	Source
Dam Failure	Otter Brook Dam (126.10)	100 YEAR FLOOD WITH BREACH	Potential	Not applicable	NHDES Dam Bureau
Dam Failure	Robinhood Park Reservoir Dam (126.25)		Potential	Not applicable	NHDES Dam Bureau
Dam Failure	Robinhood Park Reservoir Dam (126.25)	100 YEAR BREACH	Potential	Not applicable	NHDES Dam Bureau
Flood	Pako Ave, Laura Ln, Colonial Dr	2012 Flood	Past and Potential	2012	City of Keene
Flood	Beaver St south to Marlboro St	2012 Flood	Past and Potential	2012	City of Keene
Flood	South of Water St near Myrtle St	2012 Flood	Past and Potential	2012	City of Keene
Flood	North of Maple Ave west of Park Ave	2012 Flood	Past and Potential	2012	City of Keene
Flood	Tanglewood including Starling St	2005 Flood	Past and Potential	2005	City of Keene
Flood	North of Maple Ave west of Park Ave	2005 Flood	Past and Potential	2005	City of Keene
Flood	South of Arch St and Hurricane Rd	2005 Flood	Past and Potential	2005	City of Keene
Flood	Beaver Brook, Key Rd, south of NH 101	2005 Flood	Past and Potential	2005	City of Keene
Flood	NH 9 east of Sullivan Rd	Flood risk	Potential	Not applicable	2024 Public Workshop
Flood	Church St	Flooding	Past and Potential	7/18/21	Social media
High Wind	Tanglewood	Wind damage	Past and Potential	2024	Planning Team
High Wind	Washington St Extension	Wind damage along Washington St Ext	Past and Potential	2024	2024 Public Workshop
Lightning	Colony Mill Apartments	Lighting strike	Past and Potential	6/23/24	Social media
Lightning	Airport building	Lightning strike	Past and Potential	7/8/2020	WMUR
Wildfire	In the vicinity of Jordan Rd and Nims Rd	Fire risk to wooded area	Potential	Not applicable	2024 Public Workshop Comment

Table 2: NH Flood Hazard Geodatabase

FID	Source	Location	FloodDesc	Frequency	FloodDate	FloodType	FloodPeriod	Impact	CrossType	MitAction
1904	Keene Haz Mit Plan 2013	Keene	Located in topographic "bowl," at base of 12 steep rivers from 6 subwatersheds, frequent inundation-rain and snowmelt, hydraulic control dj's	Frequently	None	Flood	Past/potential	High	None	NA
1905	Keene Haz Mit Plan 2013, 2018	Keene	Area in downtown and south to Swanzey line most prone to major flooding	Frequently	None	Flood	Past/potential	High	None	NA
1906	Keene Haz Mit Plan 2013, NWS LSR 9/12/13	Church Street	(September 2004) Localized flooding on Church Street; (9/12/13) 10 inches of street flooding on Church Street	5-10 years	2004-09, 2013-09-12	Road flood	Past/potential	High	Culvert	Repeated repairs
1907	Keene Haz Mit Plan 2013, 2018	Ashuelot River Floodplain	Prone to flooding of mobile home park, risk of floating tanks and debris; approximately 80 mobile homes affected in this area, some work toward a plan has been developed to assess the risks to these properties between the 2013 and 2018 hazard mitigation	Unknown	None	Flood	Past/potential	High	Bridge	Unknown
1908	Keene Haz Mit Plan 2013	Beaver Brook	Brook contains bridge crossings functioning as constrictions exacerbating flooding	Unknown	None	Flood	Past/potential	High	Bridge	Unknown
2646	Keene Haz Mit Plan 2018	Woodland Avenue	City experienced 5.8" of rain in 5 hours. Properties in this area experienced erosion and flooded basements.	Unknown	2013-09-12	Erosion	Past/potential	Unknown	Unknown type	Once repaired
2647	NWS LSR 2013, Keene Haz Mit Plan 2018	Eastern Avenue, Bellevue Street	City experienced 5.8" of rain in 5 hours. Properties in this area experienced erosion and flooded basements; (9/12/13) Eastern Avenue flooded and impassable in this area	Unknown	2013-09-12	Erosion	Past/potential	Unknown	Unknown type	Once repaired
2648	NWS LSRs 2013, Keene Haz Mit Plan 2018	Ralston Street	City experienced 2.5" of rain in 1 hour. Damage to pavement, shoulders and ditches from flood waters; (7/22/13) Ralston Street flooded with 3 feet of water; (9/12/13) Ralston Street closed because of flooding	3-5 years	2013-07-02, 2013-09-12, 2014-07-15	Road flood	Past/potential	Unknown	None	Once repaired
2649	Keene Haz Mit Plan 2018	Rule Street	City experienced 2.5" of rain in 1 hour. Damage to pavement, shoulders and ditches from flood waters.	Unknown	2014-07-15	Washout	Past/potential	Unknown	None	Once repaired
2650	Keene Haz Mit Plan 2018	Sullivan Street	City experienced 2.5" of rain in 1 hour. Damage to pavement, shoulders and ditches from flood waters.	Unknown	2014-07-15	Washout	Past/potential	Unknown	None	Once repaired
2651	Keene Haz Mit Plan 2018	Water Street	City experienced 2.5" of rain in 1 hour. Damage to pavement, shoulders and ditches from flood waters.	Unknown	2014-07-15	Washout	Past/potential	Unknown	Culvert	Once repaired
2652	Keene Haz Mit Plan 2018	Concord Road	City experienced 2.5" of rain in 1 hour. Damage to pavement, shoulders and ditches from flood waters.	Unknown	2014-07-15	Washout	Past/potential	Unknown	Culvert	Once repaired
2726	NWS Local Storm Report	Main Street at Water Street	(8/15/15) Water covering road at Main Street and Water Street at approximately 4 PM	Unknown	2015-08-15	Road flood	Past/potential	Unknown	Unknown type	Unknown
2962	NWS LSR 9/12/2013, 6/25/2014, 6/8/2021, 7/17/2021	Roxbury Street	(9/12/13) 10 inches of street flooding on Roxbury Street; (6/25/14) Impassable road on Roxbury Street because of flooding, with portions of street closed; (6/8/2021) Flooding/road closure at Roxbury and Dover Street; (7/17/21) Portion of Roxbury Street w	3-5 years	2013-09-12, 2014-06-25, 2021-06-08, 2021-07-17	Road flood	Past/potential	Unknown	Unknown type	Unknown
2969	NWS Local Storm Report 7/9/13	Davis Street	(7/9/13) Davis Street flooded, with car stranded.	Unknown	2013-07-09	Road flood	Past/potential	Unknown	None	Unknown
2970	NWS LSR 9/12/13, 7/15/14	Woodland Avenue	(9/12/13) Woodland Avenue flooded and impassable, then closed because of washout; (7/15/14) Woodland Avenue flooded and impassable	3-5 years	2013-09-12, 2014-07-15	Road flood	Past/potential	Unknown	None	NA
2975	NWS Local Storm Report 9/12/2013	Swanzey Factory Road	(9/12/13) Swanzey Factory Road flooded and impassable	Unknown	2013-09-12	Road flood	Past/potential	Unknown	None	Unknown
2976	NWS Local Storm Report 9/12/2013	Blake Street	(9/12/13) 6 inches of water on Blake Street, with ambulance and fire department responding to rescue on this street	Unknown	2013-09-12	Road flood	Past/potential	Unknown	None	Unknown
2978	NWS LSR 1018/2005	NH Route 101	(10/8/05) NH Route 101 in vicinity of Branch Road closed because of mudslide	Unknown	2005-10-08	Landslide	Past/potential	High	None	Once repaired
3018	Town Storm Damage Reports (Social Media)	Key Road at Ivy Drive	(7/18/21) Flooding at intersection of Key Road and Ivy Drive that affected nearby businesses	Unknown	2021-07-18	Road flood	Past/potential	Unknown	None	NA
3019	Town Storm Damage Reports (Social Media)	Carpenter Street at Kingsbury Street	(7/18/21) Flooding at Intersection of Carpenter Street and Kingsbury Street	Unknown	2021-07-18	Road flood	Past/potential	Unknown	None	NA

Date: 4/30/2025
Project: C:\Users\henry\Southwest Region Planning Commission\SWRPC File Share - Documents\GIS Data\Projects2024\Keene\Hazard Mitigation Plan\Hazard Mitigation Plan Update.aprx
Layout: 2025 Past and Potential Hazards Map

APPENDIX H: PROJECT STATUS SHEET

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

Mitigation Action	Status	Explanation of Status	Effectiveness • Outstanding • Exceeds Expectations • Meets Expectations • Needs Improvement • Unacceptable	Rationale

APPENDIX I: LOCAL MITIGATION PLAN REVIEW TOOL

Please see the completed Local Mitigation Plan Review Tool on following pages.

Replace with completed local mitigation plan review tool (after FEMA approval).