

CERTIFICATE OF ADOPTION
February 24, 2025
TOWN OF Thetford, Vermont Selectboard
A RESOLUTION ADOPTING THE TOWN OF THETFORD, VERMONT 2024 LOCAL HAZARD MITIGATION PLAN

WHEREAS, the Town of Thetford has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of the hazards profiled in the **Town of Thetford, Vermont 2024 Local Hazard Mitigation Plan**, which result in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Thetford has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its **Town of Thetford, Vermont 2024 Local Hazard Mitigation Plan (Plan)** under the requirements of 44 CFR 201.6; and

WHEREAS, the **Plan** specifically addresses hazard mitigation strategies, and **Plan** maintenance procedures for the Town of Thetford; and

WHEREAS, the **Plan** recommends hazard mitigation actions (projects) that will provide mitigation for specific natural hazards that impact the Town of Thetford with the effect of protecting people and property from loss associated with those hazards; and

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

RESOLVED by Town of Thetford Selectboard:

1. The **Town of Thetford, Vermont 2024 Local Hazard Mitigation Plan** is hereby adopted as an official plan of the Town of Thetford;
2. The respective officials identified in the mitigation action plan 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 part of this resolution for a period of five (5) years from the date of this resolution; and
4. An annual report on the process of the implementation elements of the Plan will be presented to the Selectboard by the Emergency Management Director or Coordinator.

IN WITNESS WHEREOF, the members of the Selectboard of Thetford have affixed their signature this 24th day of February 2025.

ATTEST

Tracy Borst
Town Clerk

DeHaskoy Selectboard Chair
David Hodder Selectboard Member
Chris Steep Selectboard Member
Sam Forbes Selectboard Member
_____ Selectboard Member



FEMA

April 16, 2025

Stephanie A. Smith, Hazard Mitigation Section Chief | State Hazard Mitigation Officer
Vermont Emergency Management
45 State Drive
Waterbury, Vermont 05671-1300

Dear Stephanie Smith:

As outlined in the FEMA-State Agreements for FEMA-4744-DR-VT, FEMA-4720-DR-VT, FEMA-4695-DR-VT, FEMA-4621-DR-VT, FEMA-4532-DR-VT, and FEMA-4474-DR-VT, your office has been delegated the authority to review and approve local mitigation plans under the Program Administration by States Pilot Program. Our Agency has been notified that your office completed its review of the *Town of Thetford, Vermont 2024 Local Hazard Mitigation Plan* effective **April 16, 2025** through **April 15, 2030** in accordance with the planning requirements of the Robert T. Stafford Relief and Emergency Assistance Act (Stafford Act), as amended; the National Flood Insurance Act of 1968, as amended; the National Dam Safety Program Act, as amended; and Title 44 Code of Federal Regulations (CFR) Part 201.

Mitigation plans may include additional content to meet Element H: Additional State Requirements or content the local government included beyond applicable FEMA mitigation planning requirements. FEMA approval does not include the review or approval of content that exceeds these applicable FEMA mitigation planning requirements.

With this plan approval, the Town of Thetford, VT is eligible to apply to the Vermont Emergency Management for mitigation grants administered by FEMA. Requests for funding will be evaluated according to the eligibility requirements identified for each of these programs. A specific mitigation activity or project identified in this community's plan may not meet eligibility requirements for FEMA funding; even eligible mitigation activities or projects are not automatically approved.

The plan must be updated and resubmitted to the FEMA Region 1 Mitigation Division for approval every five years to remain eligible for FEMA mitigation grant funding.

Stephanie A. Smith, Hazard Mitigation Section Chief | State Hazard Mitigation Officer
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Thank you for your continued commitment and dedication to risk reduction demonstrated by preparing and adopting a strategy for reducing disaster losses. Should you have any questions, please contact Alexis Meehan at (202) 394-6439 or Alexis.Meehan@fema.dhs.gov.

Sincerely,

Christopher Markesich
Floodplain Management and Insurance Branch Chief
Mitigation Division | DHS, FEMA Region 1

cc: Caroline Paske, State Hazard Mitigation Planner, VEM
Matthew Hand, State Hazard Mitigation Planner, VEM
Richard Verville, Mitigation Division Director, DHS, FEMA Region 1
Alexis Meehan, Community Planner, DHS, FEMA Region 1

Town of Thetford, Vermont
2024 Local Hazard Mitigation Plan

***Prepared by the Two Rivers-Ottawaquechee Regional Commission and
the Town of Thetford***

Date of Town Adoption: 2/24/2025

Date of Final Approval by FEMA: 4/16/2025

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I. Introduction

Natural and human-caused hazards may affect a community at any time. Natural hazard events cannot be stopped; however, their impact on human life and property can be reduced through community planning. Accordingly, this Plan seeks to provide an all-hazards mitigation strategy that will make the community of Thetford more disaster resistant.

“Mitigation” is defined as any sustained action that reduces or eliminates long-term risk to people and property from natural and human-caused hazards and their effects. Previous Federal Emergency Management Agency (FEMA), State and Regional Project Impact efforts have demonstrated that it is less expensive to anticipate disasters than to repeatedly ignore a threat until the damage has already been done. While hazards cannot be eliminated entirely, it is possible to identify prospective hazards, anticipate which might be the most severe, and recognize local actions that can be taken ahead-of-time to reduce the damage. These actions, also known as ‘hazard mitigations strategies’ can (1) avert the hazard by redirecting its impact by means of a structure, land treatment, or land use pattern change (2) adapt to the hazard by modifying structures or standards or, (3) avoid the hazard through improved public education, relocating/removing buildings in the flood zone, or ensuring development is disaster resistant.

II. Purpose of the Plan

The purpose of this Local Hazard Mitigation Plan is to assist Thetford in identifying all hazards facing the town, to rank them according to local vulnerabilities, and to identify strategies to begin reducing risks from vulnerabilities of highest concern. Implementation of this Plan will make our community more resistant to harm and damages in the future and reduce public costs.

The Town of Thetford's Plan seeks to be in accordance with the strategies, goals, and objectives of the State Hazard Mitigation Plan.

The 2024 Thetford Local Hazard Mitigation Plan updates the Local Hazard Mitigation Plan that was approved in July of 2017. This new Plan is organized identically to the previous plan.

Old assumptions have been challenged throughout and new information has been added to make the plan stronger and more useful for those Thetford town officials and residents who will implement the hazard mitigation strategies in the future.

III. Community Profile

The Town of Thetford is located along the western bank of the Connecticut River and consists of 44.2 square miles. It borders the towns of Fairlee and West Fairlee to the North, Norwich to the South, and Strafford to the west. To the east, Thetford borders the Connecticut River and Lyme, New Hampshire. The Town is situated just north of the confluence of the Ompompanoosuc and Connecticut Rivers. Its boundaries cut a swath of land, which rises from fertile river bottom through a markedly varied terrain: a physiographic mix of steep slopes, swampy lowlands, small ponds and upland terraces. The Town contains a large portion of the Main Stem and the West Branch of the Ompompanoosuc River.

According to the U.S. Census Bureau, Thetford's 2020 population was 2,775 compared to 2,588 in 2010, representing a 7.2% increase in the Town's population. Between 2000 and 2010, there was a decrease in population of 1.1%. Between the years of 1990 and 2000, Thetford had a growth rate of 7.3%, and between 1990 and 1980 Thetford experienced a population increase of 11.43%. From 1970 to 1980 Thetford's population rapidly grew by 53.9% from 1,422 to 2,188 people. In 1990 there were 1,136 housing units in Thetford; by 2000, there were 1,193, an increase of 5%. As of 2010, there were a total of 1,288 housing units, which was an overall increase of 7.96% over the 2000 census. This increased modestly to 1,342 by 2020.

The Town lies within the service area of Green Mountain Power, which supplies electrical power to all sections of Town.

Structural fire protection within the Town is provided by the Thetford Volunteer Fire Department, Inc. (TVFD). The Town is assisted by mutual aid from 42 nearby towns. Forest fire protection is provided by the Town Forest Fire Warden, assisted by members of the Volunteer Fire Department. Fire dispatch services are provided by the Hanover Regional Emergency Communications Center.

Thetford has two fire stations – Thetford Hill Station and the Post Mills Station. The Thetford Hill Station is located on a half-acre site on Route 113 near the elementary school. The one-story structure was built in 1967 and expanded and remodeled in 1995. It consists of five bays, a large training/meeting room, kitchen, office and furnace room. The Thetford Volunteer Fire Department, Inc maintains the following vehicles: 3 Engines, 1 Rescue Truck, 1 Forestry Truck, 1 Rescue Trailer, and two 6-Wheeler ATVs. The Post Mills Station is located on a two-acre site on Route 244. The one-story concrete block structure contains a total of 1,296 square feet. It has two bays and an attic.

A major hindrance to effective fire protection within the town is the lack of an adequate means of water supply in some areas. The majority of properties in Thetford are within 3,000 feet of an existing water supply, however, many supplies are inadequate in summer, inaccessible in winter and/or do not have a dry hydrant installed. At the present time, Thetford is the only town on the west bank of the Connecticut River from Wells River to Hartford, which does not provide underground water mains for fire protection anywhere in town.

Medical emergencies are handled by the Thetford Volunteer Fire Department, Inc and patients are transported to the hospital by non-profit Upper Valley Ambulance, Inc. located in Fairlee. The closest hospital is Dartmouth-Hitchcock, located in Lebanon, NH. Medivac services are available by the DHART helicopter.

The Town of Thetford has a full-time Police Chief and full-time officers. Dispatching is being handled through the Vermont State Police dispatching center. Additional police protection and response to emergency situations are handled by the Vermont State Police, Troop "B" who operate out of the barracks in St. Johnsbury, and the Orange County Sheriff's Department who are dispatched from Chelsea, and police in neighboring communities.

IV. The Planning Process

A. Plan Developers

Connor Rigney, a Planner at the Two Rivers-Ottawaquechee Regional Commission (TRORC), assisted the Town of Thetford and its LHMP Committee with updating and developing its Local Hazard Mitigation Plan.

This section of the Plan satisfies 44 CFR 201.6(b)(1) and 201.6(c)(1) (or, A3.a and A3.b of FEMA’s Local Mitigation Plan Review Guide, 2011).

The LHMP Committee included:

Name	Role/Organization	How Participation Was Solicited
Sharon Harkay	Selectboard Chair	On March 14th, 2023, TRORC staff had a phone conversation with Bryan Gazda, who at that time was the town manager of Thetford. In this phone call, TRORC’s staff requested names and contact information for potential committee members to revise Thetford’s LHMP. Mr. Gazda responded with a number of names (Mariah Whitcomb, Michael Scruggs, Chad Whitcomb, Dale Lewis, Sharon Harkay, David Goodrich, and Lilian Shen; these officials and their roles are listed to the left). An introductory meeting was scheduled for March 28, 2023. TRORC staff continued to meet with the update committee until the Local Hazard Mitigation Plan was adopted by the Selectboard. See below section for meeting details.
Bryan Gazda	Thetford Town manager	
Mariah Whitcomb	Emergency Management Director	
Michael Scruggs	Police Chief	
Dale Lewis	Department of Public Works Foreman	
Angela Jones	Zoning Administrator	
David Goodrich	Selectboard Vice Chair	
Lilian Shen	Selectboard member	
Chad Whitcomb	Fire Chief	

B. Plan Development Process

The 2017 Thetford LHMP was approved by FEMA on August 9, 2017. This 2024 Plan is an update of the 2017 LHMP and will be a standalone LHMP to be submitted for individual approval to FEMA. As such, several sections have been updated to include all necessary information.

This section of the Plan satisfies the Element A: Planning Process requirements set out in 44 CFR 201.6.

The changes to this plan include:

- **General**

- Data updates: new hazard incidents, structure and property vulnerability, and the Town’s existing hazard mitigation efforts and resources;
- Hazards have been reevaluated;
- Status updates on mitigation strategies/actions identified in the 2017 Plan;
- Updates to the discussion of plan development process;
- New hazard mitigation strategies
- **Hazards Analysis**
 - Severe weather; flash flood / flood / fluvial erosion; extreme cold / snow / ice storm; hurricane / tropical storm; and hail storm remain on the list of “top hazards,” which reflect town officials’ beliefs that Thetford is still vulnerable to these hazards, and the Town’s intentions to continue mitigation planning for these hazards;
 - Changes to the “top hazards” list to better align with community concerns and priorities:
 - Hazardous material spill has been removed from the list of “top hazards” and infectious disease has been added to the list for reasons articulated in the “Hazard Identification” section of this plan.

The following represent the avenues taken to draft the Thetford Local Hazard Mitigation Plan:

- **Meetings**
 - 03/14/2023: TRORC spoke with Town manager Bryan Gazda regarding the upcoming LHMP update. From this conversation, TRORC was provided many names of town officials that were likely to have significant stake in the plan’s creation. Those names are enumerated above in the “Plan Developers” section. The same day, an introductory email was sent to this list.
 - 03/28/2023: The first meeting was held over Microsoft Teams. The agenda included:
 - An overview of the LHMP process
 - A formal ranking of the hazards
 - Updating the 2017 LHMP’s goals and strategies

This meeting was open to the public. There were no public comments received. The following committee members were in attendance: Bryan Gazda (Town Manager), Mariah Whitcomb (Emergency Management Director), and Sharon Harkay (Selectboard Chair).
 - 04/24/2023: TRORC met again with the LHMP committee. In this meeting, the committee reviewed the hazards deemed in the previous meeting to be the most pressing to the town. Also in this meeting, new strategies were developed to help mitigate coming hazards. The following committee members were in attendance: Bryan Gazda (Town Manager), Mariah Whitcomb (Emergency Management Director), Dale Lewis (Highway Foreman), and Sharon Harkay (Selectboard Chair). No public comments were received.
 - 06/19/2023: The LHMP committee met to review the first complete draft of the LHMP. This meeting was spent on information updates. The following committee members

were in attendance: Mariah Whitcomb (Emergency Director), Sharon Harkay (Selectboard Chair), and Michael Scruggs (Police Chief). No public comments were received.

- 07/17/2023: The LHMP committee held a public forum during the regularly scheduled Thetford Selectboard Meeting. The following individuals were present: Sharon Harkay (Selectboard Chair), David Goodrich (Selectboard), Mary Bryant (Selectboard), Brian Story (Town Manager), TRORC staff Connor Rigney and Sarah Wraight, Mariah Whitcomb (Emergency Management Director), Nolan Riegler (Energy Committee), Martie Betts (Selectboard Assistant), Bill Huff (community member). There were some clarifying questions asked about plan maintenance and emergency communication systems, and one suggestion to train emergency shelter volunteers. The suggestion was incorporated into the plan.
- **Governmental participation and involvement (44 CFR 201.6(b)(2))**
 - Note: Town officials were given the opportunity to review, provide feedback and approve the changes that were made through the initial Plan drafting process, and during Plan revision and FEMA review process. See previous section (“Meetings”) for the record of Selectboard, staff, and officials who participated in each meeting.
 - Kelly Gardner, who replaced Angela Jones as Thetford’s Zoning Administrator in August 2023, was consulted on permitting activity since the adoption of the previous local hazard mitigation plan. She provided data to demonstrate that recent development has not significantly increased the Town’s vulnerability to hazards.
 - The Chair of the Thetford Planning Commission, David Forbes, was invited on 8/9/2024 to review the revised draft plan and submit comments. No comments were received.
- **Public participation and involvement (44 CFR 201.6(b)(1))**
 - TRORC posted a notice in the Journal-Opinion alerting the public to the hazard mitigation planning process that was taking place. Contact information was provided in the notice to allow those interested in Thetford’s efforts to receive more information and how to find out about upcoming meetings. No public comments were received.
 - Journal-Opinion: 07/05/2023
 - July 2023: A notice was placed in the Two Rivers-Ottawaquechee Regional Commission Newsletter alerting recipients that Thetford was engaging in hazard mitigation planning and updating their Local Hazard Mitigation Plan. The newsletter is distributed to interested local government officials, organizations, and residents across a 30-town region in Vermont. Contact information was provided in the notice to allow those interested in Thetford’s efforts to receive more information and how to find out about upcoming meetings. A copy of the newsletter notice is appended to this Plan. No public comments were received.
 - The 7/17/2023 public forum was advertised on the Town’s website, Town listserv, and local bulletin boards. During the forum there were some clarifying questions asked about plan maintenance and emergency communication systems, and one suggestion to train emergency shelter volunteers. The suggestion was incorporated into the plan.

- On 8/9/2024, TRORC sent the revised draft to a variety of community stakeholders and provided contact information for receiving comments via email. Only one comment was received; a member of the Thetford Elementary School Board asked whether extreme heat events were addressed in the plan. TRORC responded that although extreme heat is not analyzed in the plan as a top hazard, it is addressed by the plan’s “all hazards” strategies. TRORC offered resources and options for planning specifically for extreme heat as part of a tabletop exercise or the annual Local Emergency Management Plan update. No edits were made to the plan in response to the Board member’s comment. The community stakeholders that received copies of the revised draft plan on 8/9/2024 included:
 - Community Nurse of Thetford
 - Thetford Elementary School Board
 - Open Fields School
 - Thetford Academy
 - First Congregational Church
 - Thetford Baptist Church
 - Post Mills Congregational Church
 - Thetford Food Shelf
 - Thetford After School Program, Inc.
 - Thetford Center Community Association
 - Cedar Circle Farm and Education Center
 - Baker Grocery Store
 - Long Wind Farm
 - Maple Leaf Day Care
 - Tammie’s Day Care
 - Country Bear Childcare
- **Neighboring community participation and involvement (44 CFR 201.6(b)(2))**
 - 7/30/2024: TRORC sent revised draft to neighboring towns’ Selectboards for comment and provided contact information for receiving comments via email. Only one comment was received from the Town of Fairlee Selectboard Chair, Peter Berger, who commended the plan and suggested that the former Thetford Town Manager’s name should be updated. This comment was not incorporated because the plan update process bridged the transition of leadership, so both names are retained in this plan.
 - Towns of: Fairlee (VT), West Fairlee (VT), Strafford (VT), Sharon (VT), Norwich (VT), Hanover (NH), Lyme (NH), Orford (NH).
- **Review of existing plans, studies, reports, and technical information (44 CFR 201.6(b)(3))**
 - State of Vermont Hazard Mitigation Plan, 2023
 - Thetford Hazard Mitigation Plan (Adopted July 31, 2017)
 - This Plan was referenced extensively during the update process, especially with regard to the worst threats and mitigation action strategies identified in 2017.
 - Thetford Zoning Bylaw (Effective February 12, 2024)

- This bylaw was referenced when analyzing hazard impacts for this plan, especially for flooding and fluvial erosion.
- Thetford Town Plan (Adopted September 11, 2020)
 - This Plan provided TRORC’s staff with background information on the community, as well as more detail on their emergency services.
- Thetford Subdivision Regulations (Effective June 28, 2021)
 - The Subdivision Regulations were referenced when analyzing hazard impacts for this plan, especially for flooding and fluvial erosion.
- Thetford Flood Hazard Area Bylaws (Adopted August 23, 2021)
 - The Bylaws were referenced when analyzing hazard impacts for this plan, especially for flooding and fluvial erosion.
- Thetford’s Local Emergency Management Plan (LEMP) (Last Adopted April 15, 2024)
 - This Plan provided TRORC’s staff with general information about Thetford’s emergency operations.

This section of the Plan satisfies 44 CFR 201.6(b)(3).

C. Status Update on Mitigation Actions Identified in 2017

The following table outlines the mitigation actions that were proposed in the 2017 Local Hazard Mitigation Plan for the Town of Thetford (adopted on July 31, 2017). Participants in the Plan update process reviewed those actions and reported on the status of each.

This section of the Plan satisfies the requirements of 44 CFR 201.6(d)(3).

Hazard(s) Mitigated	Hazard Mitigation Actions	2024 Status
All Hazards	<i>Install new dry hydrant at 1530 Latham Road to reduce the loss of life and infrastructure from structure fires.</i> (Mitigation).	Not completed. It was determined to be infeasible because it is located in a state-protected wetland.
	<i>Upgrade dry hydrant at 2829 Route 113 to reduce the loss of life and infrastructure from structure fires.</i> (Mitigation).	Completed.
	<i>Install new dry hydrant at 82 Bridge Road to reduce the loss of life and infrastructure from structure fires.</i> (Mitigation).	Not completed. It was determined that this project is not feasible.

Hazard(s) Mitigated	Hazard Mitigation Actions	2024 Status
All Hazards (continued)	<p><i>Purchase new Fire Engine to augment Fire Department's capacity to reduce the loss of life and property from structure fires.</i></p> <p><i>(Mitigation)</i></p>	Completed.
Flash Flood/Flood/ Fluvial Erosion/ Severe Summer Weather	<p><i>Stabilize bank and improve ditching on Robinson Hill Road. Stabilized bank will prevent sedimentation and erosion in Lake Fairlee and will protect town infrastructure from future damage from flooding and fluvial erosion.</i></p> <p><i>(Mitigation)</i></p>	Not completed. The Town decided to take an alternative, less costly approach to mitigate erosion: the Town is not weeding or landscaping along the roadway.
	<p><i>Improve ditching and stabilize banks to significantly reduce stream channel erosion on New Boston Road. This bank stabilization will protect town infrastructure from future damage from flooding and fluvial erosion and will improve the water quality of Lord Brook.</i></p> <p><i>(Mitigation)</i></p>	Completed. The Town ditched from the Strafford Town line to the Norwich Town line.
	<p><i>Improve ditching, stabilize erosion areas and culvert outlets, and upsize undersized culverts on Colby Road South. Improved road maintenance and culverts will reduce the impact on town infrastructure from fluvial erosion and flooding.</i></p> <p><i>(Mitigation)</i></p>	Completed.
	<p><i>Improve ditching and stabilize erosion areas on Barker Road. Improved road maintenance and culverts will reduce the impact on town infrastructure from fluvial erosion and flooding.</i></p> <p><i>(Mitigation)</i></p>	Completed.

Hazard(s) Mitigated	Hazard Mitigation Actions	2024 Status
	<p><i>Improve ditching, stabilize erosion areas, and upsize undersized culverts to improve drainage on Tefft Road. Improved road maintenance and culverts will reduce the impact on town infrastructure from erosion and flooding.</i></p> <p><i>(Mitigation)</i></p>	Completed.
	<p><i>Improve ditching, stabilize erosion areas, and install new culverts to improve drainage on Hauger Road. Improved road maintenance and culverts will reduce the impact on town infrastructure from fluvial erosion and flooding.</i></p> <p><i>(Mitigation)</i></p>	Completed.
Flash Flood/Flood/ Fluvial Erosion/ Severe Summer Weather	<p><i>Improve ditching, stabilize erosion areas, and install new culverts to improve drainage on Burnham Road. Improved road maintenance and culverts will reduce the impact on town infrastructure from fluvial erosion and flooding.</i></p> <p><i>(Mitigation)</i></p>	Completed.
(continued)	<p><i>Develop a schedule and capital budgeting program to replace undersized culverts. Upgraded culverts appropriately handle the hydraulic capacity of streams and therefore protect town infrastructure from flooding. (Mitigation)</i></p>	Completed. These are reviewed on a recurring basis.
	<p><i>Consider adopting river corridor regulations, which will incorporate VT ANR’s river corridor maps, helping residents and planners know what land is necessary for riparian functions and to prevent the threat to current and future development.</i></p> <p><i>(Mitigation)</i></p>	Completed. The Town decided not to regulate all lands within the state’s designated river corridor areas, but it did revise its zoning bylaw to establish setbacks from surface water bodies. The zoning bylaw was last updated in February 2024.

Hazard(s) Mitigated	Hazard Mitigation Actions	2024 Status
	<p><i>Complete an up-to-date geo-referenced culvert inventory, which will identify priority upgrade projects.</i></p> <p><i>(Mitigation)</i></p>	<p>Completed. A comprehensive update was completed in 2020. Culvert work is undertaken and documented on a continuous basis.</p>
<p>Flash Flood/Flood/ Fluvial Erosion/ Severe Summer Weather (continued)</p>	<p><i>Support projects to protect or restore, including riparian planting, strategic areas of floodplain to provide areas for flood storage, which will help alleviate peak flood flows and reduce the loss of property during a flood. (Mitigation)</i></p>	<p>Completed. Work has been done in the Taylor floodplain and is ongoing.</p>
	<p><i>Keep up-to-date with Vermont Road and Bridge Standards, which will help Thetford design structures that mitigate flood damage.</i></p> <p><i>(Mitigation)</i></p>	<p>Completed. The most recent standards were adopted by the Town on 7/1/2019.</p>
	<p><i>Request an updated flood map from FEMA, which will more accurately represent frequently flooded areas and will allow the town to properly monitor and restrict the construction of infrastructure in areas that are vulnerable to flooding and severe weather.</i></p> <p><i>(Mitigation)</i></p>	<p>Not Completed. The town expects to receive new flood maps from FEMA in 2024 or 2025.</p>
	<p><i>Continue efforts throughout Town to maintain and improve ditching in rights-of-way of Town maintained roads.</i></p> <p><i>(Mitigation).</i></p>	<p>Completed. This work is ongoing.</p>
<p>Extreme Cold/Snow/ Ice Storm</p>	<p><i>Clear and maintain town road rights-of-way to protect town infrastructure.</i></p> <p><i>(Mitigation)</i></p>	<p>Completed. This is an ongoing project during the snowy months.</p>
	<p><i>Encourage Green Mountain Power (GMP) to clear and maintain utility corridors, which will protect town and utility infrastructure. (Mitigation)</i></p>	<p>Completed. This is an ongoing project with GMP.</p>

Changes in Town Priorities and Vulnerabilities Since the 2017 Plan

This 2024 Thetford Hazard Mitigation Plan reflects the evolution of the Town of Thetford's priorities since 2017. Most of the "top hazards" identified in the 2017 Plan are retained in this plan, but there have also been some significant changes. Hazardous material spills were analyzed as a "top hazard" in the 2017 Plan, but are not examined here because the impacts are spatially limited and because adequate resources are already dedicated to mitigating the risk. Infectious disease has been added to the "top hazards" list in recognition of the harm and widespread disruption caused by the Covid-19 pandemic.

This 2024 Plan update also includes changes to the Town's mitigation strategies. New strategies were developed for each of the Town's "top hazards." One of the strategies from the 2017 plan that was not completed (updating the FEMA flood map) has been carried forward to this 2024 update because FEMA is expected to publish new maps in late 2024 or 2025. Most of the 2017 plan's mitigation strategies that were not completed are not included as strategies in this 2024 update. These are listed below, along with brief notes on why they were not included in the 2024 plan (for more details, see chart above):

- Install new dry hydrant at 1530 Latham Road. *(This was determined to be infeasible.)*
- Install new dry hydrant at 82 Bridge Road. *(This was determined to be infeasible.)*
- Stabilize bank and improve ditching on Robinson Hill Road. *(The Town decided to take an alternative approach to mitigate erosion.)*

From July 2017 through May 2024, there have been 243 permits for new construction in Thetford. Of these, 229 were for residential uses, 7 for commercial uses, 3 for municipal uses, and 4 for other civic / nonprofit uses. 38 permits were for the construction of primary residence structures, 10 permits were for the construction of accessory dwelling units, and 195 permits were for expansions of existing structures or the construction of accessory structures. Only 5 of these permits were for structures lying within the Special Flood Hazard Area (i.e., 100-year floodplain); these consisted of some small additions to existing structures and 2 accessory structures. These data suggest that the vulnerability of Thetford to flooding has not significantly increased since 2017. However, it should be noted that structures located outside of the flood hazard area might still be at risk in a 500-year flood, and they could be vulnerable to fluvial erosion. 11 of the permits issued between July 2017 and May 2024 were for structures located within state-designated "river corridors," areas that are at higher risk of fluvial erosion. All of these river corridor permits were for small additions to existing structures or accessory structures, which suggests that the vulnerability of Thetford to fluvial erosion has not significantly increased since 2017.

At the time of this Plan's drafting, there are no immediate plans for large-scale development in Thetford. Climate change impacts may change floodplain boundaries and increase flooding/erosion vulnerability within the Town. The strong focus on flooding and fluvial erosion in this updated Plan is consistent with the Town's understanding of its future vulnerability to these hazards. Since 2017, Thetford has completed a number of mitigation actions that have reduced its vulnerability to flooding and fluvial erosion:

- Ditching and bank stabilization on New Boston Road.

- Ditching, erosion area and culvert outlet stabilization, and upsizing culverts on Colby Road South, Tefft Road, Hauger Road, and Burnham Road.
- Ditching and erosion area stabilization on Barker Road.
- Riparian restoration projects in the Taylor floodplain.

D. Town Capabilities for Implementing Mitigation Strategies

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(3).

The Town of Thetford is currently engaged in the following ongoing hazard mitigation programs, projects and activities:

	Type of Existing Authority / Policy / Program / Action	Resources: Staffing & Funding	Ability to Expand/Improve on
Community Preparedness Activities	<p>Program—Annual update of Thetford’s Local Emergency Management Plan (LEMP).</p> <p>Last updated and approved on 04/15/2024.</p>	<p>Updated by the Emergency Management Director with support from Emergency Management Planning committee and Selectboard, with assistance from TRORC and funding from Vermont Emergency Management.</p>	<p>This document is reviewed and updated each year to ensure that the contact information of emergency response personnel is up-to-date. This information is then sent to Vermont Emergency Management for their records. The current program works well; there is no need to expand or improve on it.</p>
	<p>Completed Action— Designated Red Cross Shelter— located at the Thetford Elementary School. The secondary Red Cross shelter is the North Thetford Church. A regional Red Cross shelter is located in Hartford, VT.</p>	<p>Volunteer time from other emergency management personnel as well as town volunteers trained in shelter operations. Funding from American Red Cross.</p>	<p>This is a one-time action. There is no need to expand or improve on local shelters.</p>
	<p>Completed Action— Town officers certified in ICS-100 level Training (Introductory)</p>	<p>Volunteer time from town officials. Funding from FEMA.</p>	<p>There is a need for constant renewed training as elected officials change.</p>
	<p>Program— Participation/attendance in the Local Emergency Planning Committee District 12 (LEPC 12)</p>	<p>Volunteer time from the Thetford Emergency Management Director; meetings convened by TRORC. Funding from Vermont Emergency Management.</p>	<p>No need to expand or improve on attendance, as it is satisfactory.</p>

	Type of Existing Authority / Policy / Program / Action	Resources: Staffing & Funding	Ability to Expand/Improve on
Insurance Programs	<p>Authority/ Program—participation in National Flood Insurance Program (NFIP)</p> <p>The Town participates and complies with the NFIP through their enforcement of the Flood Hazard Area Bylaw, which was last adopted on 08/23/2021. The Town of Thetford first enrolled in NFIP on 6/3/1991.</p> <p>[Note: This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(3)(ii).]</p>	<p>The Town of Thetford’s Zoning Administrator, Kelly Gardner, enforces the Flood Hazard Area Zoning bylaw and serves as the NFIP administrator. Assistance from TRORC and Vermont ANR. Funding from local resources—annual budget.</p>	<p>Thetford’s initial Flood Insurance Rate Map was identified on 04/22/1977 and their current Flood Insurance Rate Map (FIRM) is dated 12/20/1999. The Town’s FIRM and Flood Insurance Study (FIS) has been updated, and the current effective date for both is 12/20/1999.</p> <p>The Flood Hazard Area Zoning Bylaw is kept up-to-date and regulates new development in the Special Flood Hazard Area (SFHA).</p>
Land Use Planning	<p>Policy/Program— Thetford Town Plan</p> <p>Adopted on 09/11/2020.</p>	<p>Volunteer time from the Planning Commission, and assistance from TRORC and other state agencies on specific subject matter. Funding from Municipal Planning Grants.</p>	<p>The Town Plan is reviewed/updated every eight years, as required by statute. The plan will be updated in 2028. There is a flood resilience chapter from pg. 63-67.</p>
	<p>Completed Authority – Thetford Zoning Bylaw</p> <p>Adopted 2/12/2024</p> <p>Thetford does not have local building codes. The zoning ordinance does regulate lighting, lot line and riparian setbacks. The state has established energy codes for residential and commercial structures, and safety codes for commercial structures.</p>	<p>Volunteer time from the Planning Commission, and assistance from TRORC and Vermont Agency of Natural Resources. Funding from Municipal Planning Grants.</p>	<p>During the Town Plan review/update period, the Thetford Zoning Bylaw is also reviewed and updated if needed. Currently, there is no need to expand or improve on these regulations.</p>

	Type of Existing Authority / Policy / Program / Action	Resources: Staffing & Funding	Ability to Expand/Improve on
	<p>Completed Authority—Thetford Flood Hazard Area Bylaws</p> <p>Last adopted on 08/23/2021.</p>	<p>Volunteer time from the Planning Commission, and assistance from TRORC and Vermont Agency of Natural Resources. Funding from Municipal Planning Grants.</p>	<p>During the Town Plan review/update period, the Flood Hazard Area Bylaws are also reviewed and updated if needed. Currently, there is no need to expand or improve on these regulations.</p>
	<p>Authority— Thetford Subdivision Regulations</p> <p>Effective June 28, 2021</p>	<p>Volunteer time from the Planning Commission. Funding from Municipal Planning Grants.</p>	<p>The Subdivision Regulations may be updated when deemed appropriate by the Selectboard. Currently, there is no need to expand or improve on these regulations.</p>
Hazard Control & Protection of Critical Infrastructure & Facilities	<p>Policy/Program— Thetford Hazard Mitigation Plan</p> <p>Adopted on 07/31/2017.</p>	<p>Updated with volunteer time from local officials and assistance from TRORC and Vermont Emergency Management (VEM). Funding from VEM/FEMA.</p>	<p>The 2024 Thetford Hazard Mitigation Plan will replace the 2017 Plan. Future iterations of the Town’s LHMP will be updated by the Town at least every five years.</p>
	<p>Authority— 2019 Town Road and Bridge Standards</p> <p>Adopted 07/01/2019</p>	<p>Adopted by the Selectboard, implemented by the Department of Public Works Foreman, and assistance from TRORC. Funding from VTrans and the local budget to implement.</p>	<p>The Town Road and Bridge standards specify minimum construction standards for roadway, ditches, culverts and bridges and guardrails. VTrans updates the Town Road and Bridge Standards on a fairly regular basis. The Town has the authority to require above-and-beyond what is written in the policy.</p>
	<p>Program—Culvert inventory completed in 2020 for the Town of Thetford</p> <p>This inventory includes georeferenced locations and attributes for all culverts/drop inlets in Thetford. The Town received targeted assistance in the culvert inventory and specific priority projects were identified.</p>	<p>Staff time from the Thetford Department of Public Works Foreman; assistance from TRORC. Funding from Better Roads grant; local personnel time.</p>	<p>The Town utilizes the culvert inventory to further its culvert mitigation improvement program, and seeking funding through various sources for implementation projects. Routine in-house updates occur on an on-going basis.</p>

	Type of Existing Authority / Policy / Program / Action	Resources: Staffing & Funding	Ability to Expand/Improve on
Education/ Public Outreach	Ongoing Action— The Town places emergency-related information, on the Emergency Management website, on the Fire Department website and facebook page.	Volunteer time from the Emergency Management Director and Fire Department personnel. Funding from local budgets.	This is an ongoing action, and there is no need to expand or improve on the use at this time.
	Ongoing action — The fire department conducts annual fire prevention and safety training for the elementary school grades Kindergarten to Grade 2. This training takes place during the annual Fire Prevention Week in October.	Volunteer time from Fire Department personnel. Funding through Fire Department budget.	This is an ongoing action. There is no need to expand or improve on it at this time.

E. Plan Maintenance

This Plan (the Thetford Local Hazard Mitigation Plan) will be updated and evaluated by discussing its effectiveness and making note to incorporate any necessary revisions in the update process. This update and evaluation will occur annually at an April Selectboard meeting along with the annual review of the Local Emergency Management Plan (LEMP). At this meeting, the Selectboard will monitor the implementation of the hazard mitigation and preparedness strategies outlined in this Plan by noting those that have been completed, and identifying the next steps required to implement the Plan's remaining strategies. Comments from local officials and the public will be incorporated when relevant. This meeting will constitute an opportunity for the public and other town officials to hear about the Town's progress in implementing mitigation strategies and to give input on future activities and Plan revisions. The public will be given the opportunity to comment at this meeting. Evaluation of the Local Hazard Mitigation Plan will consist of a thorough analysis of the status of mitigation and preparedness strategies and whether they are being implemented according to the time frames included in tables in this Plan. The Town of Thetford will evaluate the status of mitigation strategies to assess that goals of the Local Hazard Mitigation Plan are being met. Adherence to the mitigation, preparedness, and ongoing strategy implementation tables included in this Plan will constitute the degree of effectiveness of the Plan. The Town will also evaluate the status of vulnerabilities detailed in this Plan to evaluate their validity. The update of the Plan will bring up to date materials that have become outdated due to the passage of time. Thetford's Emergency Management Director will be the principal point of contact and will take primary responsibility for the monitoring, evaluation, and update process described here. He or she will bring the Plan's maintenance activities to the Selectboard's agenda and discussions.

Updates and evaluation of this Plan by the Selectboard and the local Emergency Management Director will also occur within three months after every federal disaster declaration directly impacting the Town of Thetford. The Town will monitor, evaluate and update this Local Hazard Mitigation Plan at an April Selectboard meeting and after every federally declared disaster directly impacting the Town according to the graphic in Appendix C. The Town shall reference the Local Hazard Mitigation Plan when working on Town Plan amendments or changes to the Town's bylaws.

This section of the Plan satisfies 44 CFR and 201.6(c)(4)(i), 201.6(c)(4)(ii), and 201.6(c)(4)(iii).

At least one year before the Plan expires, the update process will begin (through annual updates, monitoring of progress and evaluation that will occur at the April Selectboard meeting). For this next Plan update, the Two Rivers-Ottawaquechee Regional Commission (TRORC) will help with Plan updates if assistance is requested by the Town of Thetford and if funding is available. If TRORC is unable to assist the Town, the Emergency Management Director will update the Plan. Ultimately, it will be the Town's responsibility to update their Local Hazard Mitigation Plan.

The process of evaluating and updating the plan will include continued public participation through public notices posted on the municipal website, notice within the municipal building, notice in The

Journal Opinion, and notice on the TRORC newsletter, inviting the public to the scheduled Selectboard (or specially scheduled) meeting. The public will be given the opportunity to comment during this process. Additional stakeholders should be invited to the meeting; these include: area businesses and non-profit organizations, Thetford Volunteer Fire Department, INC., representatives from The Thetford Academy (middle and high school) and elementary school, and the Vermont Agency of Natural Resources (VT ANR). VT ANR will be invited because they can provide assistance with NFIP outreach activities in the community, models for stricter floodplain zoning regulations, delineation of river corridor areas, and other applicable initiatives. These efforts will be coordinated by the Emergency Management Director.

Updates will address changes in community mitigation strategies; new town bylaws, zoning and planning strategies if appropriate; progress on the implementation of initiatives and projects; effectiveness of implemented projects or initiatives; and evaluation of challenges and opportunities effectiveness in reducing town's vulnerabilities and meeting plan goals. If new actions are identified in the interim period, the plan can be amended without formal re-adoption during regularly scheduled Selectboard meetings.

Thetford shall also incorporate mitigation planning into their long-term land use and development planning documents. The 2017 Thetford LHMP provided guidance and development of the Thetford Municipal Plan, including directing goals, policies, and recommendations towards mitigating the effects of future hazards on health and property in the Town. The 2013 Vermont Legislature passed a law requiring all towns to incorporate flood resiliency elements into their town plans as of July 2014. To do so, flood hazard and river corridor areas were identified, and strategies and recommendations were provided to mitigate risks to public safety, critical infrastructure, historic structures and public investments. This Local Hazard Mitigation Plan will help the town to continue to comply with the community flood resiliency requirement for town plans.

The Town should review and incorporate elements of the Local Hazard Mitigation Plan into updates for the municipal plan and land use regulations. The Town shall also consider reviewing any future TRORC planning documents for ideas on future mitigation projects and hazard areas. During the Municipal Plan update process, the planning commission will review and consider incorporating mitigation actions and priorities described in this Local Hazard Mitigation Plan into Thetford's Municipal Plan. Mitigation strategies will directly influence goals, policies, and recommendations in future updates to the Thetford Town Plan. The incorporation of the goals and strategies listed in the Local Hazard Mitigation Plan into the municipal plan, zoning regulations, flood hazard bylaws, and subdivision bylaws will also be considered after declared or local disasters.

V. Community Vulnerability by Hazard

A. Hazard Identification

Mitigation efforts must be grounded in the rational evaluation of hazards to the area and the risks these hazards pose. This is done through a process, which in essence asks and answers three basic questions:

- What bad things can happen, given the Town’s vulnerabilities?
- How likely are they to occur?
- How bad could they be?

This process, which is laid out in the table below, is an attempt to inventory the known hazards, establish the likelihood of them occurring in the future, and then assess the community’s potential vulnerability to each. By performing this analysis, we are then able to prioritize actions that are designed to mitigate the effects of each of these hazard types and ultimately make Thetford a safer place.

It is important that we learn from the past in order to avoid repeating disasters. Disasters that have occurred within the Town of Thetford, the larger region, and the State of Vermont can give us good information about what types of hazards we can expect in the future and what kinds of damage they might cause. This historical data can inform our perspective of what might happen in the future, but it is by no means a prophecy. While Thetford might not have been impacted by a specific hazard in the past, this does not necessarily mean it will never be affected by that hazard in the future. Indeed, the advance of climate change means that old weather patterns may not hold. For instance, in recent years, Vermonters have seen an increase in the number and severity of storms, especially high intensity rainfall events. Armed with historical data and a healthy respect for climate change and the unknown, we have tried our best to identify hazards and prepare for the future.

The following table reflects the hazards that we believe can be expected, or are at least possible, in the central Vermont area. We have considered factors such as frequency of occurrence, warning time and potential community impact to rank each and determine which hazards pose the greatest threats to life and property in Thetford.¹ Frequency and potential impact characterizations take into account changes in the number and/or severity of some hazards as a result of climate change. The top threats (bolded in the table below) are then followed up with discussion and mitigation strategies throughout the rest of this Plan.² It should be noted that hazards assigned with the same “Hazard Score” are not in order and their placement in the table should not be assumed to reflect their potential to create hazards for the town.

¹ The ranking methodology used in this Plan (see Appendix A) is closely modeled on that which is used by Vermont Emergency Management (VEM) in the state hazard mitigation plan, though changes were made to reflect the more limited geographical scope of this analysis, Town capabilities for mitigation, and Town needs and priorities. The Hazard Score is the sum of the numerical values assigned to Frequency, Warning Time, and Potential Impact.

² It’s important to note that those hazards which were not found to pose the greatest threats may still occur in Thetford’s future; however, they are not the focus of this Plan. The Town has chosen to focus this plan on higher scoring hazards in an effort to maximize the benefits derived from investments in mitigation. For discussion of lower scoring hazards, refer to the Vermont State Hazard Mitigation Plan.

Hazard	Frequency of Occurrence	Warning Time	Potential Impact	Hazard Score
Severe Weather (Thunderstorm, Lightning, High Winds)	Highly Likely	None/Minimal	Minor	10
Flash Flood/Flood/Fluvial Erosion	Highly Likely	3-6 hours	Major	11
Extreme Cold/Snow/Ice Storm	Highly Likely	6-12 hours	Moderate	9
Hurricanes/Tropical Storms	Likely	6-12 hours	Major	9
Hail Storm	Likely	None/Minimal	Minor	9
Infectious Disease	Highly Likely	12+ hours	Major	9
Wildfire	Occasionally	None	Minor	8
Tornado	Occasionally	None/Minimal	Minor	8
Earthquake	Occasionally	None/Minimal	Negligible	7
Dam Failure (There are 2 High Hazard Potential Dams (HHPD) in Thetford, the Union Village Dam and the dam at the Elizabeth Mine.)	Unlikely	3-6 hours	Minor	6
Landslides/Mudslides	Occasionally	None/Minimal	Negligible	7
Ice Jams	Occasionally	6-12 hours	Minor	6
Invasive Species Infestation	Highly Likely	12+ hours	Minor	7
Extreme Heat	Highly Likely	12+ hours	Minor	7
Drought	Occasionally	12+ hours	Negligible	4
Avalanche (Thetford determined they do not receive enough snow build-up, nor do they have the exposures that create the possibility of avalanches.)	N/A	N/A	N/A	N/A

After engaging in discussions using their best available knowledge of past hazard events and reflecting on potential future conditions including climate change, Thetford’s hazard mitigation plan committee identified the highest-ranking hazards as “top hazards” that they believe present the largest risk to the community:

- **Severe Weather (Thunderstorm, Lightning, High Winds)**
- **Flash Flood/Flood/Fluvial Erosion**
- **Extreme Cold/Snow/Ice Storm**
- **Hurricanes/Tropical Storms**
- **Hail Storm**
- **Infectious Disease**

Hazardous material spills were analyzed as a “top hazard” in the 2017 Plan, but are not examined here because the impacts are spatially limited and because adequate resources are already dedicated to mitigating the risk. Infectious disease has been added to the “top hazards” list in recognition of the harm and widespread disruption caused by the Covid-19 pandemic.

Each of these top hazards will be discussed in the following sections. Within each section, previous occurrences of each hazard will be listed, including the County-wide FEMA Disaster Declarations (DR-#) when applicable. Hazards information was gathered from local sources (ex. town history book or local record), the National Climatic Data Center’s (NCDC’s) Storm Events Database (1950-2024), the Spatial Hazard Events and Losses Database for the United States (SHELDUS) 1960-2024, and Special Reports produced by the National Weather Service in Burlington, Vermont. Each section also includes a description of each top hazard and a hazard matrix that will include the following information (please see each hazard profile for a hazard-specific matrix):

Hazard	Location	Vulnerability	Extent	Impact	Likelihood/ Probability
Type of hazard	General areas in community that may be vulnerable to the hazard.	Community structures, systems, populations, or other assets as defined by the community that are susceptible to damage and loss from hazard events	The strength or magnitude and details of the most notable event(s).	Financial impact from an event and/or the number of structures that are impacted.	<p><u>Occasionally:</u> 1–10% probability of occurrence per year, or at least one chance in next 100 years</p> <p><u>Likely:</u> >10% but <75% probability per year, at least 1 chance in next 10 years</p> <p><u>Highly Likely:</u> >75% probable in a year</p>

B. Hazard Profiles for Hazards Posing Highest Vulnerabilities

1. Severe Weather (Thunderstorm, Lightning, High Winds)

Severe weather consists of thunderstorms, lightning, and intense winds. Often it consists of multiple events that combine to create hazardous conditions that pose a threat to communities in the State of Vermont and the Town of Thetford. Severe weather can be incredibly unpredictable. Severe thunderstorms usually tend to occur in the late spring and summer when temperatures are high, and they are sometimes accompanied by flooding, hail, or tornadoes.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Severe Weather (Thunderstorm, Lightning, High Winds)**.

Thunderstorms can generate high winds, such as hit the region on July 6, 1999, downing hundreds of large trees in a few minutes.

Over the years, Thetford has been hit with high winds that have downed and uprooted numerous trees, and knocked out electricity to residents in the Town.

Severe weather events are highly likely to occur in the future in Thetford. Precipitation trend analysis suggests that intense, local storms are occurring more frequently and will continue to do so in the future.

The following list indicates the history of occurrence with regard to this hazard in Orange County. Given the relatively small population of Thetford, town-specific data are limited. An asterisk (*) denotes those instances in which Town-specific data are available, and federal disaster numbers are listed when appropriate. In an attempt to capture the individual hazards that may arise, and the different circumstances caused by the hazards in concert, the separate hazards are documented in the table below.

History of Occurrences:

Severe Weather Date	Event			Location	Extent
	Thunderstorm / severe storm	High Winds	Lightning		
7/21/2022*	✓	✓		Thetford; County-wide	Scattered thunderstorms moved across the region, some producing damaging winds. Wind speed in Thetford was reported at 50 knots, and a tree fell on a utility line.
7/20/2021*	✓	✓		Thetford; County-wide	A line of thunderstorms hit Vermont in the evening with numerous reports of damaging winds. Wind speed in Thetford was reported at 50 knots. Several trees were downed in town.
11/1/2019*	✓	✓		Thetford/ Post Mills	A significant weather event with thunderstorms and high winds caused multiple trees and power lines to be

					affected closing numerous roads on the west side of Thetford for several days. Numerous homes were impacted with power outages for more than 5 days with power lines and tree removal taking more than 6 days to be completed due to the amount of damage. It was determined that the storm contained high straight-line winds impacting this area of town. Wind gusts exceeded 45 mph at times.
6/29/2017 - 7/1/2017* (DR-4330)	✓	✓	✓	Thetford	A significant line of thunderstorms impacted the area on 7/1/2017 with a "training storm event" bringing more than 4 inches of rain to Thetford in the space of 2 hours causing widespread flash flooding. More than 75% of all roads in Thetford sustained some damage with more than 50% being impacted significantly with limited or no access to residences. The EOC was open 24/7 for a period of 7 days and then moved to being open from 7-5pm with evening hours being managed through an on-call process. Wind speed data were not available for this event.
7/23/2016- 7/27/2016*	✓	✓		Thetford	Numerous thunderstorms traversed the region ahead of a cold front. A high wind storm lasted approximately 30 minutes and caused power outages in ¾ of the Town of Thetford. The storm caused extensive damage to power and phone lines that blocked many roads in Town, including Route 113 and Route 132. On 7/23 417 GMP customers were affected for 14.37 hours, 545 customers were affected for 9.6 hours, 59 customers were affected for 12 hours, and 564 customers were affected for nearly 24 hours. Power outages continued into 7/25 and 7/26. Wind speed was estimated at 69 mph.

7/18/2016*	✓	✓		<p>Thetford; County-wide</p> <p>Several rounds of thunderstorm developed ahead of a cold front and intensified when they reached Vermont. There were reports of wind damage to trees and utility lines. 1.5 inch in diameter hailstones were exhibited. Rainfall accumulation was not severe. 66 GMP customers were affected for 3 hours. Wind speed was estimated at 57 mph.</p>
9/11/2013*	✓	✓	✓	<p>Thetford, County-wide</p> <p>A weak area of low pressure embedded in an unseasonably warm and unstable air mass resulted in thunderstorms that moved across Vermont. Thunderstorms and high winds caused downed trees and utility lines. Thetford received 1.86 inches of rain in 96 hours. Widespread power outages occurred in Thetford, affecting 636 total customers on 9/11. 169 GMP customers lost power for 5.9 hours, 82 lost power for 8.5 hours, 111 lost power for 11.4 hours, 8 lost power for 21.4 hours, 62 lost power for 15.9 hours, 17 lost power for 22.4 hours, 14 lost power for 19 hours, 158 GMP customers lost power for 13.4 hours, and 13 GMP customers lost power 25 hours. Wind speed was estimated at 57 mph for this event.</p>
6/25/2013-7/11/2013* (DR-4140 VT)	✓	✓		<p>County-wide</p> <p>Severe storms over a nearly one-month period. Rains caused flooding in the region, winds downed trees, power outages were reported. On 7/5 80 GMP customers lost power for 3.18 hours, on 7/7 4 GMP lost power for 1 hour, on 7/8 14 GMP customers lost power for 1.4, and on 7/11 13 GMP customers lost power for 1.7 hours. In total, during the disaster period, Thetford received approximately 8 inches of rain. Wind extent data were unavailable for this event.</p>

6/2/2013 – 6/3/2013*	✓	✓		Thetford; County- wide	A very warm and humid air mass was located across Vermont. A strong mid-atmospheric disturbance, ahead of a cold front, moved across portions of Vermont and triggered widespread thunderstorms with pockets of damaging winds and large hail. Event caused tree damage and widespread power outages. At its peak, roughly 20k customers lost power. Thetford received .61 inches of rain in 24 hours. 148 total GMP lost power on 6/2. 85 customers lost power for 3 hours, 40 customers lost power for 5.6 hours, 12 lost power for 7.4 hours, and 11 lost power for 16.4 hours. Wind speed was estimated at 57 mph.
7/17/2012*	✓	✓		Thetford, County- wide	A west-east oriented cold front caused a series of weak areas of low pressure which resulted in numerous thunderstorms and damaging winds. Numerous roads in Thetford became impassible due to downed trees. Thetford experienced 1.22 inches of rain in 24 hours. Thetford experienced widespread power outages. 452 GMP customers lost power 9.72 hours, 132 GMP customers lost power for 12 hours, 272 GMP customers lost power for 6.5 hours, and 89 GMP customers lost power for 3 hours. Wind speed was reported at 50 knots in Thetford.
7/4/2012*	✓	✓	✓	Thetford, County- wide	A moderately strong upper level disturbance ahead of a surface cold front moved through Vermont on July 4. Storm caused widespread wind damage and frequent lighting. Several trees were downed along Route 5. Hailstones estimated at 1.5 inches in diameter fell. Thetford received .3 inches of rain in 24 hours. Wind speed was not recorded for Thetford, but was reported as 50 knots in nearby Newbury.

8/28/2011 (DR-4022 VT)*	✓	✓		County-wide	Tropical Storm Irene prompted widespread, devastating flooding throughout the region. Frequent wind gusts of 35 to 50 mph, especially in higher terrains, along with saturated soils caused widespread downed and uprooted trees. Thetford received 4-5 inches of rain in 48 hours. Thetford had \$22,799.26 in damages. Only minimal power outages occurred in Thetford with isolated incidents affecting singular GMP customers for short durations.
06/09/2011*	✓	✓		County-wide	Scattered thunderstorms and a few isolated reports of damaging winds and large hail were reported. Power outage and rainfall data were unavailable for this event. Wind speed was reported as 50 knots in Thetford. Numerous trees were downed in Thetford by high winds.
05/26/2011- 05/27/2011 (DR-4001 VT)	✓	✓		County-wide	Region struck by severe storms and flooding. Minimal damage occurred in Thetford. Thetford received .3 inches of rain in 24 hours. There were widespread power outages, though no data are available for Thetford. Wind speed was not recorded in Thetford, but was reported as 50 knots in nearby Brookfield.
07/21/2010	✓	✓		Thetford, County-wide	Thunderstorms hit the area along with high winds, developing into supercells that caused widespread damage to trees, power poles and structures. Golf ball-sized hail fell in Thetford. No significant rainfall or power outages occurred in Thetford. Wind speed was not reported for Thetford, but was reported as 60 knots in neighboring Fairlee and 55 knots in neighboring Strafford.
5/31/2009	✓	✓		County-wide	40-55mph wind gusts caused fallen trees and power outages in the region. Power outage and rainfall data were unavailable for this event.

9/12/2008*	✓			Thetford; County-wide	Thetford reported \$15,808.21 in damages. Storm history and extent data were unavailable.
7/21/2008- 8/12/2008 (DR-1790 VT)*	✓	✓		County-wide	Thunderstorms with heavy rainfall in a moist atmosphere moved through central and southern Vermont during the afternoon and evening hours. A few thunderstorms produced hail that ranged from .5 to .25 inches in diameter. Thetford received 2.6 inches of rain in 24 hours with an additional 1.22 inches of rain in the previous 24 hours. No significant power outages occurred. No wind speed data were available.
8/30/2007	✓	✓		Thetford; County-wide	A cold front moved through a warm and unstable air mass across southern and eastern Vermont. Severe thunderstorms produced widespread damaging winds that downed trees. Thetford's wind speed was not measured, but a wind speed of 50 knots was reported in neighboring Strafford.
07/09/2007- 07/11/2007 (DR-1715 VT)*	✓	✓	✓	Thetford; County-wide	An area of low pressure moved across Canada and south to Vermont causing thunderstorms, hail, winds, and lighting. Thetford experienced 1.65 inches of rain in 24 hours, but significant power outages did not occur. Wind speed was not measured in Thetford, but was reported at 50 knots in nearby Randolph Center.
6/2/2007*	✓	✓		Thetford; County-wide	A backdoor cold front and mid-level disturbance moved into a moderately unstable airmass during the afternoon, which moved into Vermont. Some severe thunderstorms produced damaging winds. Winds in Thetford downed trees on many roads. Thetford received .9 inches of precipitation. Outage data was unavailable for this event. Wind speed was not measured in Thetford but was reported at 60 knots in nearby Bradford.

8/2/2006	✓	✓	✓	County-wide	A mid-atmospheric disturbance moved into a very warm, humid and unstable airmass across Vermont during the afternoon of the 2nd, which lead to the development of scattered thunderstorms. Some of these thunderstorms were locally severe and produced damaging winds that knocked down trees, powerlines and a tree on a mobile home along Route 5 in nearby Newbury. Power outage data was unavailable for this event. Wind speed was not measured in Thetford but was reported at 50-55 knots across the county.
7/18/2006	✓	✓		County-wide	A strong mid-level atmospheric disturbance moved into a marginally unstable airmass across Vermont to cause severe thunderstorms. The thunderstorm knocked down trees along Interstate 91 in nearby Newbury. Power outage data was unavailable for this event. Wind speed was not measured in Thetford but was reported as 50 knots in Newbury.
9/16/1999-9/21/1999 (DR-1307 VT)	✓	✓		County-wide	The remnants of Tropical Storm Floyd brought heavy rain and high winds that downed many trees and power lines across the county. Wind speed was not measured in Thetford but it was clocked at 51 mph in nearby Randolph.

The Town of Thetford has received high wind events in the past, and the entire Town is at risk of damage from them. Thankfully, the damage caused by high winds has been relatively minimal. Often power outages occur as a result of trees and tree limbs falling on power lines. The Town of Thetford does not follow a regular tree-trimming schedule; however, Green Mountain Power provides this service as part of the utility company’s Reliability Project. This will help improve Green Mountain Power’s response time during a power outage and decrease the amount of time some residents are without power.

Residents who face the most risk from severe weather events are those who are unhoused and those who rely upon electricity for medical reasons. Both of these groups have been growing in recent years, and their numbers are projected to continue increasing due to the ongoing housing shortage, low birth

rates, and aging population in Orange County. Population changes are therefore expected to result in small increases in the Town’s vulnerability to this hazard.

Future land development in heavily forested areas of Town might also result in small increases in vulnerability to severe weather, as some structures in those areas could be at higher risk for damage and outages caused by downed trees.

Hazard	Location	Vulnerability	Extent	Impact	Likelihood/ Probability
Severe Weather	Town wide for high winds, lightning, and thunderstorm impacts. Structures surrounded by trees are potentially at higher risk.	Town and private buildings, roads, utilities, and unhooded residents are at risk from direct wind damage, falling trees, and lightning strikes. Prolonged power outages can significantly harm businesses and vulnerable residents who depend on electricity for medical reasons.	The highest wind speeds experienced in Thetford in recent history were 69 mph. These occurred most recently during the 7/23-27/2016 event. The 11/1/2019 event resulted in power outages that lasted more than 5 days.	Following the 9/12/2008 event, Thetford reported \$15,808.21 in damages. Flood damages are not included here but are discussed separately in this plan.	Highly likely

2. Flash Flood/Flood/Fluvial Erosion

The most frequent form of flooding in the State of Vermont and the Town of Thetford is riverine flooding, or overbank flooding, which happens when rivers receive more rain or snowmelt from their watershed than they typically experience. Flooding causes the inundation of land that is normally dry. Overbank flooding is experienced more frequently in mountainous and hilly areas where water moves with higher velocities. Flash floods occur when severe storms drop high amounts of rainfall in short periods of time. Flash floods occur more frequently in areas with steep slopes and narrow stream valleys. Riverine erosion is the gradual wearing away of land masses by rivers and streams. River channels are constantly changing. As rivers flow and water moves downstream, water exerts energy

upon riverbanks and causes erosion. The process is dramatically and often dangerously accelerated during flood and flash flood events.

Flooding is one of the worst threats to Thetford’s residents and infrastructure. Past instances of flooding in Thetford have included rain and/or snowmelt events that cause flooding in the major rivers’ floodplains and intense rainstorms over a small area that cause localized flash flooding. Both kinds of events can be worsened by the build-up of ice or debris which can contribute to the failure of important infrastructure, such as culverts, bridges, and dams.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Flash Flood/Flood/Fluvial Erosion**.

Perhaps the worst flood disaster to hit the Town of Thetford, as well as the overarching region and the State of Vermont, occurred on November 3, 1927. This event was caused by nearly 10 inches of heavy rain from the remnants of a tropical storm that fell on frozen ground. Eighty-four Vermonters, including the Lieutenant Governor, were killed. The flooding in the White River Valley was particularly violent, with the river flowing at an estimated 900,000 gallons per second on the morning of the 4th (Vermont Weatherbook). Like many towns in the region, the Town of Thetford received heavy precipitation.

A more recent flood that devastated the region and the state was the result of Tropical Storm Irene, which occurred on August 28, 2011. Record flooding was reported across the state and was responsible for several deaths, and millions of dollars of home, road and infrastructure damage. Due to the strong winds, 50,000 Vermont residents were initially without power, and many did not have electricity restored to their homes and businesses for over one week. Putting such an event into context, the flooding that occurred as a result of Tropical Storm Irene is considered to be greater than a 100-year flood event, and likely closer to a 500-year flood. Despite the damage wrought, the flooding caused by Tropical Storm Irene is considered to be the second greatest natural disaster in 20th and 21st century Vermont; second only to the Flood of 1927.

The Town of Thetford suffered some damage to property and infrastructure during Tropical Storm Irene, although no lives were lost. It is estimated that Tropical Storm Irene dropped 4-5 inches in the Town of Thetford in a very short span of time (24-48 hours), and 5-7 inches across the county. Many of Thetford’s roads and culverts were damaged by the storm, including Route 132. The county-wide damage totaled \$5 million, and Town-wide damage was over \$22,799.26 for this flooding event.

In 2017, severe storms brought flooding to the region but had particularly devastating impacts on Thetford. Over 50% of the Town’s roads were significantly damaged and many residents were isolated in their homes. The Town incurred well over \$5 million dollars in damages.

Flooding is common across the region, with many events impacting the Town of Thetford specifically. The following list indicates the history of occurrence with regard to this hazard in Orange County and given the relatively small population of Thetford, town-specific data are somewhat limited. An asterisk (*) denotes those instances in which Town-specific data are available., and federal disaster numbers are listed when appropriate. No detailed data are available for fluvial erosion damage in Thetford in terms of land area eroded during each event.

History of Occurrences:

Date	Event	Location	Extent and Impacts
7/7/2023 – 7/21/2023 (DR-4720-VT)*	Flooding	Thetford; County-wide	Clusters of showers and thunderstorms battered Vermont, which already had saturated soils from an unusually wet summer, with heavy rainfall and localized flooding. Most of the rain fell on July 10 th and 11 th ; Thetford received about 2.5 inches of rain and experienced relatively minor impacts.
4/15/2019 (DR-4445-VT)*	Flooding	Thetford; County-wide	Severe storms triggered flooding across the region. \$19,120.98 in damages were reported for Thetford in FEMA’s Public Assistance Database. Precipitation data are not available for Thetford for this event.
6/29/2017 – 7/1/2017 (DR-4330)*	Flooding; Flash Floods; Fluvial Erosion	Thetford; County-wide	A significant line of thunderstorms impacted the area on 7/1/2017 with a “training storm event” bringing more than 4 inches of rain to Thetford in the space of 2 hours causing widespread flash flooding. More than 75% of all roads in Thetford sustained some damage with more than 50% being impacted significantly with limited or no access to residences. The EOC was open 24/7 for a period of 7 days and then moved to being open from 7-5pm with evening hours being managed through an on-call process. The total costs of damage to town infrastructure was \$5,468,032.46.
4/15/2014*	Flash Floods; Flooding	Thetford; County-wide	Snowmelt from a late season snowpack combined with heavy rain, nearly 1 inch in 24 hours, to produce widespread flooding across central Vermont and Orange County. 4-6 inches of water was released from the snowpack over several days due to temperatures 60s to 70s. Rivers were brought to near bankful width due to snowmelt, and additional rain forced rivers out of their banks. Route 5 in Thetford was flooded by the Connecticut River. 160 Green Mountain Power customers lost power for 1.7 hours. Overall, \$46,013.07 in damage occurred in Thetford according to FEMA’s Public Assistance Database (which captures at least 70% of damage).
Period from 06/25/2013— 07/11/2013 (DR-4140)*	Flooding; Fluvial erosion	County-; region-wide	Severe storms caused flooding and fluvial erosion throughout the region, causing damage to some infrastructure and facilities. During this period, the nearby Town of Corinth received 7.96 inches of precipitation. Precipitation data are not available for Thetford for this event. On 7/19, 281 Green Mountain Power customers lost power for 7-10 hours. In Thetford, \$43,887.82 in damages occurred according to FEMA’s Public Assistance Database (which captures at least 70% of damage).
08/28/2011 (DR-4022, TS Irene)*	Flooding; Flash Flooding; and Fluvial Erosion	Thetford, County-wide	Widespread rainfall amounts of 3-5 inches occurred across Vermont with 5 to 7+ inches across much of southern, central Vermont. Devastating flash flooding occurred across much of central and southern Vermont mountain valleys with substantial and some record breaking flood stages on larger rivers. This flood event ranks second to the November 1927 flood in the scope of meteorological and hydrological conditions/impacts as well as loss of life (84 in 1927), but first in monetary damage [approx. \$500 million statewide vs \$350 million (1927 in 2010 dollars)]. There were nearly 2,400 roads, 800 homes/businesses, 300 bridges and a half dozen railroad

Date	Event	Location	Extent and Impacts
			tracks destroyed or damaged from the flooding caused by Irene. According to spotter's reports, Thetford received 4-5 inches of rain. In Thetford, \$22,799.26 in damages occurred according to FEMA's Public Assistance Database (which captures at least 70% of damage).
3/7/2011*	Flash Floods; Flooding	Thetford; County-wide	Heavy rainfall preceded a cold front that swept through Vermont that caused temperatures to drop and changed rain to heavy sleet and wet snow. Rainfall totaled about 2 inches in the morning before changing to ice/sleet. Snow accumulations added another 6-7 inches of precipitation. Rapid snowmelt and heavy rainfall caused ice-covered rivers to melt. No town-specific damage data are available for this event.
9/30/2010- 10/1/2010*	Flooding; Fluvial Erosion	County-wide	An area of low pressure and a pocket of tropical moisture associated with the remnants of Tropical Storm Nicole caused heavy rain in Vermont on September 30 and October 1, 2010. Thetford experienced 3.75 inches of rain in 24 hours, and experienced 5 inches in 48 hours. No town-specific damage data are available for this event.
07/21/2010*	Flash Flooding; Fluvial Erosion	Thetford; County-wide	Several storms strengthened into super cells that produced widespread wind damage to trees, power poles and structures as well as large hail in excess of golf ball size in diameter. Very heavy localized rains caused some temporary problems in many communities. 2.43 inches of precipitation was experienced in Thetford. No town-specific damage data are available for this event.
08/21/2009*	Flash Flooding; Fluvial Erosion	Thetford; County-wide	Thunderstorms produced torrential downpours across the region. Thetford received 1.26 inches in precipitation. No town-specific damage data are available for this event.
08/07/2008* (Part of DR-1790 VT)	Flooding; Fluvial Erosion	Thetford; County-wide	Thunderstorms with heavy rainfall in a moist atmosphere moved through central and southern Vermont during the afternoon and evening hours. Thetford received 2.6 inches of rain in 24 hours with an additional 1.22 inches of rain in the previous 24 hours. No damage data are available for this event.
07/11/2007 (DR 1715 VT)	Flash Flooding; Fluvial Erosion	County-wide	Localized heavy rainfall exceeded 3 inches within a two hour time frame. Some localized storm totals approached 6 inches across very hilly or mountainous terrain, which resulted in flash flooding and fluvial erosion in several communities in Orange County. Town-specific extent data are not available for this event.
04/15/2007- 04/21/2007 (DR-1698 VT)	Flooding	County-wide	Severe storms and flooding impacted Orange and surrounding counties. 7.5 inches of wet heavy snow mixed with warming temperatures led to flooding. Town-specific extent data are not available for this event.
1/18/2006	Flash Flooding and Fluvial Erosion	County-wide	A powerful storm moved across Ontario and Quebec that brought rising temperatures and caused snow melt. Widespread rainfall of 1.5 to 2.5 inches combined with increased runoff caused flooding and ponding of roadways across Orange county. Town-specific extent data are not available for this event.
9/12/2003*	Flooding and Fluvial Erosion	Thetford; County-wide	Thetford sustained \$45,954.93 in damages. A small area of Town received 4 inches of rain in an hour, which created flooding and significant damage to roads including Tucker Hill Road, Whippoorwill Road, and Poor Farm Road.

Date	Event	Location	Extent and Impacts
07/21/2003-08/18/2003 (DR-1488 VT)*	Flooding	Thetford; County-wide	Severe storms and flooding impacted Orange and surrounding counties. Specific precipitation data are unavailable for this event. Thetford reported \$5,710.12 in damages.
07/14/2000-07/18/2000 (DR-1336 VT)	Flooding	County-wide	Severe storms and flooding impacted Orange and surrounding counties. Specific precipitation and damage data are unavailable for this event.
9/16/1999-9/21/1999 (DR-1307 VT)	Flooding	County-wide	Tropical Storm Floyd’s rains and winds caused road and culvert washouts. Specific precipitation and damage data are unavailable for this event.
06/28/1973—06/30/1973 (DR-397 VT)	Flooding	County-wide	As much as 6 inches of rain fell in 24 hours in some locations. 3 deaths occurred and \$64 million in damage occurred in Vermont. Landslides were reported in the region. No town-specific extent data are available for Thetford.
11/02/1927—11/04/1927 (“Flood of 1927”)	Flooding	County-wide	Considered to be one of VT’s most devastating events, the flood took out 1,285 bridges, miles of roads and railways, and countless homes and buildings. 84 people were killed, including Lt. Gov. S. Hollister Jackson. Rainfall totaled 4-9” statewide, following a month with 150% the normal amount of rain. The White River crested at a record of 29.30 feet. No town-specific extent data are available for Thetford.

Residents who are most at risk during a flood or fluvial erosion event include those who live or work in higher-risk areas, those who are unhoused, those who have mobility challenges (e.g., youth and elders) that restrict their ability to evacuate, those who rely on electricity for medical reasons, and those who have low incomes (which makes it more challenging to evacuate and harder to recover from property damage or loss). As noted previously, unhoused and elderly populations are increasing in Orange County, so it’s possible that population changes might result in small increases in the Town’s vulnerability to flooding and fluvial erosion.

Across Vermont, most child and elder care facilities are not registered with the State. There are also six licensed childcare facilities in Thetford: Caring Communities, Mapleleaf Daycare, Tammie’s Daycare, Little Feet Children’s Center, Visual Eye’s Creativity Center, and County Bear Child Care. None of these facilities are located within the FEMA designated Special Flood Hazard Area. There are no elder care facilities in the Town of Thetford. Finally, low income housing is not registered with the State, and there are currently no mobile home parks located in Thetford that are registered with the State.

In Thetford, there are 1,666 acres of mapped floodplain and 58 acres of mapped floodway, which consists of 6% of the Town’s land area. Rivers, brooks, and streams in Thetford that have mapped Special Flood Hazard Areas include the Ompompanoosuc River, the West Branch of the Ompompanoosuc River, the Connecticut River, Abbot Brook, Lake Fairlee, Lake Abenaki, Mud Pond,

Zebedee Brook, and Gunn Brook. Other significant streams that flood frequently include Blood Brook, Jackson Brook, and Fulton Brook.

The Town of Thetford has a standalone Flood Hazard Area Zoning Bylaw, effective August 23, 2021. This bylaw prohibits the development of any new residential or non-residential structures in the Special Flood Hazard Area (also known as the 100-year floodplain), with the exception of accessory structures, farm structures, and liquid or gas storage tanks that serve existing structures and are properly anchored. Permitted uses in the Special Flood Hazard Area include agricultural uses, recreational open space, residential open space (e.g. lawns, gardens, and parking areas), and minor improvements of existing buildings, provided that such uses do not involve erection of walled structures, storage of materials or equipment, changes to the floodway's shape or capacity, increased risk of offsite flood damage, or grading, fill or excavation. Conditional use approval by the Development Review Board is required for development in the Special Flood Hazard Area that entails substantial improvements to existing buildings, erection of accessory structures, any changes to the floodway or obstruction of flood flows, increased risk of offsite flood damage, or any fill, grading, or excavation. (Substantial improvement is defined as any reconstruction, rehabilitation, addition, or other improvement that costs 50% or more of the market value of the structure prior to the improvement. This includes repairs to buildings that have suffered substantial damage, i.e. damage amounting to 50% or more of the market value of the structure prior to the damage.) In the Special Flood Hazard Area, existing buildings to be substantially improved must be elevated so that the lowest floor, including the basement, is at least 2 feet above base flood elevation. Accessory structures do not need to be elevated so long as the structure is only used for parking or storage, is wet floodproofed (with utilities protected), and is adequately anchored and built of flood resistant materials.

The Town does not regulate all lands that the state has designated as "river corridors" (i.e. areas at higher risk of fluvial erosion), but the zoning bylaw (effective February 12, 2024) prohibits construction of any structures within 50 feet of first order streams, within 75 feet of second order streams, within 75 feet of certain ponds and lakes, and within 3 channel widths (measured from center of channel) for all third order streams or higher. These regulations help to reduce the risk of damage from fluvial erosion.

In Thetford there are 80 structures in the Special Flood Hazard Area. These structures consist of 65 residential (48 single family residential structures, 11 camps, 2 mobile homes, 1 other residential building, and 3 accessory units), 10 commercial/industrial/government, and 5 properties classified as other. If all of these properties were destroyed in a flood, the resulting damage would be approximately \$21,765,260. Specific commercial and government structures that are vulnerable to flooding include the North Thetford Post Office, Caldwell Logging, the United Church of Thetford, A Cook Associates, Long Wind Farm, and Simple Energy. In an effort to help protect structures and road infrastructure, it is important to restore floodplain, improve floodplains areas, and increase the number of areas for retention of floodwaters. These actions will reduce the risk to structures and road infrastructure wherever possible.

Recent studies have shown that the majority of flooding in Vermont occurs along upland streams, as well as along road drainage systems that fail to convey the amount of water they are receiving. These

areas are often not recognized as being flood prone, and property owners in these areas are not typically required to have flood insurance. It should be noted that, while small, mountainous streams may not be mapped by FEMA in NFIP FIRMs (Flood Insurance Rate Maps), flooding along these streams is possible, and should be expected and planned for. Flash flooding in these reaches can be extremely erosive, causing damage to road infrastructure and to topographic features including stream beds and the sides of hills and mountains. The presence of undersized or blocked culverts can lead to further erosion and stream bank/mountainside undercutting. Furthermore, precipitation trend analysis suggests that intense, local storms are occurring more frequently, which indicates that Thetford will experience high intensity rainfall and flooding events in the future.

Due to Thetford's topography of steep slopes and narrow river valleys, fluvial erosion also has a high probability of future occurrence. The State of Vermont has conducted a mapping initiative to identify areas along rivers, brooks, and streams in Vermont that are vulnerable to fluvial erosion, and has designated these as River Corridor areas. Rivers, streams, and brooks in Thetford that have mapped River Corridor Areas include: the Ompompanoosuc River, the West Branch of the Ompompanoosuc River, Zebedee Brook, Avery Brook, Lord Brook, Abbot Brook, and Barker Brook. In Thetford, there are 51 structures in the mapped River Corridor Areas. These structures are at risk of fluvial erosion. These consist of 47 residential properties and 4 structures classified as "other." If all of these structures were destroyed in a flood, the resulting damage would be \$11,221,632.

There are a number of roads in Town that are subject to flooding and erosion when heavy rain events drop large amounts of rain in a short period of time. The July 1, 2017 storm damaged 75% of Thetford's roads as well as VT-132, and in the wake of that disaster event the Town made great strides in improving ditches and culverts throughout Town, thereby improving the Town's resilience to future floods. The Town plans to continue upsizing culverts with at least 18 inch replacements. The Town last updated its comprehensive culvert inventory in 2020, however the Department of Public Works foreman actively updates his culvert data on personal databases and on VTCulverts.org. The Town will continue to periodically update culvert data.

No large-scale development projects are planned in Thetford in areas that would be vulnerable to flooding. Some small-scale development could take place in river corridors or along flood-vulnerable roads (outside of the Special Flood Hazard Area), which would result in a small increase in the Town's vulnerability to these kinds of hazard events. There are no repetitive loss properties in Thetford on FEMA's NFIP list.

Hazard	Location	Vulnerability	Extent	Impact	Likelihood/ Probability
Flash Flood / Flood / Fluvial Erosion	Many of Thetford's roads are vulnerable to erosional flooding due to steep terrain. Some of the most vulnerable for fluvial erosion or flooding include: Route 132, Route 113, Colby Road South, New Boston Road, Barker Road, Tefft Road, Robinson Road, Poor Farm Road, Houghton Hill Road, Picknell Road, Hauger Road, and Burnham Road. Many other roads may be subject to erosional flooding, especially in steep areas.	Town and private buildings, and utilities; culverts, bridges, road infrastructure. There are 80 structures located in the 100-year floodplain. These consist of 65 residential (48 single family residential structures, 11 camps, 2 mobile homes, 1 other residential building, and 3 accessory units), 10 commercial/industrial/government, and 5 properties classified as other. If all of these properties were destroyed in a flood, the resulting damage would be approximately \$21,765,260. Specific vulnerable structures include the North Thetford Post Office, Caldwell Logging, Long Wind Farm, Roger Carpentry Services, and Simple Energy. Vulnerable populations include: those who live or work in higher-risk areas, those who are unhoused, those who have mobility challenges (e.g., youth and elders) that restrict their ability to evacuate, those who rely on electricity for medical reasons, and those who have low incomes.	During Tropical Storm Irene: 5-7" across county (4-5" in Thetford). The 2017 disaster event brought over 4" of rain in 2 hours. No detailed data are available for fluvial erosion damage in Thetford in terms of numbers of acre lost during each event.	July 2017 flooding caused \$5,468,032.46 in damages.	Highly likely

3. Extreme Cold/Snow/Ice Storm

Winter storms are a regular occurrence in Vermont. Severe winter storms can cause serious damage, including collapse of buildings due to overloading with snow or ice, brutal wind chills, downed trees, downed power lines, and stranded vehicles. People can be at risk of freezing in extended power outages if they lack wood heat or backup power, and individuals shoveling large accumulations of snow can also be at risk from frostbite, hypothermia and heart attacks due to cold and overexertion.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Extreme Cold/Snow/Ice Storm**.

While snow removal from the transportation system is standard fare in Vermont winters, extreme snow or ice can close rail and road systems, further jeopardizing any stranded persons that are in danger of freezing or needing medical assistance. Extreme cold in the Town of Thetford is defined as below zero degrees Fahrenheit for one or more consecutive days.

Severe winter storms included a blizzard on February 15-17 in 1958 that dumped over 30 inches and resulted in 26 deaths in New England. On December 26-27 in 1969, another blizzard left 18-36 inches of snow in northwestern Vermont and a whopping 45 inches in Waitsfield. A string of storms in March 2001 hit the state, beginning with 15-30 inches on March 5-6 (later declared a federal disaster), 10-30 inches on the 22nd and 10-20 inches on the 30th. Recent years have seen wet snow storms that have leveled trees and caused widespread power outages.

The worst winter storm in terms of damage to hit the state recently was not a snow storm, but an ice storm. In January of 1998, just the right combination of precipitation and temperature led to more than three inches of ice in spots, closing roads, downing power lines, and snapping thousands of trees. This storm was estimated as a 200-500 year event. Power was out up to 10 days in some areas and 700,000 acres of forest land were damaged in Vermont. Amazingly, there were no fatalities in Vermont, unlike Quebec where 3 million people lost power and 28 were killed.

Over the past few winters, Thetford has received numerous snow storms that have dropped significant amounts of snow over a day or two. However, the details of these events and the damage they caused are overshadowed by winter weather events of the past. This is not to say such extreme events will not repeat themselves. It should be assumed that extreme winter weather events will occur at some point in the future. The following table documents the occurrence of extreme cold/snow/ice storms in the Town of Thetford and Orange County. Given the relatively small population of Thetford, town-specific data are somewhat limited. An asterisk (*) denotes those instances in which Town-specific data are available, and federal disaster numbers are listed when appropriate.

History of Occurrences:

Date	Event	Location	Extent and Impacts
2/3/2023-2/4/2023*	Extreme cold	Thetford ; County-wide	Dangerously cold temperatures and wind chills impacted the area due to the arrival of an arctic airmass. The actual temperature recorded in Union Village in Thetford was 20 below zero, with windchills 30 to 45 below zero. No power outages were reported.
12/16/2022	Snow / winter storm	Thetford ; County-wide	A significant snow event impacted the town of Thetford with heavy, wet snow and wind which caused numerous trees and power lines to be damaged and impacted access to roads in town. This hampered snow removal as well as access to problem areas by GMP. Power outages were extensive in town affecting more than 70% of households in Thetford. Within 36 hours, power outages were still impacting more than 40% of households in Thetford. The cleanup and power outages required more than a week to rectify with the last households getting power back 7 days after the original storm date. No snowfall data are available for Thetford, but 18 inches were reported in nearby Vershire.
1/14/2022-1/15/2022	Extreme cold	Thetford ; County-wide	An arctic cold front moved across Vermont at the same time that a powerful ocean storm was moving into Newfoundland Canada, creating brisk north-northwest winds of 15 to 25 mph with higher gusts with dangerously cold wind chills overnight. Wind chills of 25 to 35 below zero were observed across the region with actual air temperatures of 10 to 20 below zero. No power outages were reported.
1/11/2022-1/12/2022	Extreme cold	Thetford ; County-wide	An arctic front moved from central Canada across the Great Lakes and into Vermont. Minimum temperatures on the morning of the 11th were 10 to 20 below zero with winds creating wind chills in the mid 20s to lower 30s below zero range. Daytime highs only reached near zero with still sub-zero wind chills. Lows Tuesday night fell below zero early then rose overnight but combined with south winds of 10 to 20 mph still created wind chills in the 15 to 20 below zero range. No power outages were reported.
12/17/2020*	Snow / winter storm	Thetford ; County-wide	A coastal Nor'easter moved into southern and central Vermont with a mesoscale band of snowfall, then remained stationary over central Vermont through the morning of 12/17/2020. Thetford received 15 inches of snow. No power outages were reported.
3/13/2018 – 3/15/2018	Snow / winter storm	Thetford ; County-wide	Long duration snowfall event eventually delivered 10 to 27 inches across Orange county, with the heaviest occurring the night of March 13th into the morning hours of the 14th. Some isolated to scattered power outages were reported. Specific GMP outage data are unavailable for this event. Snowfall data are not available for Thetford, but 18 inches were reported in nearby Chelsea.
1/7/2015-1/8/2015	Extreme Cold	County Wide; State-wide	An arctic cold front pushed across Vermont with plummeting temperatures and brisk strong winds of 15-30 mph caused dangerously cold wind chills of 25-40 degrees below zero during the evening of January 7 and morning of January 8. Temperatures in the morning of January 8 were 15-25 degrees below zero on the morning of January 8 in Orange County.

Date	Event	Location	Extent and Impacts
02/01/2015-02/28/2015*	Cold/ wind chill	County-; region-wide	Vermont communities experienced the coldest month on record for over 20 years. Many communities recorded 15 to 20+ days below zero and on several days, dangerously cold wind chills of 30 below zero or colder occurred. 1 Green Mountain Power Customer (GMP) lost power for 3.3 hours, and 4 GMP customers lost power for 1.7 hours.
Period from 12/09/2014—12/12/2014 (DR-4207 VT)*	Snow/ Winter Storm	County-; region-wide	A powerful prolonged heavy, wet snow event from December 9th through December 11 th . Snowfall totals ranged from a few inches to almost 2' near Warren, VT. The snow to liquid ratios ranged from 5-7" of snow to 1" of rain, which lead to the snow sticking to trees and power lines. A widespread 10 to 15 inches of snow fell across Orange County. 175 GMP customers in Thetford lost power for 2 hours.
Period from 03/12/2014—03/13/2014*	Snow Storm	County-; region-wide	A major snowstorm with near blizzard conditions at times impacted Vermont towns. Numerous motor vehicle accidents, school and business closures resulted due to the storm on both March 12th and 13th. Snowfall totals across Orange county were generally 15 to 20+ inches. 132 GMP customers in Thetford lost power for 7 hours.
Period from 02/13/2014—02/14/2014*	Winter Storm	County-; region-wide	A winter storm, responsible for record ice and snow across the southeast United States on February 12th, moved and redeveloped off the southeast United states coastline on February 13th. Snowfall across Orange county was 12 to 18 inches. 62 GMP customers lost power for 2 hours.
02/05/2014*	Snow Storm	County-; region-wide	Snowfall was at its peak during both the morning and afternoon/evening commutes causing hazardous travel. Eight to twelve inches of snow fell across Orange county. 19 GMP customers lost power for 1 hour.
11/23/2011*	Winter Storm	Thetford, County-wide	Heavy snowfall accounted for numerous vehicle accidents and scattered power outages from tree limbs falling on power lines. Thetford recorded 7 inches of snow accumulation. Specific GMP outage data was unavailable for this event.
02/02/2012	Winter Storm	County-; region-wide	An intense winter storm brought snowfall at rates of up to 2 inches per hour, and dropped 10-15 inches across Orange County. Specific GMP outage data was unavailable for this event.
Period from 12/26/2010-12/27/2010*	Winter Storm	Thetford, County-wide	Heavy snowfall combined with strong winds (15-25mph with gusts up to 40mph) caused blowing and drifting snow that led to accidents and power outages. Thetford recorded 9 inches of snow accumulation. Specific GMP outage data was unavailable for this event.
Period from 02/23/2010-02/25/2010	Winter Storm	County-; region-wide	Heavy wet snow led to accumulations of 6-30 inches across central and southern Vermont, leading to power outages of 50,000 or more residents. Local power outage and snowfall data are not available for this event.
Period from 02/22/2009-02/23/2009	Winter Storm	County-; region-wide	Heavy snow and high winds with gusts as high as 30mph it the region, impacting travel. Around a foot of snow or more fell in towns neighboring Thetford. Specific GMP outage data was unavailable for this event.
Period from 12/19/2008-12/21/2008	Winter Storms	County-; region-wide	Two heavy storms moved through the region over a 2-3 day period, leading to combined snowfall totals in excess of 2 feet. High snowfall totals led to blocked ventilation pipes and some carbon monoxide injuries as well as a few collapsed small farm structures due to the weight of the snow in Orange County. Specific GMP outage data was unavailable for this event.

Date	Event	Location	Extent and Impacts
Period from 02/06/2008—02/07/2008	Winter Storm	County-wide; statewide	Heavy snowfall of 10 to 16 inches fell across Orange County, prompting many school closures and vehicle accidents. Specific GMP outage data was unavailable for this event.
02/01/2008	“Mixed” Winter Storm	County-wide; statewide	Snowfall reports were generally 2 to 5 inches with localized amounts up to 7 inches. In addition, one quarter to one half of ice accumulation (accretion) occurred as well. Finally, strong south to southeast winds around 3000 feet and above transferred to a few hilltops along the western slopes and produced wind gusts in excess of 50 mph. Specific GMP outage and snowfall data are unavailable for this event.
02/14/2007*	Snow Storm	Thetford; County-wide; statewide	Snow fell at 2-4 inches per hour at times amidst brisk 15-25mph winds and wind chills of -10F, making many roads virtually impassible. A total of 19 inches was reported in Thetford. Specific GMP outage data are unavailable for this event.
Period from 12/06/2003-12/07/2003	Winter Storm	County-; region-wide	Steady snow fell throughout a two day period, producing snow totals around 12-20 inches in Orange County. Specific GMP outage and snowfall data are unavailable for this event.
Period from 01/06/1998-01/16/1998 (DR-1201 VT)	Ice Storm	County-; state-wide	Ice accumulations of around 3/4 of an inch or less hit the region, causing damage to tens of thousands of trees, downed power lines, road closures due to ice coatings, vehicle accidents, and temporary cessation of milking operations at farms. Indirect injury impacts included carbon monoxide poisoning from improper generator use and hazards from tree limb/other debris. Specific GMP outage data are unavailable for this event.

Residents most vulnerable to winter weather include those who are unhoused, those who have physical limitations that restrict their ability to clear snow, and those who are dependent upon electricity for medical reasons. The rising numbers of unhoused and elderly people in Orange County will increase the Town’s vulnerability to this hazard.

Depending on the event, particularly with heavy, wet snow or ice, electricity may be knocked out for a few hours or days. The utility companies currently serving the Town of Thetford, including Green Mountain Power, have followed a regular tree-trimming schedule. Thetford town officials believe this is satisfactory to mitigate damage and the power outages caused by downed trees and tree limbs during a heavy, wet snow or ice event. In the event of an extended power outage, the Town would open emergency shelters at the North Thetford Church and Thetford Elementary School.

Heavy, wet snow or large quantities of snow may also leave structures vulnerable to roof collapse. Roof collapse occurs when the structural components of a roof can no longer hold the weight of the snow. Flat roofs are most vulnerable to collapse because they do not drain well, and the snow on the roof soaks up water like a sponge, increasing the weight the roof must bear. More common it seems is the collapse of barns commonly used for livestock sheltering and other agricultural purposes. Unfortunately, livestock in the barn are often killed and equipment stored in the barn may be damaged or ruined. It is difficult to determine whether a residential structure or a barn would be rebuilt after a roof collapse, because the decision to rebuild would likely depend on the extent of damage and the

property owner’s finances. The collapse of a barn roof is likely to be a total loss, and the collapse of a house roof may be a 50% loss. While roof collapse has not occurred in Thetford recently, very heavy snow in the region on February 14, 2007 resulted in the partial or total collapse of 20 or more barn roofs, and led to the deaths of more than 100 cattle.

In general, winter weather is hazardous to travelers. Icy and snow-covered roads present multiple examples of dangerous driving conditions and situations. In Thetford, the mountainous terrain, steep slopes, and remoteness of some roads further complicate travel. The Town relies on Travel Advisories issued by the State of Vermont Department of Emergency Management Homeland Security and the National Weather Service to alert residents of dangerous travel weather. However, it is difficult, if impossible, to prohibit people from driving during winter weather events. As a result, emergency services personnel must always be prepared to provide assistance to stranded drivers or to those who have been in an accident. To increase awareness in the event of hazardous weather, the Town also encourages residents to utilize 211, social media outlets, and the Town listserv.

Small-scale development in more remote parts of Town could increase the Town’s vulnerability to winter weather insofar as it would increase the number of travelers on dangerous roads and increase the number of structures that would be impacted by downed trees during winter storms.

Hazard	Location	Vulnerability	Extent	Impact	Likelihood/Probability
Extreme Cold/ Snow/Ice Storm	Town-wide. More remote areas may be at greater risk due to steeper roads and higher risk of downed trees during storms.	The entire Town is vulnerable, including road infrastructure, town and privately owned buildings, utility infrastructure. In particular, power transmission lines and power-critical customers are at risk during these events. Residents who are unhoused and those who have disabilities are also vulnerable.	Snow fall has varied, from a few inches to over a foot or more. Heavy snow and wind downed trees and power lines. Snow/ice contributed to hazardous driving conditions. The January 2015 event brought windchills of -40 degrees F. The December 2008 storm brought more than 2 feet of snow.	For car crashes due to poor driving conditions: minimal damage to vehicle to totaled vehicle. Power outages: Following the December 2022 storm, some households were without power for up to 7 days.	Highly likely

4. Hurricanes and Tropical Storms

Hurricanes (storms with sustained winds greater than 74 mph) rarely reach as far inland as Vermont; more often, they have weakened to tropical storms. In either case, the high winds, heavy rains, and large affected areas from hurricane or tropical storms can make these rare events major disasters. The most infamous example of an actual hurricane hitting the state was the disastrous “Long Island Express” Hurricane of 1938. On September 21, 1938 a very fast-moving hurricane hit Vermont in the early evening, but was moving so fast that wind damage was more severe than damage from rain in places. However, there was severe flooding, as over 4 inches of rain accompanied the storm and followed upon the heels of preceding storms that had saturated the ground and raised river levels. Buildings were lost, power lines downed, and millions of trees were felled. Much more recently, Tropical Storm Floyd in September 1999 caused flooding and wind damage in parts of Vermont, as well as one fatality, and resulted in a federal disaster declaration.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Hurricanes / Tropical Storms**.

Another flood disaster was the result of Tropical Storm Irene, which occurred on August 28, 2011. Record flooding was reported across the state and was responsible for several deaths, and millions of dollars of home, road, and infrastructure damage. Due to the strong winds, there were 117,000 power outages across the state, and many did not have power restored for over a week. The damage and flooding caused by Tropical Storm Irene is considered to be the second greatest natural disaster in 20th and 21st century Vermont, second only to the Flood of 1927.

The following list indicates the history of occurrence with regard to this hazard in Orange County. Federal disaster numbers are listed where appropriate.

History of Occurrences:

Date	Event	Location	Extent
08/28/2011* (DR 4022 VT for period of 8/26/2011 – 9/2/2011) (Tropical Storm Irene)	Severe Flash Flooding	Thetford, county-wide	Tropical storm Irene brought rainfall amounts of 3-5 inches across Vermont with 5 to 7+ inches across much of southern, central Vermont. Devastating flash flooding occurred across much of central and southern Vermont mountain valleys with substantial and some record breaking flood stages on larger rivers.

Date	Event	Location	Extent
			According to spotter's reports, Thetford received 4-5 inches of rain. In Thetford, \$22,799.26 in damages occurred according to FEMA's Public Assistance Database (which captures at least 70% of damage). No town-specific wind speed data are available for this event, but the region saw frequent gusts of 35 to 50 mph.
9/16/1999 – 9/21/1999 (DR 1307 VT) (Tropical Storm Floyd)	High winds, flooding	County and state-wide	Tropical Storm Floyd's rains and winds caused road and culvert washouts. Statewide, maximum wind speed was 51 mph. Town-specific precipitation, wind speed, and damage data are unavailable for this event.
9/21/1938 ("The Great New England Hurricane")	High winds, flooding	State-wide	Hit Vermont as a Category 1 storm. High winds severely damaged trees, buildings, power lines. No available local data on the size of the land area that was impacted. No town-specific precipitation, wind speed, or flood depth data are available for this event.

The primary impacts from tropical storms and hurricanes are high winds and flooding.

Historically, high winds have caused damage in Orange County and in the Town of Thetford specifically. Damage caused by high winds has included downed trees and power lines, and, as a result, power outages. Power outages can be particularly serious for “power critical customers” that do not have the luxury of having a generator. All parts of the Town are at risk of power outages during a tropical storm or hurricane event. Climate change is increasing the number and intensity of tropical storms and hurricanes that may reach inland to Vermont.

As described in the Flash Flood/Flood/Fluvial Erosion hazard analysis above, the following areas in Town are particularly vulnerable to flooding: the Ompompanoosuc River, the West Branch of the Ompompanoosuc River, the Connecticut River, Abbot Brook, Lake Fairlee, Lake Abenaki, Mud Pond, Zebedee Brook, Gunn Brook, Blood Brook, Jackson Brook, and Fulton Brook. The Town of Thetford’s most recent comprehensive update of its culvert inventory was completed in 2020. The Town continuously updates its culvert records and upgrades culverts. A considerable number of culverts have been upgraded in the Town of Thetford as part of the Town’s recovery from July 1, 2017 storm event that damaged 75% of Thetford’s roads as well as VT-132.

Residents who are most vulnerable to these kinds of events include the unhoused, those with mobility challenges that impede evacuation, those who depend on electricity for medical reasons, and those with low incomes who will have a harder time recovering from property damage. As with other hazards profiled in this plan, population increases among the unhoused and the elderly will increase the Town’s vulnerability to hurricanes and tropical storms. Small-scale development could occur in more remote areas or areas outside of the 100-year floodplain that are at risk of flooding or fluvial erosion, which would also increase the Town’s vulnerability.

Hazard	Location	Vulnerability	Extent**	Observed Impact**	Likelihood/Probability
Tropical Storms and Hurricanes	Town wide for wind impacts. Generally speaking, the entire Town is also vulnerable to flooding but “hot spots” include the following roads/areas: Route 132, Route 113, Colby Road South, New Boston Road, Barker Road, Tefft Road, Robinson Road, Poor Farm Road, Houghton Hill Road, Picknell Road, Hauger Road, and Burnham Road. Many other roads may be	Town buildings, private buildings, utilities, culverts, bridges, and road infrastructure. Specific vulnerable structures include the North	During Tropical Storm Irene: 5-7” across county (4-5” in Thetford). 35-50 mph wind gusts.	From Tropical Storm Irene (DR-4022 VT): \$22,799.26 in damages according to FEMA’s Public Assistance database (captures at least 70% of the total damage). Note that July 2017 flooding (not a tropical storm or hurricane event) caused	Likely

	subject to erosional flooding, especially in steep areas.	Thetford Post Office, Caldwell Logging, Long Wind Farm, Roger Carpentry Services, and Simple Energy.		\$5,468,032.46 in damages.	
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****Note:** The main hazard caused by tropical storms and hurricanes is typically flooding (though not always). In addition, flooding is often the most expensive hazard caused by such storms. Therefore, the Extent and Impact categories for Tropical Storms and Hurricanes will reflect the data reported in the Flash Flood/Flood/Fluvial Erosion category, as it represents the higher limits of damage caused by severe weather.

5. Hail Storm

Hailstorms have occurred in Vermont, usually during the summer months. While local in nature, these storms are especially significant to area farmers, who can lose entire fields of crops in a single hailstorm. Large hail is also capable of property damage. Between 1950 and 2013, there were 698 hail events recorded in the state of Vermont, making hail an annual occurrence in some part of the state. Most of these events had hail measuring 0.75 inches, but many had hail at least 1.5 inches in size. The largest hail during the period was 3-inch hail that fell in Chittenden County in 1968. Tennis ball-sized hail was reported in the town of Chittenden during a storm in the summer of 2001.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Hail Storm**.

The following table documents the occurrence of hail storms in the Town of Thetford and Orange County.

Date	Event	Location	Extent and Impacts
7/21/2022	Hail Storm	County-wide	A moderately strong shortwave and surface cold front moved across a moderate to highly unstable airmass across Vermont. Scattered thunderstorms developed and quickly intensified, some producing damaging winds and hail. Hail measuring 1 inch in diameter

			was reported in nearby Bradford. Thetford-specific data are not available for this event. No monetary damage data are available.
5/18/2017	Hail Storm	County-wide	Record setting heat set the stage for an moderately unstable air mass, while a mid-level atmospheric disturbance provided the forcing and strong winds to develop scattered thunderstorms by late afternoon into early evening, some of which produced damaging winds and hail. Hail measuring 0.75 inches in diameter was reported in nearby East Corinth. Thetford-specific data are not available for this event. No monetary damage data are available.
7/18/2016	Hail Storm	County-wide	Several rounds of thunderstorms developed ahead of a cold front across northern New York and then moved into Vermont. Hailstones measuring 1.5 inches were reported in nearby Bradford. Thetford-specific data are not available for this event. No monetary damage data are available.
7/19/2015	Hail Storm	County-wide	Several rounds of scattered thunderstorms moved across Vermont, and a few of these storms produced hail. Hail measuring 1 inch in diameter was reported in nearby Chelsea. Thetford-specific data are not available for this event. No monetary damage data are available.
7/21/2010	Hail Storm	County-wide	Scattered to numerous thunderstorms traveled across northern New York and through Vermont. Several storms strengthened into supercells that produced widespread wind damage as well as large hail. Thetford-specific data are not available for this event. Hail measuring 1-2 inches fell in nearby Brookfield and caused \$45,000 in damage to crops and property. Hail measuring 1 inch in diameter fell in nearby

			Bradford and caused \$20,000 in property damage.
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Severe thunderstorms are more likely to form larger hailstones. It is not certain whether these events will increase in frequency with climate change. Though a relatively infrequent event and localized in its impacts, a hail storm can be very harmful. Hailstones of 1 inch in diameter can cause severe damage to fruit and crops as well as damage to glass and plastic. Hailstones of 1.5 inches can cause widespread glass damage and cause injuries to people who are unsheltered. All parts of Thetford are at risk of experiencing hail storms. The Town relies on Advisories issued by the State of Vermont Department of Emergency Management Homeland Security and the National Weather Service to alert residents of dangerous weather.

Future land use changes could increase the Town’s vulnerability to this hazard if open space is converted to structures or crops that could suffer monetary damages in the event of a hailstorm. Large-scale development is not anticipated or planned in Thetford. The only population change that could increase the Town’s vulnerability would be a growing unhoused population.

Hazard	Location	Vulnerability	Extent	Impact	Likelihood/Probability
Hail Storm	Town wide	The entire Town is vulnerable. Crops, structures, and vehicles / equipment are at risk due to exposure to the elements, as are unhoused residents.	The largest hailstones recorded near Thetford were 1.5” in diameter, reported in Bradford in 2016.	The 2010 event created \$65,000 in property and crop damages in nearby Brookfield and Bradford.	Likely

6. Infectious Disease

While not an entirely new hazard for Thetford, the recent COVID-19 pandemic (the illness caused by a novel coronavirus) has had impacts of particular concern for the town and the state. The scale and complexity of COVID-19 has not been seen in this country since the 1918 Spanish Flu. With a major pandemic, the hazard to Thetford is its effect on individuals, vulnerable populations, the medical system, and the economy. This is an ongoing hazard at the time of this plan’s writing, and it impossible at this time to fully understand and capture in this plan the short and long-term impacts on the Town. On March 25, 2020, Governor Scott enacted a ‘Stay Home, Stay Safe’ order that effectively closed all but essential businesses, required companies to work from home if they could, and to reduce trips outside the home to limit human-to-human contact.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Infectious Disease**.

There were untold economic impacts to this order for the town and the state, including a massive spike in unemployment and severe drops in tax revenue.

COVID-19 has made it clear that in major pandemics that affect most of the population, the current medical system is largely inadequate to handle a surge of caseloads and hospitalizations. Vulnerable populations, such as nursing homes and prisons, have been particularly hard hit due to close living quarters. Around Thetford, there are assisted living facilities and elderly housing that are at high risk for death due to COVID-19 and other infectious diseases. In addition, the VA Medical Center has expressed that they have limited caseload capacity.

Thetford does not expect to experience development on a large enough scale to significantly increase its pandemic vulnerability due to crowding, but the increasing elderly and unhoused populations will increase the Town’s vulnerability.

History of Occurrences:

Date	Event	Location	Extent and Impacts
March 2020- March 2023	COVID-19 Pandemic	County Wide; State-wide; Nation-wide; World-wide	COVID-19 is a disease caused by the novel coronavirus. Since March 2020, the disease has killed nearly seven million people globally, according to the World Health Organization. In Vermont, there have been 1,169 deaths.

Hazard	Location	Vulnerability	Extent	Impact	Likelihood/ Probability
Infectious Disease	Town wide	The entire town is vulnerable, but particularly those with suppressed or otherwise diminished immune systems, like the elderly, children, and those with pre-existing conditions. Unhoused individuals with few resources to protect themselves are also at higher risk.	Has the potential to affect everybody in town.	<p>Loss of life: There have been 1,169 covid-related deaths in Vermont since January 1, 2020.</p> <p>Significant economic impacts for the town and for individuals who were out of work during lockdown or whose businesses did not survive the economic shock.</p> <p>Healthcare system overruns</p>	Highly Likely

C. Vulnerability Summary

As a result of the above profiled hazards, the Town believes the following vulnerabilities to be of highest concern due to their potentially severe consequences and likelihood of occurrence:

- **Severe Weather (Thunderstorm, Lightning, High Winds):** Unhoused residents, Town and private buildings, roads, and utilities are at risk from direct wind damage, falling trees, and lightning strikes. Prolonged power outages can have significant impacts on businesses and vulnerable residents who depend on electricity for medical reasons. All areas of Town are at risk, and climate change will increase the frequency and intensity of these kinds of events. Increases in the unhoused and elderly populations will increase the Town's vulnerability to this hazard. Development in forested areas may result in small increases in vulnerability.
- **Flash Flood / Flood / Fluvial Erosion:** Many of Thetford's roads are at risk of inundation and/or erosion during these events, resulting in risk to life and significant monetary damages. Some of the most vulnerable areas of Town are Route 132, Route 113, Colby Road South, New Boston Road, Barker Road, Tefft Road, Robinson Road, Poor Farm Road, Houghton Hill Road, Picknell Road, Hauger Road, and Burnham Road. Specific vulnerable structures include the North Thetford Post Office, Caldwell Logging, Long Wind Farm, Roger Carpentry Services, and Simple Energy. Precipitation trend analysis suggests that intense, local storms are occurring more frequently, so the risk of this hazard is increasing. There are no repetitive loss properties in Thetford on FEMA's NFIP list. As noted in section IV C of this plan, development in Thetford since 2017 has not significantly increased risk of damage from flooding and fluvial erosion. In the future, there may be small increases to the Town's vulnerability resulting from small-scale development in river corridors or along flood-vulnerable roads outside of the Special Flood Hazard Area, and from population increases among the elderly and/or the unhoused.
- **Extreme Cold / Snow / Ice Storm:** These events create travel hazards and sometimes directly damage infrastructure. All areas of Town are vulnerable to this hazard, including road infrastructure, town and privately owned buildings, and power lines. Unhoused residents, those with physical disabilities, and those who depend on electricity for medical reasons are particularly vulnerable; as those populations increase, the Town's vulnerability will also increase.. Future development in remote areas could increase the Town's vulnerability to winter weather, as those areas tend to have more dangerous driving conditions and increased risk of downed trees during storms.
- **Hurricanes / Tropical Storms:** All areas of Town are at risk of property damage and power outages during high winds. Some of the areas most vulnerable to flooding include: Route 132, Route 113, Colby Road South, New Boston Road, Barker Road, Tefft Road, Robinson Road, Poor Farm Road, Houghton Hill Road, Picknell Road, Hauger Road, and Burnham Road. Specific vulnerable structures include the North Thetford Post Office, Caldwell Logging, Long Wind Farm, Roger Carpentry Services, and Simple Energy. Climate change is increasing the number and intensity of tropical storms and hurricanes that may reach inland to Vermont. The Town's future vulnerability could be increased by small-scale development in areas that are at risk of flooding or fluvial erosion (outside the 100-year floodplain), and by increases in the number of unhoused and elderly residents in Town.

- **Hail Storms:** All areas of Town are vulnerable to impact damage, particularly crops, equipment, and infrastructure that are exposed to the elements. The population most vulnerable to hail storms is unhoused residents. It is not certain whether hail storm events will increase in frequency with climate change. The Town could experience small increases in its vulnerability due to small-scale development that increases the value of property at risk, and increases in the unhoused population.
- **Infectious Disease:** The entire town is vulnerable, but risks to life and health are particularly high for those residents with suppressed or otherwise diminished immune systems. Increases in the elderly and unhoused populations will increase the Town's vulnerability over time. Economic impacts during lockdowns can be significant.

VI. Mitigation

A. Mitigation Goals

1. To reduce injury and losses, including loss of life and damage to infrastructure, structures, and businesses, from the natural hazard of severe weather.
2. To reduce injury and losses, including loss of life and damage to infrastructure, structures, and businesses, from the natural hazard of flash flood, flood, and fluvial erosion.
3. To reduce injury and losses, including loss of life and damage to infrastructure, structures, and businesses, from the natural hazard of extreme cold, snow, and ice storms.
4. To reduce injury and losses, including loss of life and damage to infrastructure, structures, and businesses, from the natural hazard of hurricanes and tropical storms.
5. To reduce injury and losses, including loss of life and damage to infrastructure, structures, and businesses, from the natural hazard of hail storms.
6. To reduce injury and losses, including loss of life and damage to infrastructure, structures, and businesses, from the natural hazard of infectious disease.

B. Town Plan Goals & Policies Supporting Local Hazard Mitigation

Note that the following language is excerpted from the 2020 Thetford Town Plan:

- It is the policy of the Town to systemically inventory and prioritize road maintenance and repair so that no road, bridge, or culvert falls into a condition of disrepair. (p.45)
- The Town should support buffer zones along Thetford's rivers, streams and in areas where groundwater comes to the surface in order to maintain quality water supply and the community's fishery and plant diversity. (p. 58)
- The Town should promote voluntary planting of native shrubs and trees in river and stream buffer zone protection areas and in stream bank restoration projects to prevent erosion, silting and to provide food and shelter for wildlife. (p.58)
- The Town should sustain the long-term ability of the Town wetland areas to perform critical hydrological functions, filter surface water, and enhance wildlife and plant diversity. (p.59)
- Goal: Flood hazard areas that are maintained and enhanced as conservation areas, greenways, and non-commercial recreation and/or agricultural land. (p.66)
- Goal: No net loss of flood storage capacity of floodplains and upland forests. (p.66)
- Goal: Town infrastructure and buildings that are protected from the potential of flood damage. (p.66)
- It is the policy of the Town to use sound planning practices to address flood risks so that Thetford's citizens, property, economy, and the quality of the Town's rivers and waterways all remain protected. (p. 66)
- It is the policy of the Town to design new culverts and bridges to, at a minimum, meet current VTrans Hydraulics Manual and ANR (VT Agency of Natural Resources) Stream Alteration Standards and size them appropriately to handle floods. (p.66)

- It is the policy of the Town use all reasonable efforts to limit the extent of impervious land cover and to retain storm water on site. (p.67)
- It is the policy of the Town to protect and where possible restore floodplains and upland forests so they may retain and absorb floodwater. (p.67)
- The Town should continue developing flood mitigation plans, and emergency preparedness and recovery procedures. (p.67)
- The Town should continue to maintain and update town bridge and culvert inventories. This information should be used to develop a schedule to replace undersized culverts using up-to-date hydrological surveys based on current weather patterns. (p. 67)
- The Town should research alternate ways of interpreting and predicting areas of flood and fluvial erosion hazard because recent experiences suggest the FEMA mapped floodplains are not accurate predictors of true flood damage and revise the flood regulations to take into account these new flood risk areas. (p.122)

The Thetford Town Plan was adopted on September 11, 2020 and will be up for renewal in 2028, around the same time this hazard mitigation plan will be up for renewal. The 2017 Thetford LHMP, the previous version of this Local Hazard Mitigation Plan for the Town of Thetford, provided guidance in the development of the 2020 Thetford Municipal Plan, including directing goals, policies, and recommendations towards mitigating the effects of future hazards on health and property of the Town.

C. Hazard Mitigation Strategies: Programs, Projects & Activities

Vermont Emergency Management encourages a collaborative approach to achieving mitigation at the local level through partnerships with Vermont Agency of Natural Resources, VTrans, Vermont Agency of Commerce and Community Development, Regional Planning Commissions, FEMA Region 1 and others. These agencies and organizations can work together to provide assistance and resources to towns interested in pursuing hazard mitigation projects.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(3)(ii), 201.6(c)(3)(iii) and 201.6(c)(3)(iv).

With each mitigation strategy, general details about the following are provided: benefits, cost, resources, responsible parties, timeframe, and prioritization.

A “High” prioritization indicates that the benefits provided by the strategy will address critical and urgent need, or the benefits are greater than those expected from other actions with similar costs. A high priority strategy is known or reasonably expected to be feasible from a technical and political standpoint, the potential funding is readily available, and the implementation timeframe is less than 2 years. A “Medium” prioritization indicates that the benefits provided by the strategy are addressing needs that are less critical and not urgent, or the benefits are lower than those expected from actions with similar costs. For medium priority projects, uncertainties over a project’s technical or political feasibility may exist, potential funding is readily available (or is reasonably expected to become available

within the implementation timeframe), and the implementation timeframe is more than 2 years but less than 4. A “Low” prioritization indicates that the benefits provided by the strategy are lower than those expected from other actions identified in this plan; the strategy is not addressing an urgent or critical need. For low priority strategies, uncertainties over a project’s technical, political, or financial feasibility may exist, and the implementation timeframe is more than 4 years.

The Town of Thetford understands that in order to apply for FEMA funding for mitigation projects, a project must meet more formal FEMA benefit cost criteria. A project seeking FEMA funds would undergo a full benefit-cost assessment in the FEMA-approved format. The Town must have a FEMA approved Local Hazard Mitigation Plan as well.

The following mitigation strategies will be incorporated into the Town of Thetford’s long-term land use and development planning documents. Specifically, the Town will review and incorporate elements of this Local Hazard Mitigation Plan into updates for the municipal plan (particularly in goal, policy, and recommendation language), zoning regulations, and flood hazard bylaws. The incorporation of the goals and strategies listed in the Local Hazard Mitigation Plan into the municipal plan, zoning regulations and flood hazard bylaws will also be considered after declared or local disasters. The Town shall also consider reviewing any future TRORC planning documents for ideas on future mitigation projects and hazard areas.

Hazards Addressed	Actions	Benefits	Cost	Possible Resources*	Responsible Parties	Time Frame	Priority
Severe Weather (Thunderstorm, Lightning, High Winds)	Encourage Green Mountain Power to clear and maintain utility corridors, with emphasis on burying lines, which will protect town and utility infrastructure.	Reduced number and duration of power outages during severe weather	Low	Green Mountain Power; local resources (town staff time and utility customer rates)	Emergency Management Director (primary); Town Manager	Fall 2024-Fall 2025	High
	Clear and maintain town road rights-of-way.	Reduced risk of damage to utilities and road closures during hazard events	Low	Local resources	Highway Department (primary); Town Manager	2024-2025; ongoing	High
Flash Flood / Flood / Fluvial Erosion	Request an updated flood map from FEMA, which will more accurately represent frequently flooded areas and will allow the town to properly monitor and restrict the construction of infrastructure in areas that are vulnerable to flooding and severe weather.	Reduced risk of damage, injuries, or death during flood or flash flood events	Low	FEMA; local resources	Planning Commission (primary); Town Zoning Administrator	Fall 2024-Spring 2025	High
	Update Thetford's flood hazard area regulations to ensure that they are compliant and consistent with state and federal guidelines and statutes.	Reduced damage to structures from flooding	Low	Municipal Planning Grant; TRORC; local resources	Planning Commission (primary); Selectboard	Fall 2024	High

Hazards Addressed	Actions	Benefits	Cost	Possible Resources*	Responsible Parties	Time Frame	Priority
Flash Flood / Flood / Fluvial Erosion (continued)	Keep up-to-date with Vermont Road and Bridge Standards, which will help Thetford design structures that mitigate flood damage.	Reduced damage to infrastructure from flooding and fluvial erosion.	Low	Local resources	Selectboard (primary); Department of Public Works foreman; Town Manager	2024-2025 (or whenever the standards are updated by VTrans)	High
	Educate residents about the importance of preserving and restoring riparian buffers.	Additional overgrowth will help reduce fluvial erosion.	Low	Local Resources; State Grants	Conservation Commission	Fall 2024-Spring 2025	Medium
	Update the Flood Resilience Element in the Town Plan to identify areas of vulnerability to flooding and erosion and to identify areas for future protection.	Reduced development in high-risk areas, leading to reduced risk of damage during events	Low	Municipal Planning Grant; Two Rivers-Ottawaquechee Regional Commission (TRORC); local resources	Planning Commission (primary); TRORC; Selectboard	2027-2028	Low
	Consider adopting river corridor regulations for all lands designated on the state Agency of Natural Resources river corridor maps	Reduced development in river corridors and therefore reduced risk of damage from fluvial erosion	Low	Municipal Planning Grant; TRORC; local resources	Planning Commission (primary); Selectboard; Conservation Commission;	2025-2026	Medium

Hazards Addressed	Actions	Benefits	Cost	Possible Resources*	Responsible Parties	Time Frame	Priority
Extreme Cold / Snow / Ice Storm	Update and maintain existing list of populations that are vulnerable to extreme cold and other hazards so that they can be contacted quickly and efficiently before/during hazard events.	Reduced risk to life and safety during hazard events	Low	Local resources; VT Public Safety Answering Points (PSAPs); Vermont Emergency Management	Emergency Management Director (primary); Fire Department	Fall 2024 – Summer 2025; Ongoing	High
	Plan for, budget, and maintain roads for safe winter travel.	Reduced risk to life and safety during hazard events	Moderate	Local resources	Department of Public Works	Annual	High
	Distribute seasonal safety informational materials to residents by means of social media.	Increased resident awareness and decreased risk to life and safety during hazard events	Low	Local Resources	Fire Department (primary)	Fall 2024-Summer 2025; Ongoing	High
Hurricanes / Tropical Storms	Use the existing Town of Thetford culvert inventory and capital budgeting program to replace undersized culverts.	Upsizing culverts reduces damage to town infrastructure during flooding.	Moderate	VTrans Structures Grant; BRIC, HMGP; local resources	Town Manager (primary); Department of Public Works Foreman	Fall 2024-Fall 2025; ongoing	Medium
	Continue efforts throughout Town to maintain and improve ditching in rights-of-way of Town-maintained roads.	Reduced damage to Town infrastructure and private property	Low	VTrans Better Roads grant; local resources	Department of Public Works Foreman	Fall 2024-Fall 2025; ongoing	High

Hazards Addressed	Actions	Benefits	Cost	Possible Resources*	Responsible Parties	Time Frame	Priority
Hail Storm	Encourage Thetford residents to sign up for Vermont Alert. This will allow residents to be alerted when there are hazards.	Increased resident awareness and ability to take shelter and protect property before events	Low	Local resources; Vermont Alert; Vermont Emergency Management	Emergency Management Director (primary); Town Manager	Fall 2024; Ongoing	High
Infectious Disease	Coordinate town services to ensure continuity in the event of an outbreak.	Increased local capacity to respond to outbreaks	Low	Local Resources; Vermont Emergency Management; Vermont Department of Health	Selectboard (primary); Town Manager; Emergency Management Director; Health officer	Fall 2024; ongoing	High
	Stock PPE and disinfecting products at the town hall, emergency operations center, shelter, and each department	Help Town staff and residents reduce the spread of illness.	Low	Local Resources; Vermont Emergency Management; Vermont Department of Health	Emergency Management Director (primary); Town Manager; Health Officer; Department heads	Fall 2024; ongoing	High
	Follow CDC, Vermont Department of Health, and FEMA guidelines during outbreaks; including scheduling vaccine clinics, educational events, and coordinating the dissemination of health information	Reduced spread of illness	Low	Local Resources; Vermont Emergency Management; Vermont Department of Health; CDC; FEMA	Emergency Management Director (primary); Selectboard; Town Manager; Health officer	Fall 2024; ongoing	High

Hazards Addressed	Actions	Benefits	Cost	Possible Resources*	Responsible Parties	Time Frame	Priority
Infectious Disease (continued)	Provide evidence-based educational resources to community regarding infectious disease prevention	Reduced spread of illness	Low	Local Resources; Vermont Emergency Management; Vermont Department of Health; CDC	Health Officer (primary); Emergency Management Director	Fall 2024; ongoing	High
All hazards	Ensure that Thetford's Local Emergency Management Plan (LEMP) is kept up-to-date and identifies vulnerable areas and references this Plan.	Improved coordination for response to hazard events	Low	Local resources; Two Rivers-Ottawaquechee Regional Commission	Emergency Management Director (primary); Selectboard	Annually	High
	Alert residents to upcoming hazards, bad weather, and potentially treacherous travel conditions by posting the VTrans Live Update Road Condition webpage on the Thetford Town Website and through social media.	This resource will reduce the loss of life and property during a hazard.	Low	Local resources	Emergency Management Director (primary); Town Manager	Fall 2024; ongoing	High
	Develop an electronic methodology to consistently document infrastructure damage after weather events.	Improved documentation of damages will help with the Town plan for infrastructure resiliency upgrades.	Low	Local resources; TRORC; VTrans	Department of Public Works / Foreman (primary); Town Manager; Emergency Management Director	Fall 2024	High

Hazards Addressed	Actions	Benefits	Cost	Possible Resources*	Responsible Parties	Time Frame	Priority
All hazards (continued)	Require Thetford employees and Town Manager and recommend that Selectboard become FEMA 402 certified.	Increased local capacity to respond to hazard events	Low	Local resources; Vermont Emergency Management	Emergency Management Director (primary)	Fall 2024; ongoing	High
	Maintain highway and fire mutual aid agreements.	Increased local capacity to respond to hazard events	Low	Local resources; assistance from TRORC	Fire Department (primary for fire services); Town Manager (primary for highway); Selectboard; Department of Public Works	Fall 2024; ongoing	High
	Ensure Red Cross Shelter and Thetford Elementary School are stocked off-site with cots, blankets, and supplies. Train volunteers as resources allow.	Preparedness to shelter residents impacted by hazard events	Low	Local resources; Vermont Emergency Management	Emergency Management Director	Annually	High
	Maintain and test the generator at the Red Cross Shelter.	Preparedness to shelter residents impacted by hazard events	Low	Local resources; Vermont Emergency Management	Emergency Management Director (primary); Town Manager	Annually	High

*Depending on the mitigation action, local resources may include the following: personnel/staff time; volunteer time; budget line items, donations, cash from capital campaigns, among others.

Appendices

Appendix A: Hazard Ranking Methodology

<u>Frequency of Occurrence</u> Probability	<u>Warning Time</u> Amount of time generally given to alert people to hazard	<u>Potential Impact</u> Severity and extent of damage and disruption *Note: Severity of damage and disruption generally correlates with magnitude (extent) of an event
<p>1 = <i>Unlikely</i> <1% probability of occurrence per year</p> <p>2 = <i>Occasionally</i> 1–10% probability of occurrence per year, or at least one chance in next 100 years</p> <p>3 = <i>Likely</i> >10% but <75% probability per year, at least 1 chance in next 10 years</p> <p>4 = <i>Highly Likely</i> >75% probable in a year</p>	<p>1 = More than 12 hours</p> <p>2 = 6–12 hours</p> <p>3 = 3–6 hours</p> <p>4 = None–Minimal</p>	<p>1 = <i>Negligible</i> Isolated occurrences of minor built or natural environmental damage, potential for minor injuries, health, or well-being impacts, or minimal economic disruption.</p> <p>2 = <i>Minor</i> Isolated occurrences of moderate to severe built or natural environmental damage, potential for injuries or health or well-being impacts, minor economic disruption.</p> <p>3 = <i>Moderate</i> Severe built or natural environmental damage on a community scale, injuries, fatalities or impacts to individual and community well-being, short-term economic impact.</p> <p>4 = <i>Major</i> Severe built or natural environmental damage on a community or regional scale, multiple injuries or fatalities or severe long-term impacts to individual and community well-being, significant long-term economic impact</p>

Appendix B: Critical Stream Crossings

Critical crossings in the table below includes stream crossing structures on town highways that cross third order streams or larger. Headwater streams generally include first through third order. Third order was included as these headwater streams will have larger drainage areas and may have larger structures that are more difficult to replace and have a larger impact on the road network. Most of these are bridges. Structures that have a “Y” in the “AOTSTRUCT” column are state-owned.

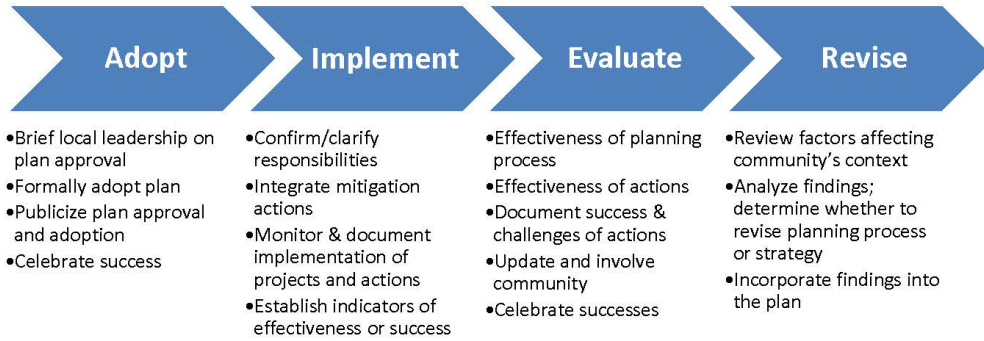
local_id	location	label	cul_type	cul_matl	height	width	length
B12	GODFREY RD	THETFORD					
B5	ROUTE 132	THETFORD					
B21	PICKNELL RD	THETFORD					
B18	LATHAM RD	THETFORD					
B6	NEW BOSTON RD	THETFORD					
B19	STEVENS RD	THETFORD					
B4	ROUTE 132	THETFORD					
00008	W BR. OMPOMPANOOSUC RIV.	THETFORD	200177000809112	3 SP CONT WELD GIRD			000225
00007	OMPOMPANOOSUC RIVER	THETFORD	100911000709111	GLU LAM BM/MKGPSTCB			000123
00022	LAKE FAIRLEE OUTLET	THETFORD	100911002209111	PRESTRESS CONC. TBM			000055
00023	LORD BROOK	THETFORD	100911002309111	CONCRETE SLAB			000025
00026	OMPOMPANOOSUC RIVER	THETFORD	100911002609111	WELDED PLATE GIRDER			000103
00027	OMPOMPANOOSUC RIVER	THETFORD	100911002709111	2 SPN ROLBM/HAUPT CB			000125

The critical crossings in the table below includes significantly undersized structures, usually culverts, which were identified from the ANR-DEC stream geomorphic assessment survey with openness ratios less than 50%. This measure refers to when structure’s width is less than half of the stream bank’s full width. Several of these structures may have been damaged during TS Irene or other events and may have been replaced. The town, at some point, should look at these sites and assess their status and need for repair/upgrades.

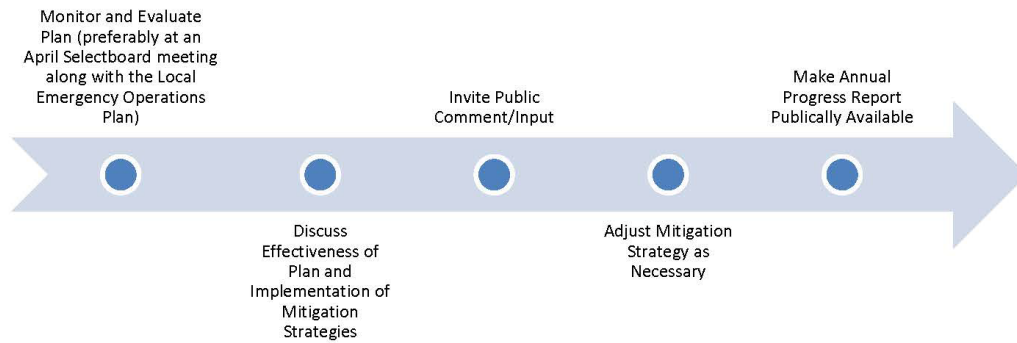
BankfullWidthPercent	CompatabilitySum	IceDebrisJam	OpennessRatio	AOPCourseScreen	RetrofitPotential	StructureType	Town	Location	GisRoadName	StreamName	ChannelWidth	StructureLength	StructureHeight	StructureWidth
24.2	2	1	7%	Red	LLL	Culvert	Thetford	Thetford Hill State Forest. Trail Off of Houghton Hill Rd.		Trib to Zebedee Brook	4.96667	20	1.2	1.2
59.1	5	1	9%	Gray	LLL	Culvert	Thetford	East of Route 5 Culvert		Roaring Brook	11	502	7.2	6.5
28.6	5	1	11%	Gray	LLL	Culvert	Thetford	CT river bends back to South. Near a PVT Drive, BM 396	ROUTE 5	Trib to CT	14	210	6	4
25.5	1	1	14%	Red	LLL	Culvert	Thetford	Just North of Cream street	ROUTE 132	Trib to West Branch C	13.7	85	3.5	3.5
69.8	3	1	16%	Gray	MLL	Culvert	Thetford	MM - 81.75		Trib to CT River	6.3	118	4.4	4.4
69.8	3	1	16%	Red	MLL	Culvert	Thetford	100' after Orange / Windsor Town Line - MM 81.75		Trib to CT River	6.3	118	4.4	4.4
33.5	1	1	18%	Gray	MLL	Culvert	Thetford	Thetford Hill State Forest. On Lower Loop		Unnamed Trib	7.16667	34	2.5	2.4
46	3	1	19%	Gray	MLL	Culvert	Thetford	Above large turnout/school bus turn around Below Thetford Hill	ROUTE 113	Outlet to Lake Abenab	8.7	106	5	4
38.8	5	1	19%	Red	MLL	Culvert	Thetford	First structure after road turns to dirt	ROBINSON HILL RD	Trib to Lake Fairlee	7.6	39	2.7	2.8
49.7	1	1	20%	Red	MLL	Culvert	Thetford	Thetford Hill state Forest		Unnamed Trib	4.025	20	2	2
26.5	4	1	22%	Red	LLL	Culvert	Thetford	100' east of Y in road	CRANBERRY HILL RD	Trib to Zebedee Brook	11.3	40	3	3
72.7	3	1	24%		Missing Data	Bridge	Thetford	Part of the Route 5 Culvert at Newton Lane (pvt)		Roaring Brook	11	100	3	8
43.4	5	1	28%	Gray	MLL	Culvert	Thetford	Just below Colby and Sawnee Bean intersection	SAWNEE BEAN RD	Barker Brook	7.61	42	3.3	3.3
49.1	1	1	28%	Gray	LLL	Culvert	Thetford	Median between North & South Bound Lanes		Zebedee Brook	21.2	290	9.5	8.5
68	3	1	28%	Red	MML	Culvert	Thetford	Near the Thetford/Norwich town lines	CAMPBELL FLATS RD	Trib to Ompompanoos	5	30	2.5	3.4
41.1	1	1	30%	Gray	MLL	Culvert	Thetford	Second structure above junction with Tucker Hill Road	POOR FARM RD S	Trib to West Branch C	7.3	30	3	3
54.8	1	1	31%	Red	LLL	Culvert	Thetford	At Jct with Clay Hill Road	ROUTE 5	Trib to CT River	7.3	77	6	4
23.4	2	1	31%	Red	LLL	Culvert	Thetford	North of Turnpike Road South Jct		Trib to CT River	10.7	20	2.5	2.5
57.7	0	1	33%	Red	MLL	Culvert	Thetford	North of Sanborn Road	LATHAM RD	Trib to CT River	13	114	5	7.5
56.3	5	1	34%	Gray	MML	Culvert	Thetford	By Mile Marker 81.8		Unnamed	8	60	4.5	4.5
46.3	1	1	38%	Gray	MLL	Culvert	Thetford	West of Gorey Road	ROUTE 113	Zebedee Brook	10.8	68	5.1	5
46.7	4	1	38%	Gray	MLL	Culvert	Thetford	Just south east of Turnpike Road		Trib to CT	15	153	8.3	7
42.7	2	1	39%	Gray	LLL	Culvert	Thetford	Junction of Wipponwill Road & Tucker Hill Road	TUCKER HILL RD	Trib to Ompompanoos	11.7	64	5	5
26.4	3	1	39%	Gray	LLL	Culvert	Thetford	Jct Godfrey Road & Quail John Road	GODFREY RD	Trib to Zebedee Brook	16.3	33	3	4.3
38	1	1	40%	Red	MLL	Culvert	Thetford	Just after passing under the I-91 Overpass.	TURNPIKE RD S	Trib to CT River	15	88	6.1	5.7
46.7	4	1	41%	Gray	MLL	Culvert	Thetford	Just South of I-91 South overpass		Trib to CT River	15	141	8.3	7
40.1	1	1	43%	Gray	MLL	Culvert	Thetford	Under I-91 underpass, between N/S bound lanes	QUAIL JOHN RD	Zebedee Brook	21.2	190	9.5	8.5
40	1	1	45%	Red	MLL	Culvert	Thetford	Thetford Hill State Park		Unnamed	7.5	20	3	3
50	3	1	45%	Gray	MML	Culvert	Thetford	Near Junction with S - corners road	ROUTE 113	Mud Pond Outlet	11	74	6.1	5.5

Appendix C: Five-Year Review and Maintenance Plan

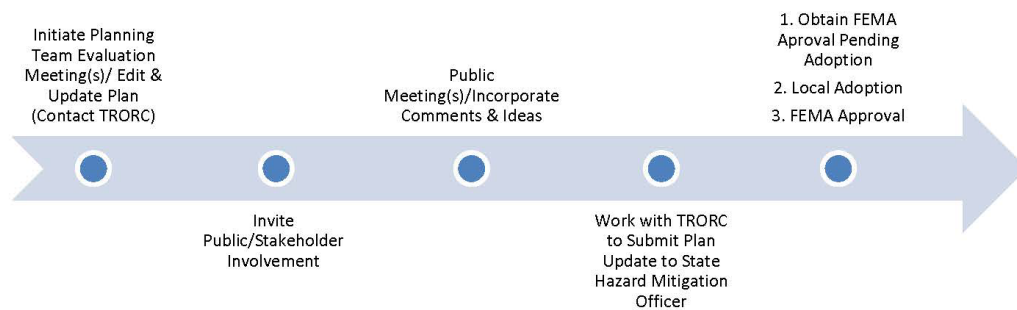
Five-Year Local Hazard Mitigation Plan Review/Maintenance



After Plan Adoption—Annually Implement & Evaluate

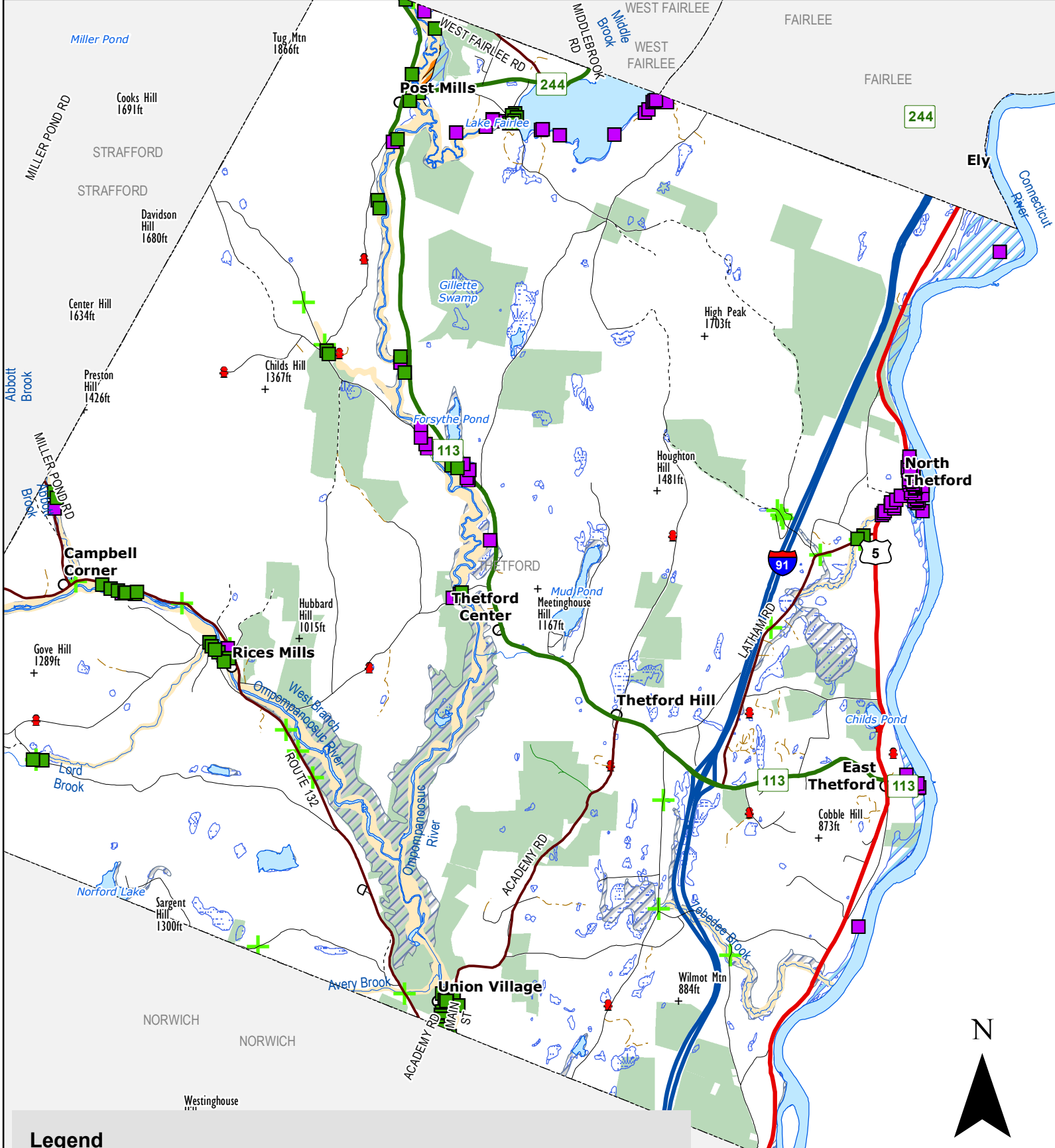


Fifth Year, and After a Major or Federally Declared Disaster Directly Impacting the Town Evaluate & Revise



Attachments

Attachment A: Map of the Town of Thetford



Legend

Flood Sites

- Sites in Flood Hazard Area
- Sites in River Corridor
- + Bridges

Surface Water

- Lake or Pond
- River

- Stream
- Brook
- HYDRANTS
- River Corridor

Mapped Flood Hazard Areas

- A, Special Flood Hazard Area
- AE, SFHA with BFE
- AE, FLOODWAY
- Wetland
- Conserved

