

THE TOWN OF CHESTERFIELD, MA

HAZARD MITIGATION PLAN UPDATE



Chesterfield Town Hall, Source: PVPC

Adopted by the Chesterfield Board of Selectmen on XX Date_____

**Prepared by:
The Chesterfield Hazard Mitigation Planning Committee
and**

The Pioneer Valley Planning Commission

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1 - PLANNING PROCESS

Introduction

The Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA) define Hazard Mitigation as any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards such as flooding, storms, high winds, hurricanes, wildfires, earthquakes, etc. Mitigation efforts undertaken by communities will help to minimize damages to buildings and infrastructure, such as water supplies, sewers, and utility transmission lines, as well as natural, cultural and historic resources.

Planning efforts, like the one undertaken by the Town of Chesterfield and the Pioneer Valley Planning Commission, make mitigation a proactive process. Hazard mitigation planning emphasizes actions that can be taken before a natural disaster occurs. Future property damage and loss of life can be reduced or prevented by a mitigation program that addresses the unique geography, demography, economy, and land use of a community within the context of each of the specific potential natural hazards that may threaten a community.

Preparing a hazard mitigation plan before a disaster can save the community money and facilitate post-disaster funding. Costly repairs or replacement of buildings and infrastructure, as well as the high cost of providing emergency services and rescue/recovery operations, can be avoided or significantly lessened if a community implements the mitigation measures detailed in the plan. FEMA requires that a community adopt a pre-disaster mitigation plan as a condition for mitigation funding. For example, the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance Program (FMA), and the Building Resilient Infrastructure and Communities (BRIC) Program all have this requirement.

Hazard Mitigation Plan Workgroup

In 2023, the Town of Chesterfield completed an update of their 2016 Hazard Mitigation Plan, in collaboration with the Pioneer Valley Planning Commission. All portions of the plan were reviewed and updated as necessary. Planning for hazard mitigation in Chesterfield involved the following members of the Hazard Mitigation Update Committee:

- Larry Holmberg, Emergency Management Director, Chair
- Roger Fuller, Select Board Chair
- David Hewes, Fire Chief
- Mike Malouin, Police Chief
- John Follet, Conservation Commission
- John Chandler, Board of Health

- Matt Smith, Highway Department Superintendent
- Denise Cormier, Energy Committee
- Jan Gibeau, COA Director
- Joe Gazillo, Energy Committee Chair
- Fred Drake, Planning Board
- Trish Colson, Select Board Vice-Chair

The hazard mitigation planning process for the Town included the following tasks:

- Reviewing and incorporating existing plans and other information.
- Identifying the natural hazards that may impact the community.
- Conducting a Vulnerability/Risk Assessment to identify the infrastructure at the highest risk for being damaged by the identified natural hazards, particularly flooding.
- Identifying and assessing the policies, programs, and regulations the community is currently implementing to protect against future disaster damages.
- Identifying deficiencies in the current strategies and establishing goals for updating, revising or adopting new strategies.
- Adopting and implementing the final Hazard Mitigation Plan.

Changes in priorities since the previous plan, for both the committee and community in general, influenced the plan's development and the content. Committee members and members of the community are more concerned about the impacts of climate change since the 2016 plan. Most noticeable have been changes in patterns of precipitation that have led to both increased flooding and increased incidences of drought. Also of concern were general temperature increases and the associated impacts, particularly in the winter, which has resulted in fewer days below freezing.

The key product of this process is the development of an Action Plan with a Prioritized Implementation Schedule. The action items within the Action Plan represent a multi-faceted approach to addressing natural hazards in the Town and will be undertaken as resources become available and will be integrated into ongoing planning activities. As part of the review and adoption process, the Committee approved the action items that were in keeping with the goals and criteria established by the Town and assigned appropriate bodies within the Town to implement them within a five-year framework.

Committee Meetings

Meetings of the Hazard Mitigation Planning Committee, all of which took place at Chesterfield Town Offices, were held on the dates listed below. Agendas for each meeting are included in Appendix B. Meetings held in 2023 and 2024 included a review of the entire Hazard Mitigation Plan and updates to the document. **After the January 2016 meeting**, the plan was submitted to MEMA for initial review, and then to FEMA for final review and approval.

April 27, 2023

The Committee reviewed the Hazard Mitigation Planning process, completed a review and update of
Town of Chesterfield Hazard Mitigation Plan Update

the hazard risk assessment for the Town, and a review and update of the critical facilities in Town.

May 31, 2023

The committee updated locations and previous occurrences for hazards, updated recent and potential development and development in hazard-prone areas, and started the mitigation capabilities assessment.

June 29, 2023

The committee reviewed and discussed comments from the public meeting on 6/14/23, completed the mitigation capabilities assessment, and reviewed the status of previous mitigation strategies.

July 27, 2023

The committee revised the previous mitigation strategies to carry over to the plan update and developed new mitigation strategies to implement, including the cost, priority level, responsible parties, timeline and funding sources.

Agendas and sign-in sheets for each meeting can be found in Appendix B. While not all members of the Hazard Mitigation Committee were able to attend each meeting, all members collaborated on the plan and were updated on progress by fellow Committee members after meetings occurred as necessary.

Participation by Stakeholders

A variety of stakeholders were provided with an opportunity to be involved in the update of the Agawam Hazard Mitigation Plan. The different categories of stakeholders that were involved, and the engagement activities that occurred, are described below.

Local and regional agencies involved in hazard mitigation activities:

Representatives from the Select Board, Planning Board, Board of Health, Energy Committee, MVP Committee, and Conservation Commission on the HMP committee assured the involvement of local agencies in the plan development. In addition, all Town staff and departments were informed of the public meetings on the plan update and had the opportunity to participate in those meetings as well as the meetings of the Hazard Mitigation planning committee, as all meeting notices were posted per requirements of the State Open Meetings law. All input received was integrated into the plan. The type of input received included local information not readily available through internet research, updates on the status of implementation of the previous action plan and changes in local rules and regulations as well as other updates on capabilities.

The Pioneer Valley Planning Commission is a regional planning agency for 43 towns and cities in Massachusetts' Hampden and Hampshire Counties. PVPC regularly engages with the Town of Chesterfield as part of its regional planning efforts, which include the following:

- Developing the Pioneer Valley Regional Land Use Plan, Valley Vision 2, which advocates for sustainable land use throughout the region and consideration for the impact of flooding and other natural hazards on development.
- Developing the Pioneer Valley Climate Action and Clean Energy Plan, which assesses the impact that climate change will have on the region and recommends strategies for mitigation that can be implemented by local municipalities and businesses.
- Collaborating with state agencies, such as the Department of Conservation and Recreation, to maintain inventories of critical infrastructure throughout the region.

All of these PVPC initiatives considered the impact of natural hazards on the region and strategies for reducing their impact to people and property through hazard mitigation activities. The facilitation of the Chesterfield Hazard Mitigation Plan by PVPC ensured that the information from these plans was incorporated into the Hazard Mitigation Planning process.

Agencies that have the authority to regulate development:

The Chesterfield Planning Board is the primary Town board responsible for regulating development in Chesterfield. Other Town commissions, boards, and committees that have the authority to regulate development in Chesterfield include the Zoning Board of Appeals, the Select Board, the Conservation Commission, and the Building Inspector. The participation of the Select Board and Planning Board on the HMP Committee ensured feedback to these Boards as well as to the Zoning Board.

Members of the public and neighboring communities

Two public planning sessions were held as part of the development of Chesterfield plan – on June 14, 2023, and January 27, 2016. Both meetings occurred after the Hazard Mitigation Workgroup had provided input on hazards and mitigation strategies relevant to the community. Notice of both public meetings was posted at Chesterfield Town Offices in compliance with the Commonwealth of Massachusetts’ open meeting law. Public meeting agendas and notices may be found in Appendix B.

On June 5, 2023, a press release was sent to the following media organizations: The Country Journal, The Reminder, the Springfield Republican, the Daily Hampshire Gazette, WWLP, Western Mass News, WAMC, NEPC, and the Westfield News. The Springfield Republican ran a news story on June 7, 2023 publicizing the event, and a copy of the news clip is included in Appendix X. Outreach and publicity for the public meeting also included a flyer that was posted on the Town website and Facebook page, a hard copy of the flyer that was posted at Town Hall, the Library, and the Senior Center, and an announcement on the electronic bulletin boards located at the Town lines on Route 143. Nine Chesterfield residents attended the public meeting, as well as three members of the HMP committee.

On January 13, 2016, the Pioneer Valley Planning Commission sent a press release to all area media outlets to inform the public that a draft of the Chesterfield Hazard Mitigation Plan had been placed on PVPC's website (www.pvpc.org). The release also indicated that hard copies were available at PVPC's offices and at Chesterfield Town Offices, and that all residents, businesses and other concerned parties of Chesterfield and adjacent communities were encouraged to comment on the plan by e-mailing or calling staff contacts at PVPC or the Town of Chesterfield directly.

Citizens from adjacent municipalities were encouraged to comment on Chesterfield's plan by e-mailing or calling staff contacts at PVPC or the Town of Chesterfield. The Pioneer Valley Planning Commission's regional scope ensured that residents and government officials throughout the Pioneer Valley saw the press release and request for comments. In addition, an email was sent to Emergency Management Directors of surrounding towns with the draft plan attached, requesting comments on the plan and inviting them to the public meeting.

PVPC staff regularly present to their Executive Committee and Commission (representatives from the 43 cities and towns that comprise the Pioneer Valley, when new projects are launched and when funding opportunities are available). As result, all the communities in the region were informed of Chesterfield's Hazard Mitigation Plan update process and encouraged to comment. In addition, PVPC is facilitating Hazard Mitigation work in many other communities in Hampden and Hampshire Counties concurrent to working with Chesterfield, so all these municipalities were aware of and had the opportunity to share hazard mitigation information with one another. We did not receive any comments from these neighboring municipalities on Chesterfield's draft plan update.

The press release and a screen shot of PVPC's website showing the link to the press release can be found in Appendix B.

Representatives of businesses, academia, and other private organizations:

The owners of the Chesterfield General Store, representatives of Eversource, and administrators at New Hingham Elementary School (which serves students from Chesterfield and Goshen) were invited to review the draft plan and to attend the public meetings. In addition, the committee sent the draft plan to the UMass Amherst Landscape Architecture and Regional Planning Department, with an invitation for either faculty or students to review the plan, and faculty and students were also invited to the second public meeting.

Representatives of nonprofit organizations:

The director of Chesterfield's Council on Aging was a member of the HMP committee, and her participation ensured that the needs of older and disabled adults were prioritized during the planning process. Staff at Hilltown Community Development Corporation (HCDC), located in Chesterfield, were also invited to attend the public meetings and to review the draft plan. HCDC provides social services to vulnerable groups in the Massachusetts hilltowns, including low-income, senior, and disabled populations. HCDC also develops housing for low and moderate-income residents and seniors.

Strategies for Ongoing Public Involvement

Public participation will be a critical component of the Hazard Mitigation Plan maintenance process. The Hazard Mitigation Workgroup will hold all meetings in accordance with Massachusetts open meeting laws. The Chesterfield Local Emergency Planning Committee (LEPC), under the direction of the Emergency Management Director, will hold an annual review of Chesterfield's Hazard Mitigation Plan. This meeting will be held at the Chesterfield Town Offices and will focus on the LEPC's planning activities.

In addition to these annual meetings, the Town of Chesterfield website (www.townofchesterfieldma.com/) will contain a tab for the Town's Hazard Mitigation Plan, where a copy of the Plan will be posted. During LEPC annual review meetings, the Emergency Management Directory will make attendees aware of the presence of the HMP plan on the town's website.

Select Board Meeting

In 2023, the Select Board agreed to begin the process of developing a Hazard Mitigation Plan Update. Once the plan has been provisionally approved by FEMA, the Select Board will hold a public hearing on the plan for consideration and adoption.

Incorporation with Other Planning Documents

Existing plans, studies, reports and technical information were incorporated throughout the planning process. This included a review and incorporation of significant information from the following key documents:

- *Chesterfield Comprehensive Emergency Management Plan* (particularly the Critical Infrastructure Section) – the Critical Infrastructure section was used to identify those infrastructure components in Chesterfield that have been identified as crucial to the function of the Town; also, this resource was used to identify special needs populations as well as potential emergency shortcomings.
- *Subdivision Rules and Regulations Governing the Subdivision of Land* – Town of Chesterfield, original document June 4, 1963, amended July 8, 2008
- *Chesterfield Zoning Bylaw* - The Town's Zoning Bylaw was used to identify those actions that the Town is already taking that are reducing the potential impacts of a natural hazard (i.e. floodplain regulations) to avoid duplicating existing successful efforts.
- *Massachusetts State Climate Adaptation and Hazard Mitigation Plan* - This plan was used to

insure that the Town's HMP was consistent with the State's Plan. There was also natural hazard and climate change data that was utilized for Chesterfield's HMP.

- *Chesterfield Open Space and Recreation Plan* – This plan was used to provide information about natural resources in Chesterfield, as well as growth and development patterns.
- *Chesterfield MVP Summary of Findings* – This plan also assessed climate change impacts and natural hazards that affect the Town, as well as strategies to pursue to increase resilience. Therefore, as this plan was very pertinent to the HMP, it was reviewed closely, and the actions identified in the plan informed the actions identified for the HMP.

Elements of the previous HMP were also incorporated into other Town plans and documents. It informed the development or update of the Comprehensive Emergency Management Plan, the Open Space and Recreation Plan, the Municipal Vulnerability Preparedness planning process and Summary of Findings, and the zoning ordinance.

2 – LOCAL PROFILE

Community Setting

Chesterfield is a rural town in western Massachusetts located 8 miles from Northampton and 40 miles northwest of Springfield. The Town was settled around 1755 and incorporated in 1762. The Town center, established after the American Revolution, has well-preserved Federal Period houses along Main Road. Chesterfield's main villages - the Town center, Bisbeeville, West Chesterfield, Sugar Hill and Bofat - were settled in 1762. The economy was mainly supported by agricultural practices and water-powered industries until the mid-1900s.

Throughout this period of growth in Chesterfield, several villages outside of the current town center were established. West Chesterfield is located near the East Branch of the Westfield River; Sugar Hill is where the first town meeting was held; and Bisbeeville and Bofat are located on the eastern side of town. These village sites were chosen along the rivers and brooks for their proximity to water-powered mills. The decline in industrialization led to the disuse and deterioration of many of these mills. While some of these historic mills have been lost, there are many renovated historic houses and buildings that generations of residents have preserved, which contribute greatly to Chesterfield's character. In more recent years, new residents of Chesterfield have built houses on forested lots and on old family farms, as well as in the established villages. With limited employment options in Chesterfield and most residents commuting to work outside of town, there has been very little industrial development. Thus, the rural and small-town character in Chesterfield has remained fairly constant over time, even as the number of working farms has decreased.

Government

Chesterfield is governed by an Open Town Meeting form of government in which all registered voters may participate. Acting as the legislative branch, the Town Meeting enacts bylaws (both general and zoning), appropriates the operating budget, and makes other important decisions about the town's resources and services. An elected three-member Board of Selectmen act as the town's chief executive officers, and a variety of elected or appointed volunteer committees and town officials are responsible for budget preparation, policy development, town bylaws, and state codes and regulations, among other advisory responsibilities.

Population Characteristics

The population of Chesterfield is 1,189, according to 2020 Census data. This is an increase of 17.14% over the 2010 population of 1,015, so there has been significant population growth. According to the 2021 American Community Survey 5-year estimates data, this population resides in approximately 551 households. The median household income is \$80,156, which is lower than the median household income for the state as a whole of \$89,645. There are 3.5% of residents living

below the poverty level (2021 American Community Survey) in Chesterfield, which is significantly lower than the state poverty rate of 9.9%. There are no Environmental Justice communities in Chesterfield.

Development Patterns and Trends

Chesterfield's landscape is characterized by rolling hills with two main valleys. The land is nearly 90% woodland or wetland. The Chesterfield Gorge, a 60-acre preserve owned by the Trustees of Reservations, features a 30-foot drop near the headwaters of the Westfield River, a federally designated National Wild and Scenic River.

Most of Chesterfield's 20,032 acres is undeveloped and conserved land, totaling approximately 18,567 acres (Mass Audubon *Losing Ground* Report, 2020). Developed land comprises only 241 acres, or 1%, of Chesterfield's land area. Open land such as agricultural and low-vegetation areas comprises 1,126 acres, or 6% of the total.¹ The amount of permanently protected land in Chesterfield more than doubled from 3,424 acres in 1990 to 7,538 acres in 2015. By 2019, MassGIS data showed that the acreage of protected open space increased to 7,628². The Commonwealth of Massachusetts is one of the largest landowners in Chesterfield, owning approximately 28% of the total acreage (20,003 acres) and 71% of the permanently protected land.

Historically, Chesterfield's rocky terrain was better suited for grazing than tillage, and the lumber industry was also prominent. Numerous mills, including sawmills, tanneries, gristmills, and cloth dressing mills, were introduced and in operation throughout the early 19th century. Residents took advantage of the natural water resources available to power their equipment in the mills and build their economy. The rural character of Chesterfield is sustained today through continued agricultural uses and a regenerated forest over much of the historic pastureland.

There has not been any significant development in the last 5 years since the Town first created a Hazard Mitigation Plan. This is due primarily to Chesterfield's relatively rural location. While there have been individual homes built, there have not been any new subdivisions or new industrial development.

Economy

As stated above, the median household income in the Town of Chesterfield in 2021 was approximately \$80,156. The median home value in 2021 was \$405,000 (ACS 2021 5-year estimates). As there are limited employment options in Chesterfield, most of the population works outside the Town and either commutes to work or works remotely from home (the percentage of residents working remotely has increased significantly since the Covid pandemic began in 2020). The nearby employment centers include Northampton, Amherst (UMass Amherst in particular), Springfield, and

¹ <https://www.massaudubon.org/our-conservation-work/policy-advocacy/local-climate-resilient-communities/losing-ground/statistics/town/chesterfield>

² PVPC, Exploring Financial Implications of Land Conservation in Chesterfield, 2020.

Westfield.

Zoning and Planning

Several factors have played, and will continue to play, an important role in the development of Chesterfield. These include:

- Availability of land for future development
- Current road network
- Physical factors: steep slopes, poor soil conditions, land set aside for conservation, and the Westfield River and its tributaries and floodplains
- Availability (or lack) of resources such as public water, sanitary sewers, high-speed internet, cell phone service
- Economic development opportunities

Chesterfield has three base zoning districts and four overlay districts. The base districts define the allowed uses and dimensional requirements in all parts of the Town, while the overlay districts provide for additional restrictions in certain areas. Overlay districts include the Floodplain and Westfield River Protection district; the Water Supply Protection District; and the Wireless Communication Overlay District. There are no delineated business, commercial, or industrial zoning districts in town.

Zoning and other land use regulations constitute a town's "blueprint" for its future. Zoning is the primary land use tool that the Town may use to manage development and direct growth to suitable and desired areas while also protecting critical resources and ensuring that development is not placed in areas with high risk for natural hazards.

Climate

Chesterfield, MA is located in north central Hampshire County, and has an average temperature of approximately 49.8° F (measured at Westfield-Barnes Regional Airport). The hottest month in Chesterfield is typically July, which has an average high temperature of 79°F and average low of 59°F. The coldest month is typically January, which has an average low of 15°F and an average high of 30°F. Average annual precipitation (also measured at Westfield-Barnes Regional Airport) from 2000 – 2022 was 44.86 inches.

Temperatures and precipitation levels and patterns are changing due to climate change, and these changes will need to be factored into the probability of hazards occurring in Chesterfield. Climate projections from the Northeast Climate Science Center at the University of Massachusetts show with more certainty than ever that these changes can be expected to continue. Projections are based on simulations from the latest generation of climate models from the Intergovernmental Panel on Climate Change and scenarios of future GHG emissions, and are downscaled to the watershed and

county level across the Commonwealth of Massachusetts.³ Chesterfield lies primarily within the Westfield River Basin, where projections show that by the end of this century, communities could see more than 9 inches of additional rainfall annually over a 1971-2000 baseline of 50.7 inches per year.

Average annual temperatures in Chesterfield are projected to increase by over 4°F by mid-century, and there is also projected to be a significant increase in the number of extreme heat days, meaning days with the temperature above 90°F. Projections indicate a possible 2,000% (60 day) increase in 90-degree days per year by the end of the century from a baseline average of three days per year. Heat-related illnesses and mortality show a marked increase at temperatures above 90°F.

Infrastructure

Chesterfield's geography has been a major factor in the development of its infrastructure. Rolling hills with two main valleys surrounded by large wetland systems have helped shape and guide local land use patterns. These geographic characteristics have also limited the expansion of development beyond those lots that have frontage on the main roadways in town.

Roads and Highways

The principal highway in Chesterfield is State Route 143, traveling east-west across the Town, which connects with the cross-state Worcester Turnpike (State Route 9) in the neighboring Town of Williamsburg. Chesterfield's town center is at the intersection of Route 143 (or Main Road), North Road, and South Street.

Rail

There is no passenger or freight rail service in Chesterfield.

Public Transportation

Chesterfield is a member of the Franklin Regional Transit Authority (FRTA), which provides paratransit services for the elderly and disabled through the Town of Goshen and the Council on Aging.

Schools

Public schools serving Chesterfield include the New Hingham Regional Elementary School, serving both Chesterfield and Goshen, and the Hampshire Regional High School in Westhampton, serving the communities of Chesterfield, Goshen, Southampton, Westhampton, and Williamsburg.

³ <https://resilientma.org/datagrapher>

Water and Sewer

Chesterfield does not have a public water supply and relies on numerous private, on-site wells located throughout the community, including six wells for non-community water systems. Chesterfield does not have a public sewer system or any publicly owned wastewater treatment plants in the town. All residences and businesses are served by on-site septic systems.

Energy

Chesterfield does not have a municipal energy source. There is no large-scale solar generation or natural gas distribution infrastructure in town.

Communications

The Town of Chesterfield is serviced by a broadband internet network, completed in 2022, that is owned by the Town and administered by the Broadband Chesterfield Municipal Light Plant (MLP). The MLP is an Enterprise Fund Accounting Entity, overseen by an MLP Board of five appointed members, an MLP Manager and an Associate Manager. The MLP partners with Whip City Fiber, a subsidiary of Westfield Gas + Electric, to operate the network and provide internet service and optional VOIP phone service. Thus, residents with VOIP phone service have reception wherever they have internet coverage, but they lose that service if they are in an area without internet coverage or if they lose internet service because the power is out. The MLP does have a generator that should keep internet coverage up and running in the event of a power outage. Internet outages have occurred, but due to equipment failure rather than severe weather. Recently, redundancy has been added to the system by having multiple cross feeds from abutting communities, which in theory should lessen the risk of a wide-scale outage.

There is also a lack of consistent cell coverage in Town – some areas have little to no cell reception, and in some areas it is spotty. There is one cell tower in the far southwest corner of Town.

Natural Resources

Information in the following section includes excerpts from the Chesterfield Open Space and Recreation Plan (2003):

Chesterfield is characterized by smooth ridge tops and gently rolling hills, with stronger relief occurring along the East Branch of the Westfield River running north/south through the western part of town. The Dead Branch of the Westfield River meanders over gentler land on the eastern side of town and is associated with large tracts of wetlands.

Dramatic wooded slopes distinguish the Chesterfield landscape from the nearby foothills of the Connecticut River Valley. Occasional hilltop pasturelands open up distant western views towards the rolling forested expanse of the Berkshire Highlands. Historic sites and buildings are concentrated

in three main villages, and old mills, cemeteries, and historic houses pepper the landscape as reminders of the history of European settlement on the land. Chesterfield has continued its tradition of working forests and farmlands. A combination of low-density dwellings, reforested landscapes and protected lands has sustained the rural character of the town.

However, the majority of residents today lead a modern life of commuting to nearby towns for employment. Furthermore, given today's economic climate, forestry and agriculture are becoming less profitable. Forests and fields throughout the town are likely places for continued residential growth.

Watersheds

Chesterfield's plentiful water resources include numerous rivers and streams, extensive wetlands, and several ponds. The abundance of water resources is also reflected in the reliable availability of groundwater for private and public wells. Chesterfield sits within two separate watersheds: the Westfield River watershed and the Connecticut River watershed. Most of the town is situated in the Westfield River watershed. Ten miles of the Westfield River run north/south through Chesterfield. Due to a large ridge along the eastern border of Town, 734 acres of Chesterfield is within the Connecticut River watershed.

Rivers and Streams

The Westfield River is the main water course that flows through Chesterfield and was the first river to be designated a National Wild and Scenic River in Massachusetts. The watersheds in Chesterfield eventually flow into either the Westfield River or the Connecticut River. Land surrounding the Westfield River is an important natural riparian corridor, providing habitat for more than ninety state-protected rare species and preventing erosion along riverbanks.

The ultimate confluence of Chesterfield's numerous streams, brooks, and rivers is the Connecticut River by way of the three branches of the Westfield River. The East branch of the Westfield River begins approximately 13 miles northwest of Chesterfield in the Town of Savoy and flows southeast through Windsor, Cummington, Chesterfield, and beyond. The river enters at the northern town line bordering Cummington and flows south along the western side of Chesterfield, crossing Route 143 west of the town center. The Westfield River continues south into Huntington, where it eventually merges with the Middle and West Branches before its confluence with the Connecticut River.

Lakes and Ponds

Several ponds and wetland areas within the town include:

- Damon Pond, located off Damon Pond Road at the Goshen and Chesterfield border;
- Scout Pond, located off Main Road to the east of the main entrance to the Boy Scouts property on Sugar Hill Road;

- Long Pond, located off South Street and linked with the Dead Branch Brook; and
- Little Galilee Pond, located on the border of South Worthington and Chesterfield.

Other water resources include Dead Branch Brook, Tower Brook, Whiteside Brook, Baker Brook, Thayer Brook, Page Brook, Roberts Meadow Brook, West Branch Bronson Brook, Rocky Brook, Branch Shop Brook, Holly Brook, Chauncey Branch, West Falls Branch, Wilder Swamp, and Dead Swamp.

Wetlands

There are 680 acres characterized as wetlands in Chesterfield. Wetlands exist along many of the brooks, streams, and rivers throughout Chesterfield. Wetlands provide viable habitat, nesting, food, and water for a variety of species. In addition, wetlands also mitigate the effects of floods by containing excess water and blunting water velocity. Wetlands can also be found at higher elevations where bedrock is close to the surface, but in Chesterfield the majority is located along the brooks and Westfield River.

Bordering vegetated wetlands are wetlands found bordering these brooks and rivers. Within a 100' buffer zone beyond the wetland edge, development is controlled and requires an Order of Conditions from the Conservation Commission according to the provisions of the Wetlands Protection Act. The objective of the Wetlands Protection Act, as amended by the 1996 Rivers Protection Act, is to preserve the quality of water, maintain quality and quantity of drinking water, provide recharge through infiltration of water into the ground, retain the natural flood storage capacity, sustain fisheries, and protect viable wildlife habitat.

Several of Chesterfield's wetlands are large enough to appear on Geographic Information System (GIS) or United States Geological Survey (USGS) maps; however, there are many smaller wetlands that also exist in town. These types of wetlands are typically identified in the field by soil scientists or wetland experts through recognition of wetland vegetation and soil types. Wetlands not shown on maps may be under the protection of the Massachusetts Wetland Protection Act, and are identified on a site-by-site basis.

Wetlands not associated with brooks or rivers are called "isolated wetlands." Vernal pools are examples of these and fill with water only during the wet seasons, providing habitat for salamanders, frogs, and other threatened species. There are numerous vernal pools found scattered throughout Chesterfield, but they are not protected by state laws unless they are certified, are over a quarter acre in size, or within another water resource area.

Beaver Dams

Beaver activity has been increasing over the past decade. Several wetland areas have been flooded by beaver dam construction. As a result, their vegetation has changed from forested wetland to marshy habitat. Sometimes beaver activity is detrimental to property, causing problems for local landowners (*e.g.*, flooding of wells, septic systems, lawns, out-buildings, and

roadways). Problems with beaver dams impact Fuller Road as well as other areas in Chesterfield. Affected individuals must contact the Board of Health and Conservation Commission for advice and permission to alleviate the beaver problem.

Aquifers

All Chesterfield residents access drinking water through private wells, which are ultimately dependent on ground water within the two watersheds. There are public water supplies located at the New Hingham Elementary School, the First Congregational Church, The Chesterfield General Store, Hilltown Community Development Corporation, and Indian Hollow Campground. Henshaw Farms, a company that provides public and emergency bulk potable water, is pending. There are no designated aquifer recharge areas or surface water reservoirs that the town relies on for water supply. However, there is a water protection zoning district along Bisbee Road, and a water supply protection area in the southeastern part of town within the Connecticut River watershed that is for the City of Northampton.

Forests

Chesterfield is unique for the vast acreage of forest that covers the landscape. Most of Chesterfield is covered with second- and third-growth floodplain and northern hardwood forests. The main forest type is northern hardwood forest, also known as “transition forest”, with eastern hemlock as the dominant canopy tree. The understory consists primarily of striped maple, hobblebush, nannyberry, and mountain laurel. Spring wildflowers such as trillium, lady slipper, cowslip, meadowsweet, and various ferns carpet the forest floor. Smith Pyramid and Chesterfield Gorge are popular places to explore this type of forest. Page Brook, located where Dead Swamp runs into Dead Branch, has a transition forest of hemlock, yellow birch, and maple along its stream banks.

Floodplain forests, which occur where forty or more square miles of watershed drain into the lower reaches of a river, are one of the rarest natural communities, and can be found along the Westfield River. The state-protected Gilbert Bliss State Forest includes the largest floodplain forest in Chesterfield. This large and continuous block of forest provides recreational opportunities for hikers, cross-country skiers, hunters, and snowmobilers.

Development in Hazard Areas

While new single-family homes have been built since the last plan, none are located in flood zones or any areas vulnerable to other natural hazards. There have not been any subdivisions built or new commercial development since the last plan. The Hazard Mitigation committee considered the new development in Chesterfield since the last Hazard mitigation plan was approved, and has determined that there is no new development that has increased the Town's vulnerability to natural hazards.

National Flood Insurance Program (NFIP)

The National Flood Insurance Program produces maps that identify floodways across America. Chesterfield is a participating member of the National Flood Insurance Program, and had the following NFIP policy and claim statistics as of January 2016:

- Flood Insurance Maps (FIRMs) are used for flood insurance purposes and are on file with the Chesterfield Town Clerk.
- FIRMs have been effective since August 15, 1989 with the current map in effect since August 15, 1989. FEMA is in the process of updating FIRMs for the Westfield River watershed, which will include most of the Town of Chesterfield. Chesterfield had three NFIP policies in force as of 6/13/2023. There have been two losses since 1978, with claim payments totaling \$11,746.59 (these two losses were for the same property, as described below).
- As of 6/13/2023, there has been one Repetitive Loss Property in Chesterfield, with a total of two losses and a total insurance payment of \$11,746.59.
- The Town will maintain compliance with the NFIP throughout the next 5-year Hazard Mitigation Planning cycle by monitoring its Flood Plain Overlay District.

3 – HAZARD IDENTIFICATION & RISK ASSESSMENT

The following section includes a summary of disasters that have affected or could affect Chesterfield. Historical research, conversations with local officials and emergency management personnel, available hazard mapping and other weather-related databases were used to develop this list. Identified hazards are the following:

- Floods
- Severe snowstorms / ice storms
- Hurricanes/tropical storms
- Severe thunderstorms / wind / tornadoes
- Wildfires / brushfires
- Earthquakes
- Dam failure
- Drought
- Extreme Temperatures





Massachusetts State Hazard Mitigation and Climate Adaptation Plan

The 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP); EEA and EOPSS) identified the natural hazards that can occur in the state along with the climate change interaction for each, and the representative climate change impacts. The one hazard without a climate change interaction is earthquakes. These are shown in Table 3.1 below from the SHMCAP.

Not all hazards included in the 2018 SHMCAP apply to the Town of Chesterfield. Given Chesterfield's inland location, coastal hazards and tsunamis would not affect the Town. The core team did not include landslides in their natural hazard inventory, as they have not previously occurred in the town. The plan also does not include invasive species as a natural hazard, although they are identified as a vulnerability. It is assumed that the entire Town of Chesterfield and its critical facilities are exposed to earthquakes, high wind events, hurricanes, winter storms, snow and ice, temperature extremes, and drought, to a similar extent. Flood risk from riverine flooding is elevated in the vicinity of flood zones.

Due to the impacts of climate change, Chesterfield is likely to experience more instances of extreme and sustained heat, as well as possibly more instances of extreme cold. Because warmer air holds more moisture, higher temperatures will also bring more severe storms, more frequent flooding, and generally wetter winters. The likelihood of more severe storms could mean increases in the number of severe thunderstorms, tornadoes or microbursts, hurricanes or tropical storms, and nor'easters affecting Chesterfield. Generally higher winter temperatures may result in less snow but more rain, sleet, and ice, as well as more alternating thawing and freezing affecting roads.

Figure 3.1 Natural Hazards and Climate Change Interaction

Primary Climate Change Interaction	Natural Hazard	Other Climate Change Interactions	Representative Climate Change Impacts
 Changes in Precipitation	Inland Flooding	Extreme Weather	Flash flooding, urban flooding, drainage system impacts (natural and human-made), lack of groundwater recharge, impacts to drinking water supply, public health impacts from mold and worsened indoor air quality, vector-borne diseases from stagnant water, episodic drought, changes in snow-rain ratios, changes in extent and duration of snow cover, degradation of stream channels and wetland
	Drought	Rising Temperatures, Extreme Weather	
	Landslide	Rising Temperatures, Extreme Weather	
 Sea Level Rise	Coastal Flooding	Extreme Weather	Increase in tidal and coastal floods, storm surge, coastal erosion, marsh migration, inundation of coastal and marine ecosystems, loss and subsidence of wetlands
	Coastal Erosion	Changes in Precipitation, Extreme Precipitation	
	Tsunami	Rising Temperatures	
 Rising Temperatures	Average/Extreme Temperatures	N/A	Shifting in seasons (longer summer, early spring, including earlier timing of spring peak flow), increase in length of growing season, increase of invasive species, ecosystem stress, energy brownouts from higher energy demands, more intense heat waves, public health impacts from high heat exposure and poor outdoor air quality, drying of streams and wetlands, eutrophication of lakes and ponds
	Wildfires	Changes in Precipitation	
	Invasive Species	Changes in Precipitation, Extreme Weather	
 Extreme Weather	Hurricanes/Tropical Storms	Rising Temperatures, Changes in Precipitation	Increase in frequency and intensity of extreme weather events, resulting in greater damage to natural resources, property, and infrastructure, as well as increased potential for loss of life
	Severe Winter Storm / Nor'easter	Rising Temperatures, Changes in Precipitation	
	Tornadoes	Rising Temperatures, Changes in Precipitation	
	Other Severe Weather (Including Strong Wind and Extreme Precipitation)	Rising Temperatures, Changes in Precipitation	
Non-Climate-Influenced Hazards	Earthquake	Not Applicable	There is no established correlation between climate change and this hazard

Natural Hazard Analysis Methodology

This chapter examines the hazards in the Massachusetts State Hazard Mitigation Plan that are identified as likely to affect Chesterfield. The analysis is organized into the following sections: Hazard Description, Location, Extent, Previous Occurrences, Probability of Future Events, Impact, and Vulnerability. A description of each of these analysis categories is provided below.

Hazard Description

The natural hazards identified for Chesterfield are floods, severe snowstorms/ice storms, hurricanes, severe thunderstorms / wind / tornadoes, wildfire/brushfire, earthquakes, dam failure, drought, and extreme temperatures. Many of these hazards result in similar impacts to a community. For example, hurricanes, tornadoes and severe snowstorms may cause wind- related damage.

Location

Location refers to the geographic areas within the planning area that are affected by the hazard. Some hazards affect the entire planning area, while others apply to a specific portion, such as a floodplain or area that is susceptible to wildfires. Classifications are based on the area that would potentially be affected by the hazard, on the following scale:

Location of Occurrence, Percentage of Town Impacted by Given Natural Hazard	
Location of Occurrence	Percentage of Town Impacted
Large	More than 50% of the town affected
Medium	10 to 50% of the town affected
Small	Less than 10% of the town affected

Extent

Extent describes the strength or magnitude of a hazard. Where appropriate, extent is described using an established scientific scale or measurement system. Other descriptions of extent include water depth, wind speed, duration, and speed of onset.

Previous Occurrences

Previous hazard events that have occurred are described for each hazard. Depending on the nature of the hazard, events listed may have occurred on a local, state-wide, or regional level.

Probability of Future Events

The likelihood of a future event for each natural hazard was classified according to the following scale:

Frequency of Occurrence and Annual Probability of Given Natural Hazard	
Frequency of Occurrence	Probability of Future Events
Very High	70-100% probability in the next year
High	40-70% probability in the next year
Moderate	10-40% probability in the next year
Low	1-10% probability in the next year
Very Low	Less than 1% probability in the next year

Impact

Impact refers to the effect that a hazard may have on the people and property in the community, based on the assessment of the extent described above. Impacts are classified according to the following scale:

Impacts, Magnitude of Multiple Impacts of Given Natural Hazard	
Impacts	Magnitude of Multiple Impacts
Catastrophic	Multiple deaths and injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of facilities for 30 days or more.
Critical	Multiple injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 week.
Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 day.
Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of facilities.

Vulnerability

Based on the above metrics, a hazard index rating was determined for each hazard. The hazard index ratings are based on a scale of 1 through 5 as follows:

- 1 – Highest risk
- 2 – High risk
- 3 – Medium risk
- 4 – Low risk

5 – Lowest risk

The ranking is qualitative and is based, in part, on local knowledge of past experiences with each type of hazard. The size and impacts of a natural hazard can be unpredictable. Many of the mitigation strategies currently in place and many of those proposed for implementation can be applied to the expected natural hazards, regardless of their unpredictability.

Figure 3.2: Vulnerability Assessment Methodology

In order to determine estimated losses due to natural hazards in Chesterfield, each hazard area was analyzed with results shown below. The data below was calculated using the methodology outlined in FEMA’s mitigation planning guide, *Understanding Your Risks: Identifying Hazards and Estimating Losses (FEMA 386-2)*, August 2001.

Total value of all structures in Chesterfield (Assessor’s data, FY 2023): \$137,985,500

Median value of an owner-occupied home in Chesterfield: \$332,600 (ACS, 2022)

Average household size: 2.40 persons (across approximately 424 households, ACS 2021)

Human losses are not calculated during this exercise, but could be expected to occur depending on the type and severity of the hazard. Most of these figures exclude both the land value and contents of the structure. The damage calculations are rough estimates, and likely reflect worst-case scenarios. Computing more detailed damage assessment based on assessor’s records is a labor-intensive task and beyond the scope of this project.

Table 3.1 Hazard Identification and Analysis for Chesterfield

Type of Hazard	Location of Occurrence	Probability of Future Events	Impact	Vulnerability
Floods	Small	Moderate	Limited	4 – Low Risk
Severe snowstorms / Ice storms	Large	Very High	Critical	1 – Highest risk
Hurricanes	Large	Moderate	Critical	3 – Medium risk
Severe thunderstorms / wind	Large	High	Critical	1 – Highest risk
Tornadoes	Medium	Low	Critical	4 – Low risk
Wildfires / brushfires	Small	Low	Minor	4 - Low risk
Earthquakes	Large	Low	Critical	4 – Low risk
Dam failures	Medium	Very Low	Critical	5 – Lowest risk
Drought	Large	Moderate	Minor	4 – Low risk
Extreme Temperatures	Large	High	Minor	3/4 – Medium to Low risk

Source: Adapted from FEMA Local Hazard Mitigation Planning Handbook (March 2013) Worksheet 5.1; Town of Holden Beach North Carolina Community-Based Hazard Mitigation Plan, July 15, 2003 and the Massachusetts Emergency Management Agency (MEMA).

Flooding

Hazard Description

There are three major types of storms that can generate flooding in Chesterfield:

- **Continental storms** are typically low-pressure systems that can be either slow or fast moving. These storms originate from the west and occur throughout the year.
- **Coastal storms**, also known as nor'easters, usually occur in late summer or early fall and originate from the south. The most severe coastal storms, hurricanes, occasionally reach Massachusetts and generate very large amounts of rainfall.
- **Thunderstorms** form on warm, humid summer days and cause locally significant rainfall, usually over the course of several hours. These storms can form quickly and are more difficult to predict than continental and coastal storms.

A floodplain is the relatively flat, lowland area adjacent to a river, lake or stream. Floodplains serve an important function, acting like large “sponges” to absorb and slowly release floodwaters back to surface waters and groundwater. Over time, sediments that are deposited in floodplains develop into fertile, productive farmland like that found in the Connecticut River valley. In the past, floodplain areas were also often seen as prime locations for development. Industries were located on the banks of rivers for access to hydropower. Residential and commercial development occurred in floodplains because of their scenic qualities and proximity to the water. Although periodic flooding of a floodplain area is a natural occurrence, past and current development and alteration of these areas will result in flooding that is a costly and frequent hazard.

The Hazard Mitigation Map for the Town of Chesterfield in **Appendix X** shows the 100-year and 500-year flood zones identified by FEMA flood maps. The 100-year flood zone is the area that will be covered by water due to flooding that has a one percent chance of occurring in any given year. Likewise, the 500-year flood has a 0.2 percent chance of occurring in any given year. In Chesterfield, there are several floodplain areas – primarily along the Westfield River in the western side of Town, and along the Dead Branch Brook, east of the town center. In addition, there are some smaller floodplains mapped in low-lying areas throughout Chesterfield, like Wilder Swamp and Dead Swamp, as well as along Tower Brook and West Falls Branch, two tributaries flowing into the Westfield. Furthermore, there are some level stretches along Dead Branch Brook that could potentially flood very wide, especially around Long Pond and Fisk Meadow.

Location

The percentage of the town impacted by flooding is estimated to be “small,” or less than 10 percent, though there is potential for annual flood incidents in Chesterfield. There are approximately 1,229 acres of land within the FEMA mapped 100-year floodplain and 71 acres of land within the 500-year floodplain within the Town of Chesterfield.

Extent

Floods can be classified as one of two types: flash floods and general floods.

- **Flash floods (localized flooding)** are the product of heavy, localized precipitation in a short time period over a given location. Flash flooding events typically occur within minutes or hours after a period of heavy precipitation, after a dam or levee failure, or from a sudden release of water from an ice jam. Most often, flash flooding is the result of a slow-moving thunderstorm or the heavy rains from a hurricane. In rural areas, flash flooding often occurs when small streams spill over their banks. However, in urbanized areas, flash flooding is often the result of clogged storm drains (leaves and other debris) and the higher amount of impervious surface area (roadways, parking lots, roof tops).
- **General floods** may last for several days or weeks and are caused by precipitation over a longer time period in a particular river basin. Excessive precipitation within a watershed of a stream or river can result in flooding particularly when development in the floodplain has obstructed the natural flow of the water and/or decreased the natural ability of the groundcover to absorb and retain surface water runoff (e.g., the loss of wetlands and the higher amounts of impervious surface area in urban areas).

The average annual precipitation for Chesterfield and surrounding areas in western Massachusetts is 53 inches.

Previous Occurrences

The major floods recorded in Western Massachusetts during the 20th century have been the result of rainfall alone or rainfall combined with snowmelt. Flooding along the Westfield River was historically a problem in Chesterfield. Over the years, floods have destroyed several of the mills along the river, but flooding does not currently threaten homes due to land protection along the river.

Various parts of Chesterfield have had issues with localized flooding, described below: Route

143 (Main Road), 1 Mile west of the Williamsburg/Chesterfield Town Line

Approximately two structures⁴ could be affected by a flood incident. This area is within a FEMA mapped 100-year flood zone, and there is a past record of flooding in this area. There is an annual potential for flooding in the floodplain from both spring runoff and heavy summer/fall rains, in addition to potential for damage to the Main Road (Route 143) surface area. Beaver dams contribute to the potential for flooding.

Willcutt Road

There are approximately 8 structures located in this area that have been affected or could be affected by a flood incident. This area is not within a FEMA mapped 100-year flood zone. In 2003, heavy rains caused flooding in this area; one structure suffered minor damage. There is potential for flooding due to heavy rains and runoff, in addition to potential for damage to the road surface. Beavers are a contributing issue in this location as well.

Ireland Street at Ireland Street Extension

This is an evacuation route that is subject to flooding primarily due to beaver dams. There are no structures at risk, but the road could flood.

Fuller Road

There are 9 structures located in this area at the intersection with Willcutt Road that have been affected or could be affected by flooding. This area is not within a FEMA mapped 100-year flood zone. In 2003, heavy rains caused flooding in this area and one structure had minor damage. There is potential for flooding due to heavy rains and runoff, in addition to potential for damage to the road surface.

Main Road, West Chesterfield to Worthington Town Line

In 2005, an unusual weather system stalled over northern portions of Worthington and western portions of Cummington. This storm dropped several inches of rain in this isolated area in a relatively short span of time (2-3 hours). This rain event caused the water level in West Branch Brook a.k.a. Stevens Brook, which meanders along Main Road from the town line to the Westfield River, to rise very quickly and high enough where evacuations were ordered for several houses along the stream. Fortunately, only minor structural damage to one structure was noted during follow-up inspections. While a similar storm has not happened since, a re-occurrence is possible.

Cummington Road

South end near Main Road. During Tropical Storm Irene flooding occurred in this location and evacuations were necessary. Flooding has occurred on some other occasions, but evacuations were not warranted.

⁴ Determined through the use of aerial photography from MassGIS

Tropical Storm Irene

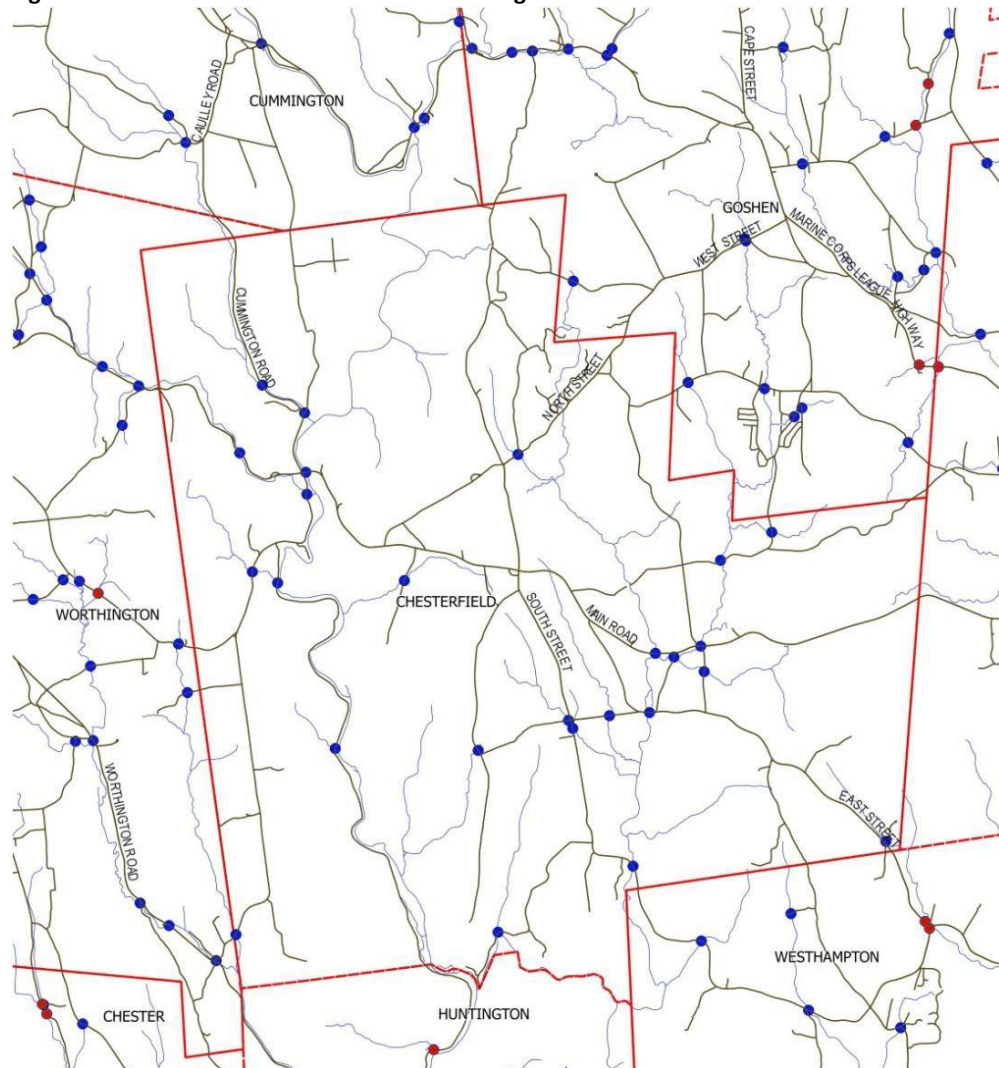
The large amounts of rainfall produced by Tropical Storm Irene in 2011 resulted in flooding on Cummington Road (1000' feet north of Route 143) due to the Westfield River. Bofat Hill Road also flooded. The Westfield River Bridge was also close to washing away, threatening to cut off a substantial portion of the town and the ability of residents to commute to their jobs.

Undersized Culverts

Undersized culverts on Bissell Road, Cummington Road, Fuller Road, and Willcutt Road have frequently experienced flooding in high-rainfall events. During recent heavy precipitation events, Main Road, Smith Road, and Curtis Road also experienced flooding. The Town is in the process of replacing undersized culverts on Bissell Road and Cummington Road.

The map below identifies the locations of all culverts in the Town of Chesterfield, which were assessed in the summer of 2011, and then again in 2015 by the Westfield River Wild & Scenic Committee as part of the North Atlantic Aquatic Connectivity Collaborative's stream continuity project (www.streamcontinuity.org). This culvert assessment program has been a resource for the town in planning for and designing culvert replacements, to help ensure that new culverts reduce flooding risks and also provide ecological co-benefits.

Figure 3.3: Assessed culverts and stream crossing in Chesterfield



Chesterfield Culverts

- Stream Continuity Culverts 2011
- Top 5 % Ecologically Sensitive Culverts
- Major Roads
- Streams

Chesterfield Culvert Road Crossings

Source: University of Massachusetts Stream Continuity Project 2011 <<https://streamcontinuity.org/index.htm>>

Probability of Future Events

Based upon previous data, it is likely that there is a “moderate” chance of flooding, with a 10 to 40 percent probability in the next year. Because most of the land along the Westfield river is now protected and undeveloped, flooding has less potential to damage structures and is, therefore, less of a concern for the town. Along the brooks and rivers of Chesterfield, much of the land is subjected to flooding, not just wetlands. Areas within the floodplain that are disturbed, developed, or filled could alter the water-holding capacity, which essentially sends flooding further beyond the boundary lines, damaging buildings, roads and potentially redirecting the course of the rivers and streams. Chesterfield’s zoning bylaw includes a flood plain district for this reason.

In the coming years, it is likely that the currently designated 10-year, 25-year, 100-year and 500-year floodplains will flood more frequently due to climate change. Climate change will increase the frequency and intensity of all storms and precipitation events that can cause flooding. In particular, climate projections indicate that extreme one-day rainfall events will continue to increase and will be a major cause of flooding. These intense precipitation events will lead to more localized or flash flooding, in addition to increasing the risk of flooding in designated floodplains. Currently, floods are the costliest natural hazard in the United States, and climate change will only increase the amount of damage they cause.

Impact

The total value of all buildings in the 100-year floodplain is \$22,313,900. Damage from flooding could result in a range of losses, from approximately 1% for a very limited amount of damage to 50% or more of damage to buildings. The dollar amounts for those estimates range from \$223,129 to upwards of \$11,156,950. In addition, the cost of repairing or replacing the roads, bridges, utilities, and contents of structures is significant, but cannot be estimated with sufficient accuracy for this plan.

Vulnerability

Based on the above analysis, Chesterfield faces a vulnerability of “4 – low risk” from flooding.

Severe Snowstorms/Ice Storms

Hazard Description

Snow is characterized as frozen precipitation in the form of six-sided ice crystal. In order for snow to occur, temperatures in the atmosphere (from ground level to cloud level) must be at or below freezing. The strongest form of a severe snowstorm is a blizzard. Blizzards are characterized by frequent wind gusts above 35 miles per hour, limited to no visibility due to falling snow and extreme cold that lasts longer than three hours.

Ice storms are liquid rain that falls and freezes upon contact with cold objects. There must be an ice build-up of greater than ¼ inch for it to be considered an ice storm. When more than a ½ inch of ice build-up is forecasted a winter storm warning can be triggered.

Severe winter storms can pose a significant risk to property and human life. The freezing rain, ice, snow, cold temperatures and wind associated with these storms can cause the following hazards:

- Disrupted power and phone service
- Unsafe roadways and increased traffic accidents
- Infrastructure and other property are also at risk from severe winter storms and the associated flooding that can occur following heavy snow melt.
- Tree damage and fallen branches that cause utility line damage and roadway blockages
- Damage to telecommunications structures
- Reduced ability of emergency officials to respond promptly to medical emergencies or fires.

Location

The entire Town of Chesterfield is susceptible to severe snowstorms, making the location of occurrence from this hazard “large.” Because these storms occur regionally, they would impact the entire town.

Extent

The Northeast Snowfall Impact Scale (NESIS) developed by Paul Kocin of The Weather Channel and Louis Uccellini of the National Weather Service (Kocin and Uccellini, 2004) characterizes and ranks high-impact Northeast snowstorms. These storms have large areas of 10-inch snowfall accumulations and greater. NESIS has five categories: Extreme, Crippling, Major, Significant, and Notable. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus NESIS gives an indication of a storm's societal impacts.

NESIS scores are a function of the area affected by the snowstorm, the amount of snow, and the number of people living in the path of the storm. The aerial distribution of snowfall and population information are combined in an equation that calculates a NESIS score which varies from around one for smaller storms to over ten for extreme storms. The raw score is then converted into one of the five NESIS categories. The largest NESIS values result from storms producing heavy snowfall over large areas that include major metropolitan centers.

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

Source:

The Sperry-Piltz Ice Accumulation (SPIA) Index (below) is a forward-looking ice accumulation and ice damage prediction index that uses an algorithm of researched parameter that, when used in conjunction with National Weather Service forecast data, can predict the projected footprint, total ice accumulation, and resulting potential damage from approaching ice storms. As a tool, it can be used for risk management and/or winter weather preparedness.⁵

⁵ <https://www.spia-index.com/>
Town of Chesterfield Hazard Mitigation Plan Update

Figure 3.4: Sperry-Piltz Ice Accumulation Index

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

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

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

Previous Occurrences

New England generally experiences at least one or two severe winter storms each year with varying degrees of severity. Severe winter storms typically occur during January and February; however, they can occur from late September through late April.

Large snowstorms, blizzards and ice storms in Massachusetts can range from an inconvenience to extreme events that cause significant impacts and require a large-scale, coordinated response. A list of winter weather federal disaster declarations since 2000 affecting Hampshire County is shown in Table 3.2 below.

Table 3.2: Winter Weather Federal Disaster Declarations in Hampshire County

Disaster Name and Date of Event	Disaster Number	Type of Assistance	Counties Under Declaration
Snowstorm December 6-7, 2003	EM-3191	FEMA Public Assistance	Middlesex, Essex, Suffolk, Norfolk, Bristol, Plymouth, Barnstable, Berkshire, Hampshire , Hampden, Franklin, Berkshire
Snowstorm January 22 - 23, 2005	EM-3201	FEMA Public Assistance	All 14 Massachusetts Counties
Severe Winter Storm and Flooding December 11-18, 2008	DR-1813	FEMA Public Assistance; FEMA Hazard Mitigation Grant Program	All 14 Massachusetts Counties
Severe Winter Storm December 11-18, 2008	EM-3296	None	Middlesex, Essex, Suffolk, Bristol, Berkshire, Hampshire , Hampden, Franklin, Berkshire
Severe Winter Storm and Snowstorm January 11-12, 2011	DR-1959	FEMA Public Assistance Grant	Middlesex, Essex, Suffolk, Norfolk, Hampshire , Hampden, Berkshire
Snowstorm October 29-30, 2011	DR-4051	FEMA Public Assistance	Middlesex, Worcester, Hampshire , Hampden, Franklin, Berkshire
Severe Winter Storm, Snowstorm, and Flooding February 8-9, 2013	DR-4110	FEMA Public Assistance	All 14 Massachusetts Counties

Based on data available from the National Oceanic and Atmospheric Administration, there are 14 winter storms in the Pioneer Valley between 2010 and 2022 that have registered on the NESIS scale and resulted in snowfalls of at least 10 inches. These storms are listed in the table below in order of their NESIS severity.

Table 3.3: Winter Storms producing over 10 inches of snow

Winter Storms Producing Over 10 inches of Snow in the Pioneer Valley, 2010 -2022			
Date	NESIS Value	NASIS Category	NESIS Classification
12/13/2022	8.52	4	Crippling
2/23/2010	5.46	3	Major
1/29/2015	5.42	3	Major
1/9/2011	5.31	3	Major
2/11/2014	5.28	3	Major

Winter Storms Producing Over 10 inches of Snow in the Pioneer Valley, 2010 -2022			
3/12/2017	5.03	3	Major
1/31/2021	4.93	3	Major
2/7/2013	4.35	3	Major
3/5/2018	3.45	2	Significant
2/14/2020	3.21	2	Significant
3/11/2018	3.16	2	Significant
3/4/2013	3.05	2	Significant
1/25/2015	2.62	2	Significant
10/29/2011	1.75	1	Notable
1/3/2018	1.65	1	Notable
2/8/2015	1.32	1	Notable

Source:

In Chesterfield, an ice storm in December 2008 caused significant damage and disruptions for a full week. Downed limbs from one inch of ice and high winds led to impassable roads, which meant all emergency responses were conducted on foot. Power was lost for an entire week, and there were numerous instances of damage to houses from falling trees and tree limbs.

The October 2011 snowstorm resulted in 30" of snowfall in Chesterfield. In part due to the previous 2008 ice storm, and the fact that most of the trees were already defoliated for winter (unlike areas in the Connecticut River valley below), there were fewer instances of tree falls. The largest disruption was due to road clearing. Power was not lost.

The winter of 2022/2023 saw two heavy snowfalls, with the largest in March 2023. The Town received 30 inches of heavy snow, and some locations were without power for two days. There were difficulties with plowing and moving of soil and other substrates due to the ground not being frozen at the time of the snowfall. This snowfall is not included in the above database as it occurred in 2023.

Probability of Future Events

Based upon the availability of records for Hampshire County, the likelihood that a severe snowstorm will hit Chesterfield is "high," or between 40 and 70 percent.

Research on climate change indicates that there is great potential for stronger, more frequent storms as the global temperature increases. More information about the effect of Climate Change can be found in the Pioneer Valley Planning Commission's Climate Action Plan, available at www.sustainableknowledgecorridor.org. Additional information about the impacts of climate change can be found in the SHMCAP at <https://www.mass.gov/service-details/massachusetts-integrated-state-hazard-mitigation-and-climate-adaptation-plan>

Impact

The impact to the town is estimated to be “critical,” with more than 25 percent of property in affected areas damaged or destroyed.

To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, \$137,985,500, is used. An estimated 20 percent of damage could occur to at least 25 percent of structures, resulting in a potential total of \$6,899,275 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above assessment, Chesterfield’s vulnerability from snowstorms and ice storms is “1 – Highest Risk.”

Hurricanes

Hazard Description

Hurricanes are classified as cyclones and defined as any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and whose diameter averages 10 to 30 miles across. The primary damaging forces associated with these storms are high-level sustained winds and heavy precipitation. Hurricanes are violent rainstorms with strong winds that can reach speeds of up to 200 miles per hour and generate large amounts of precipitation. Hurricanes generally occur between June and November and can result in flooding and wind damage to structures and above-ground utilities.

Location

Chesterfield's location in Western Massachusetts reduces the risk of extremely high winds that are associated with hurricanes. The town has experienced small blocks of downed timber and uprooting of trees onto structures. The location of occurrence is "large," from 40 percent to 70 percent of the town affected.

Extent

As an incipient hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Hurricane Wind Scale, which rates hurricane wind intensity on a scale of 1 to 5, with 5 being the most intense.

Figure 3.5: Saffir-Simpson Scale of Hurricane Damage Classifications

Hurricane Damage Classifications			
Storm Category	Damage Level	Description of Damages	Wind Speed (MPH)
1	MINIMAL	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage. An example of a Category 1 hurricane is Hurricane Dolly (2008).	74-95
	Very dangerous winds will produce some damage		
2	MODERATE	Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings. An example of a Category 2 hurricane is Hurricane Francis in 2004.	96-110
	Extremely dangerous winds will cause extensive damage		
3	EXTENSIVE	Some structural damage to small residences and utility buildings, with a minor amount of curtain wall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain may be flooded well inland. An example of a Category 3 hurricane is Hurricane Ivan (2004).	111-129
	Devastating damage will occur		
4	EXTREME	More extensive curtain wall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland. An example of a Category 4 hurricane is Hurricane Charley (2004).	130-156
	Catastrophic damage will occur		
5	CATASTROPHIC	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required. An example of a Category 5 hurricane is Hurricane Andrew (1992).	157+
	Catastrophic damage will occur		

Previous Occurrences

Hurricanes that have affected the Pioneer Valley are shown in the following table ("Super

Storm Sandy” in 2012 was not considered a hurricane or tropical storm, as it did not meet the meteorological criteria for having a warmer temperature at its core; nonetheless, the storm was significant in Chesterfield.)

Table 3.4: Major Hurricanes in the Pioneer Valley

Major Hurricanes in the Pioneer Valley		
Hurricane/Storm Name	Year	Saffir/Simpson Category (when reached MA)
Great Hurricane of 1938	1938	3
Great Atlantic Hurricane	1944	1
Carol	1954	3
Edna	1954	1
Diane	1955	Tropical Storm
Donna	1960	Unclear, 1 or 2
Groundhog Day Gale	1976	Not Applicable
Gloria	1985	1
Bob	1991	2
Floyd	1999	Tropical Storm
Irene	2011	Tropical Storm
Sandy	2012	Super Storm
Henri	2021	Tropical Storm

National Hurricane Center, 2023

Probability of Future Events

Chesterfield’s location in western Massachusetts reduces the risk of extremely high winds that are associated with hurricanes, although it can experience some high wind events. The probability of future events is estimated to be “moderate,” or between 10 and 40 percent in any given year.

According to the NOAA, a review of existing studies, including studies conducted as recently as 2020, led to the conclusion that “it is likely that greenhouse warming will cause hurricanes in the coming century to be more intense globally and have higher rainfall rates than present-day hurricanes”. The NOAA further concludes that “it is likely that climate warming will cause Atlantic hurricanes in the coming century to have higher rainfall rates than present-day hurricanes, and medium confidence that they will be more intense (higher peak winds and lower central pressures) on average.” (NOAA, <https://www.gfdl.noaa.gov/global-warming-and-hurricanes/>)

Impact

A description of the damages that could occur due to a hurricane is described by the Saffir-Simpson scale, as shown below. The impact of hurricanes to the Town is estimated to be “critical,” with more than 25 percent and up to 50 percent of property in the affected area damaged or destroyed.

In the event of a tropical storm or hurricane, the greatest risk to Chesterfield will be flooding of the Westfield River, which has, historically, been a problem in the Town. Wind damage could include damage to structures, and downed power and communications lines; the town’s transportation infrastructure and evacuation routes could also be impacted.

For most hurricanes or severe wind events, the town has experienced small blocks of downed timber and uprooting of trees onto structures. Using a total value of all structures in town of \$,137,985,500 and an estimated wind damage of 5 percent to all structures with 10 percent damage to each structure, an estimated \$689,928 damage would occur. Estimated flood damage to 10 percent of the structures with 20 percent damage to each structure would result in \$2,759,710 of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above analysis, Chesterfield faces a vulnerability of “3 – Medium Risk” from hurricanes.

Severe Thunderstorms / Wind / Tornadoes

Hazard Description

A thunderstorm is a storm with lightning and thunder produced by a cumulonimbus cloud, usually producing gusty winds, heavy rain, and sometimes hail. Effective January 5, 2010, the NWS modified the hail size criterion to classify a thunderstorm as 'severe' when it produces damaging wind gusts in excess of 58 mph (50 knots), hail that is 1 inch in diameter or larger (quarter size), or a tornado (NWS, 2013).

Wind is air in motion relative to the surface of the earth. For non-tropical events over land, the NWS issues a Wind Advisory (sustained winds of 31 to 39 mph for at least 1 hour or any gusts 46 to 57 mph) or a High Wind Warning (sustained winds 40+ mph or any gusts 58+ mph). For non-tropical events over water, the NWS issues a small craft advisory (sustained winds 25-33 knots), a gale warning (sustained winds 34-47 knots), a storm warning (sustained winds 48 to 63 knots), or a hurricane force wind warning (sustained winds 64+ knots). For tropical systems, the NWS issues a tropical storm warning for any areas (inland or coastal) that are expecting sustained winds from 39 to 73 mph. A hurricane warning is issued for any areas (inland or coastal) that are expecting sustained winds of 74 mph. Effects from high winds can include downed trees and/or power lines and damage to roofs, windows, etc. High winds can cause scattered power outages. High winds are also a hazard for the boating, shipping, and aviation industry sectors.

According to the National Weather Service, microbursts are downdrafts in thunderstorms. Wind speeds of up to 150 miles per hour are possible in microbursts, although the impact area may be less than 2.5 miles in diameter.

Tornadoes are swirling columns of air that typically form in the spring and summer during severe thunderstorm events. In a relatively short period of time and with little or no advance warning, a tornado can attain rotational wind speeds in excess of 250 miles per hour and can cause severe devastation along a path that ranges from a few dozen yards to over a mile in width. The path of a tornado may be hard to predict because they can stall or change direction abruptly. Within Massachusetts, tornadoes have occurred most frequently in Worcester County and in communities west of Worcester, including towns in eastern Hampshire County. High wind speeds, hail, and debris generated by tornadoes can result in loss of life, downed trees and power lines, and damage to structures and other personal property (cars, etc.). Most tornadoes occur in the late afternoon and evening hours, when the heating of the air is the greatest. The most common months are June, July, and August, but the Great Barrington, MA tornado (1995) occurred in May and the Windsor Locks, CT tornado (1979) occurred in October.

Location

As per the previous Chesterfield Hazard Mitigation Plan, entire the town would be at risk of high winds, severe thunderstorms, and tornadoes. The location of occurrence for thunderstorm/severe wind hazards is “large,” or more than 50 percent of the town affected. The location of occurrence for tornadoes is “medium,” or 10 to 50 percent of the town affected.

Extent

An average thunderstorm is 15 miles across and lasts 30 minutes; severe thunderstorms can be much larger and longer. Thunderstorms can cause hail, wind, and flooding. According to the SHMCAP, there are approximately 20 to 30 days of thunderstorm activity in the state each year. The table below gives the extent of hail sizes, from .5 on an inch to 4.5 inches.

Microbursts and tornadoes are not uncommon in the region. There are typically 1 to 3 tornadoes somewhere in southern New England per year, and according to the SHMCAP, Massachusetts experiences an average of 1.7 tornadoes per year. However, tornadoes may be occurring more frequently due to the impacts of climate change. Just in the summer of 2023, eight tornadoes touched down in New England. On August 18, 2023, five tornadoes touched down in southern New England – three in Massachusetts, one in Connecticut and one in Rhode Island. Additionally, two other tornadoes touched down in Massachusetts in 2023 – one in July and one in early August.

Extent of Hail	
Hail Size in inches	Object Analog
.50	Marble, moth ball
.75	Penny
.88	Nickel
1.00	Quarter
1.25	Half dollar
1.50	Walnut, ping pong
1.75	Golf ball
2.00	Hen egg
2.50	Tennis ball
2.75	Baseball
3.00	Tea cup
4.00	Grapefruit
4.50	Softball

Source: <http://www.spc.noaa.gov/misc/tables/hailsize.htm>

Tornadoes are measured using the enhanced F-Scale, shown with the following categories and corresponding descriptions of damage:

Enhanced Fujita Scale Levels and Descriptions of Damage			
EF-Scale Number	Intensity Phrase	3-Second Gust (MPH)	Type of Damage Done
EF0	Gale	65–85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
EF1	Moderate	86–110	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
EF2	Significant	111–135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	Severe	136–165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	Devastating	166–200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown, and large missiles generated.

Previous Occurrences

Thunderstorms and high winds affect Chesterfield regularly. While municipal records of storms are not kept, the National Weather Service compiles such data on a statewide basis, which is included in the SHMCAP. As mentioned above, there are 20 to 30 days of thunderstorm activity in the state each year on average, and Chesterfield sees approximately that number of thunderstorms annually as well.

In the last fifty years, two known tornadoes have touched down in Chesterfield, and there have been several high-wind storms and hail events. In February 2017 an EF2 tornado touched down in Chesterfield in the Sugar Hill Road area and caused damage to one house. It then touched down in Goshen and Conway. In 2011, a tornado ranked F3 (Severe Damage) on the Fujita Scale of Tornado Intensity, blew through West Springfield, Westfield, Springfield, Monson, Wilbraham, Brimfield, Sturbridge, and Southbridge. The tornado and related storm killed 3 people and resulted in hundreds of injuries across the state.

A microburst incident occurred in 2005 in the Damon Pond area, resulting in structural damage to one house caused by the destruction of several large white pine trees adjacent to the house. A microburst also occurred in 2006 on East Street that resulted in tree damage.

Probability of Future Events

One measure of tornado activity is the tornado index value. It is calculated based on historical tornado events data using USA.com algorithms. It is an indicator of the tornado level in a region. A higher tornado index value means a higher chance of tornado events. Data was used for Hampshire County to determine the Tornado Index Value as shown in the table below. Hampshire County has a higher tornado index value than Massachusetts as a whole.

Tornado Index for Hampshire County	
Hampshire County	125.73
Massachusetts	87.60
United States	136.45

Source: USA.com

<http://www.usa.com/hampshire-county-ma-natural-disasters-extremes.htm>

Based upon the available historical record, it is reasonable to estimate that there is a “moderate” probability of the occurrence of severe thunderstorms and wind in Chesterfield, and a “low” probability of the occurrence of tornadoes affecting the town in any given year.

As mentioned above, there is evidence that rising temperatures due to climate change will increase convective available potential energy (CAPE), which is one of the two ingredients needed for severe thunderstorms as well as for tornadoes and microbursts. The other is strong wind shear. It is projected by warming the surface and putting and producing more evaporative moisture in the air, CAPE will increase, providing more raw fuel to produce rain, hail, and vertical wind shear, resulting in an increased amount of severe thunderstorm activity (NASA, 2021).

Impact

The potential for locally catastrophic damage is a factor in any tornado, severe thunderstorm, or wind event. According to the *Institute for Business and Home Safety*, the wind speeds in most tornadoes are at or below design speeds that are used in current building codes; however, most buildings in the Town of Chesterfield have not been built to Zone 1, Design Wind Speed Codes. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975, with most of the town’s housing built before this date.

Like earthquakes, the location and extent of potential damaging impacts of a tornado are

completely unpredictable. Most damage from tornadoes comes from high winds that can fell trees and electrical wires, generate hurtling debris and, possibly hail.

The estimated impact from a severe thunderstorm, wind, or tornado is “critical,” with over 25 percent but less than 50% of property in the affected area damaged or destroyed.

Using a total value of \$,137,985,500 of all structures in Chesterfield, an estimated 25 percent of structures damaged each by 20 percent, would result in a total damage of \$6,899,275. This estimate does not include building contents, land values or damages to utilities.

Vulnerability

Based on the above assessment, Chesterfield’s vulnerability to severe thunderstorms and wind is “2 – High Risk.” Chesterfield’s vulnerability to tornadoes is “4 – Low Risk.”

Wildfire / Brushfire

Hazard Description

Wildland fires are typically larger fires, involving full-sized trees as well as meadows and scrublands. Brushfires are uncontrolled fires that occur in meadows and scrublands, but do not involve full-sized trees. Both wildland fires and brushfires can consume homes, other buildings and/or agricultural resources. Typical causes of brushfires and wildfires are lightning strikes, human carelessness, and arson.

FEMA has classifications for 3 different classes of wildland fires:

- Surface fires – the most common type of wildland fire, surface fires burn slowly along the floor of a forest, killing or damaging trees.
- Ground fires burn on or below the forest floor and are usually started by lightning.
- Crown fires move quickly by jumping along the tops of trees. A crown fire may spread rapidly, especially under windy conditions.

Location

Hampshire County has approximately 252,000 acres of forested land, which accounts for 71% of total land area. Forest fires are therefore a potentially significant issue. In Chesterfield, approximately 88 percent of the town's total land area is forested and is therefore at risk of fire. However, the actual area affected by an individual wildfire or brushfire is likely to be small, due to climate factors as well as the quick response time if a fire does break out. Thus, the location of occurrence for wildfires/brushfires is deemed to be "small."

Extent

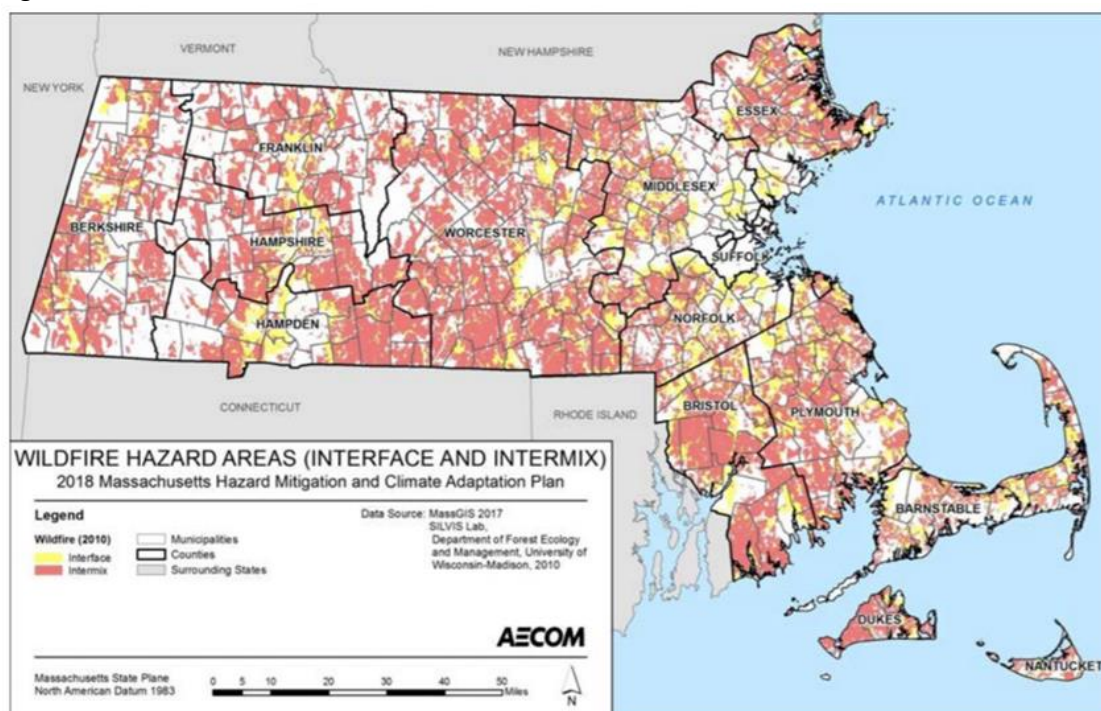
Wildfires can cause widespread damage to the areas that they affect. They can spread very rapidly, depending on local wind speeds, and be very difficult to get under control. Fires can last for several hours up to several days. The Wildfire Severity Rating is shown in the table below, showing the danger rating from Low (Class 1) to Extreme (Class 5). Much of Chesterfield's acreage is forested and is thus at risk of fire. Certain forested areas of Chesterfield are remote and rugged, which would make fighting a wildfire difficult. Hampshire County receives more than 49 inches of annual rainfall, which makes wildfires relatively uncommon in the county. However, in drought conditions a brushfire or wildfire would be a matter of concern, and the incidence of drought has been increasing, and will likely continue to increase because of climate change. There have not been any major wildfires recorded in Chesterfield. However, based on other major wildfires that have occurred in western Massachusetts, it is estimated that such a fire would likely destroy around 50 to 500 acres of forested area.

Figure 3.6: Wildfire Severity Rating Scale

Wildfire Severity Rating		
Rating	Basic Description	Detailed Description
CLASS 1: Low Danger (L) Color Code: Green	Fires not easily started	Fuels do not ignite readily from small firebrands. Fires in open or cured grassland may burn freely a few hours after rain, but wood fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting.
CLASS 2: Moderate Danger (M) Color Code: Blue	Fires start easily and spread at a moderate rate	Fires can start from most accidental causes. Fires in open cured grassland will burn briskly and spread rapidly on windy days. Woods fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel – especially draped fuel -- may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.
CLASS 3: High Danger (H) Color Code: Yellow	Fires start easily and spread at a rapid rate	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High intensity burning may develop on slopes or in concentrations of fine fuel. Fires may become serious and their control difficult, unless they are hit hard and fast while small.
CLASS 4: Very High Danger (VH) Color Code: Orange	Fires start very easily and spread at a very fast rate	Fires start easily from all causes and immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high-intensity characteristics - such as long-distance spotting - and fire whirlwinds, when they burn into heavier fuels. Direct attack at the head of such fires is rarely possible after they have been burning more than a few minutes.
CLASS 5: Extreme (E) Color Code: Red	Fire situation is explosive and can result in extensive property damage	Fires under extreme conditions start quickly, spread furiously and burn intensely. All fires are potentially serious. Development into high-intensity burning will usually be faster and occur from smaller fires than in the Very High Danger class (4). Direct attack is rarely possible and may be dangerous, except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions, the only effective and safe control action is on the flanks, until the weather changes or the fuel supply lessens.

The SHMCAP describes the urban-wildland interface as areas that are more susceptible to wildfires. There are two classifications: Interface and Intermix. Interface communities are defined as being in the vicinity of contiguous vegetation, with more than one house per 40 acres and less than 50% vegetation, and within 1.5 miles of an area of more than about 200 acres that is more than 75% vegetated. Intermix communities are defined as those where housing and vegetation intermingle, and where the area includes more than 50% vegetation and has a housing density of more than one house per 6.5 acres. According to the urban-wildland interface in Massachusetts shown below, Chesterfield has about 25% Intermix areas that would be most at risk.

Figure 3:7: Wildland-Urban Interface and Intermix in Massachusetts



Source: MA State Hazard Mitigation and Climate Adaptation Plan

Previous Occurrences

On average, there are about five brush fires per year in Chesterfield as reported by the Fire Chief, which is the number that occurred in 2023. Burn permits for the Town are issued from the Chesterfield Fire Department. In 2023 there were 385 burn permits issued.

During the past 100 years, there have not been many wildfires occurring in the Pioneer Valley. However, several have occurred during the past 20 years, as shown in the list below:

- 1995 – Russell, 500 acres burned on Mt. Tekoa
- 2000 – South Hadley, 310 acres burned over 14 days in the Lithia Springs Watershed
- 2001 – Ware, 400 acres burned
- 2010 – Russell, 320 acres burned on Mt. Tekoa
- 2012 – Eastern Hampden County, dry conditions and wind gusts created a brush fire in Brimfield, and burned 50 acres
- 2016 –Montgomery, 60 acres burned on Mt. Tekoa
- 2019 – Russell and Montgomery, 200 acres burned on Mt. Tekoa

Probability of Future Events

In accordance with the SHMCAP, the Town Hazard Mitigation Workgroup found it is difficult to predict the likelihood of wildfires in a probabilistic manner due to the number of variables involved. While wildland fires have not been a significant problem in Chesterfield, it is possible that changing land use patterns and climate conditions will increase the Town's vulnerability. Increased temperatures and periods of drought could result in more incidences of wildfires. Climate change is also predicted to bring increased wind damage from major storms, as well as new types of pests to the region. Both increased wind and the introduction of new pests could potentially create more debris in wooded areas and result in a larger risk of fires. However, given the occurrence of previous wildfires as well as the chance of wildfires increasing in the next five years, the Hazard Mitigation Workgroup identified the likelihood of a future wildfire to be "low," or between 1 to 10 percent in any given year.

Impact

The estimated impact from wildfires was determined to be "minor," with minor property damage and minimal disruption to quality of life for town residents. Using a total value of \$,137,985,500 of all structures in Chesterfield, and an estimated one percent of structures damaged each by 50 percent, an estimated damage due to wildfires is \$689,926. This estimate does not include building contents, land values or damages to utilities.

Chesterfield is protected by an all-volunteer fire department, and is dependent on residents volunteering for the critical job of firefighter. This includes participating in weekly trainings and being available 24 hours a day for an emergency. In years when there are a smaller number of firefighters, the Town depends on mutual aid from surrounding towns.

Vulnerability

Based on the above assessment, Chesterfield faces a vulnerability of "4 – Low Risk" from wildfires.

Earthquakes

Hazard Description

An earthquake is a sudden, rapid shaking of the ground that is caused by the breaking and shifting of rock beneath the Earth's surface. Earthquakes can occur suddenly, without warning, at any time of the year. New England experiences an average of 30 to 40 earthquakes each year although most are not noticed by people.² Ground shaking from earthquakes can rupture gas mains and disrupt other utility service, damage buildings, bridges and roads, and trigger other hazardous events such as avalanches, flash floods (dam failure), and fires. Un-reinforced masonry buildings, buildings with foundations that rest on filled land or unconsolidated, unstable soil, and mobile homes not tied to their foundations are at risk during an earthquake.³

Location

Because of the regional nature of the hazard, the entire town is susceptible to earthquakes. This means that the location of occurrence of this hazard is "large," with more than 50 percent of the town affected.

Extent

The magnitude of an earthquake is measured using the Richter scale, which measures the energy of an earthquake by determining the size of the greatest vibrations recorded on the seismogram. On this scale, one step up in magnitude (from 5.0 to 6.0, for example) increases the energy more than 30 times. The intensity of an earthquake is measured using the Modified Mercalli scale. This scale quantifies the effects of an earthquake on the Earth's surface, humans, objects of nature, and man-made structures on a scale of I through XII, with I denoting a weak earthquake and XII denoting an earthquake that causes almost complete destruction. Both the Richter scale and the Mercalli scale magnitude and effects are shown in the tables below.

² Northeast States Emergency Consortium Web site: www.nesec.org/hazards/earthquakes.cfm.

³ Federal Emergency Management Agency Web site: www.fema.gov/hazards/earthquakes/quake.shtm.

Richter Scale Magnitudes and Effects	
Magnitude	Effects
< 3.5	Generally not felt, but recorded.
3.5 - 5.4	Often felt, but rarely causes damage.
5.4 - 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1 - 6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0 - 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or >	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Modified Mercalli Intensity Scale and Effects			
Scale	Intensity	Description Of Effects	Corresponding Richter Scale Magnitude
I	Instrumental	Detected only on seismographs.	
II	Feeble	Some people feel it.	< 4.2
III	Slight	Felt by people resting; like a truck rumbling by.	
IV	Moderate	Felt by people walking.	
V	Slightly Strong	Sleepers awake; church bells ring.	< 4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves.	< 5.4
VII	Very Strong	Mild alarm; walls crack; plaster falls.	< 6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged.	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open.	< 6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread.	< 7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards.	< 8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves.	> 8.1

Source: U.S. Federal Emergency Management Agency

Previous Occurrences

No historical earthquake events that had recorded magnitudes of 3.5 or above have been found in or near the Town of Chesterfield or in Hampshire County. There are fault lines running through the New England area, and in the below table are documented earthquake events over the last 300+ years. The below earthquakes had little to no impact on Chesterfield.

Table 3.5: Largest Earthquakes in the Northeast in the Past Century

Largest Earthquakes to Affect Chesterfield Since 1924		
Location	Date	Magnitude
Ossipee, NH	December 20, 1940	5.5
Ossipee, NH	December 24, 1940	5.5
Dover-Foxcroft, ME	December 28, 1947	4.5
Kingston, RI	June 10, 1951	4.6
Portland, ME	April 26, 1957	4.7
Middlebury, VT	April 10, 1962	4.2
Near NH Quebec Border, NH	June 15, 1973	4.8
West of Laconia, NH	Jan. 19, 1982	4.5
Plattsburg, NY	April 20, 2002	5.1
Bar Harbor, NH	October 3, 2006	4.2
Hollis Center, ME	October 16, 2012	4.6
New Bedford, MA	November 8, 2020	3.6

Table 3.6: Historic Earthquakes in New England

New England States Record of Historic Earthquakes		
State	Years of Record	Number Of Earthquakes
Connecticut	1668 - 2016	115
Maine	1766 - 2016	454
Massachusetts	1668 - 2016	408
New Hampshire	1638 - 2016	320
Rhode Island	1776 - 2016	34
Vermont	1843 - 2016	50
New York	1840 - 2016	551
Total Number of Earthquakes within the New England states between 1638 and 2016 is 1,932		

Source: Northeast States Emergency Consortium

Probability of Future Events

One measure of earthquake activity is the Earthquake Index Value. It is calculated based on historical earthquake events data using USA.com algorithms and is an indicator of the earthquake activity level in a region. A higher earthquake index value means a higher chance of earthquake events. Data was used for Hampshire County to determine the Earthquake Index Value for Chesterfield, as shown in the table below.

Earthquake Index for Hampshire County	
Hampshire County	0.17
Massachusetts	0.70
United States	1.81

Based upon existing records, the probability of future earthquakes in Chesterfield is “low,” or 1 to 10 percent probability in any given year.

Impact

Massachusetts introduced earthquake design requirements into their building code in 1975 and improved building code for seismic reasons in the 1980s. However, these specifications apply only to new buildings or to extensively modified existing buildings. Buildings, bridges, water supply lines, electrical power lines and facilities built before the 1980s may not have been designed to withstand the forces of an earthquake. The seismic standards have also been upgraded with the 1997 revision of the State Building Code.

The impact to the town from a significant earthquake is considered “critical,” with more than 25 percent of property in affected areas damaged or destroyed.

Structures in Chesterfield are mostly of wood frame construction. Assuming a total value of all structures in town of \$137,985,500, with potentially 25 percent of structures in town affected and experiencing 50 percent damage each, an earthquake could result in \$17,248,188 worth of damage. The costs of repairing or replacing roads, bridges, power lines, telephone lines, or the contents of the structures are not included in this estimate.

Vulnerability

Based on the above analysis, Chesterfield’s vulnerability from an earthquake is “4 – Low Risk.”

Dam Failure

Hazard Description

Dams and their associated impoundments provide many benefits to a community, such as water supply, recreation, hydroelectric power generation, and flood control. However, they also pose a potential risk to lives and property. Dam failure is not a common occurrence, but dams do represent a potentially disastrous hazard. When a dam fails, the potential energy of the stored water behind the dam is released rapidly. Most dam failures occur when floodwaters above overtop and erode the material components of the dam. Often dam breaches lead to catastrophic consequences as the water rushes in a torrent downstream flooding an area engineers refer to as an “inundation area.” The number of casualties and the amount of property damage will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area.

Many dams in Massachusetts were built during the 19th century without the benefit of modern engineering design and construction oversight. Dams of this age can fail because of structural problems due to age and/or lack of proper maintenance, as well as from structural damage caused by an earthquake or flooding.

The Massachusetts Department of Conservation and Recreation Office of Dam Safety is the agency responsible for regulating dams in the state (M.G.L. Chapter 253, Section 44 and the implementing regulations 302 CMR 10.00). To be regulated, these dams are in excess of 6 feet in height (regardless of storage capacity) and have more than 15-acre feet of storage capacity (regardless of height). Dams not meeting those criteria are considered “non jurisdictional.” Dam safety regulations enacted in 2005 transferred significant responsibilities for dams from the State of Massachusetts to dam owners, including the responsibility to conduct dam inspections.

The state has three hazard classifications for dams:

- *High Hazard:* Dams located where failure or improper operation will likely cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways, or railroads.
- *Significant Hazard:* Dams located where failure or improper operation may cause loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads or cause interruption of use or service of relatively important facilities.
- *Low Hazard:* Dams located where failure or improper operation may cause minimal property damage to others. Loss of life is not expected.

The inspection schedule for dams is as follows:

- Low Hazard dams – 10 years
- Significant Hazard dams – 5 years

- High Hazard dams – 2 years

The time intervals represent the maximum time between inspections. More frequent inspections may be performed at the discretion of the state. Dams and reservoirs licensed and subject to inspection by the Federal Energy Regulatory Commission (FERC) are excluded from the provisions of the state regulations provided that all FERC-approved periodic inspection reports are provided to the DCR. All other dams are subject to the regulations unless exempted in writing by DCR.

Location

DCR identifies seven (7) dams in Chesterfield. Below is the latest dam inspection and ownership data for Chesterfield as provided by the Office of Dam Safety in the spring of 2023. It also includes Hammond Pond Dam in Goshen as it borders Chesterfield and if it were to fail, it would flood areas of Chesterfield.

Table 3.7: Dams in and affecting Chesterfield

Dam Name	Primary Owner	Hazard Potential	Date of Most Recent Formal Phase I Assessment	Condition	Dam Purpose	Regulatory Authority
Bisbee Mill Dam #1 (off Bisbee Road)	William and Norma Bisbee	N/A				Non-Jurisdictional
Bisbee Mill Dam #2	William and Norma Bisbee	N/A				Non-Jurisdictional
Bisbee Mill Pond Dike	William and Norma Bisbee	N/A				Non-Jurisdictional
Damon Pond Dam	Lake Damon Corporation	Low Hazard	08/28/2020	Fair	Recreation	Office of Dam Safety
Healey's Pond Dam	No Record for Privately Owned Non-Jurisdictional Dam	N/A				Non-Jurisdictional
Little Galilee Pond Dam (Ireland Street)	No Record for Privately Owned Non-Jurisdictional Dam	N/A				Non-Jurisdictional
Oleksak Farm Pond (Bryant Street)	No Record for Privately Owned Non-Jurisdictional Dam	N/A				Non-Jurisdictional

Dam Name	Primary Owner	Hazard Potential	Date of Most Recent Formal Phase I Assessment	Condition	Dam Purpose	Regulatory Authority
Scout Pond Dam	Western Massachusetts Council, Inc., Boy Scouts of America	Low Hazard	8/3/2009	Satisfactory	Recreation	Office of Dam Safety
Hammond Pond (Goshen)	Hammond Acres Club, Inc.	Significant hazard	04/01/2022	Fair	Recreation	Office of Dam Safety

Office of Dam Safety, MA Department of Conservation and Recreation, 2023

The location of occurrence of this hazard is determined to be “medium,” with 10 to 50 percent of the town affected by a dam failure.

Extent

Often dam breaches lead to catastrophic consequences as the water ultimately rushes in a torrent downstream, flooding an area engineers refer to as an “inundation area.” The number of casualties and the amount of property damage would depend upon the number of people living or working in the inundation area, the number of structures in the inundation area, and the timing of the warning provided to downstream residents.

While there are no significant concerns with dams presently in Chesterfield, the integrity of one dam on Damon Pond Road is at risk due to an adjacent failing culvert. The impact of a dam failure due to culvert collapse would be the flooding of the town’s primary ambulance and mutual aid route, rendering the route impassable for several days. It is also important to consider and plan for the potential critical failure of dams upstream in Cummington, Worthington, or Goshen – although none of these upstream dams are of high hazard.

Previous Occurrences

To date, there have been no dam failures in Chesterfield.

Probability of Future Events

As described in the SHMCAP, dams are designed partly based on assumptions about a river’s flow behavior, expressed as hydrographs. Changes in weather patterns can have significant effects on the hydrograph used for the design of a dam. If the hydrograph changes, it is conceivable that the dam can lose some or all of its designed margin of safety, also known as freeboard. If freeboard is reduced, dam operators may be forced to release increased volumes earlier in a storm cycle in order to maintain the required margins of safety. Such early releases of increased volumes can increase

flood potential downstream. Dams are constructed with safety features known as “spillways.” Spillways are put in place on dams as a safety measure in the event of the reservoir filling too quickly. Spillway overflow events, often referred to as “design failures,” result in increased discharges downstream and increased flooding potential. Although climate change is not likely to increase the probability of catastrophic dam failure, it may increase the probability of design failures due to more frequent high-intensity rainfall events.

The likelihood of a dam failure in Chesterfield is considered to be “very low,” with a less than 1 percent chance of a dam failing in any given year.

Impact

The impact from a dam failure is estimated to be “critical,” with more than 25 percent of property in the affected area damaged or destroyed and a shutdown of facilities for more than 1 week. Using a total value of \$,137,985,500 of all structures in Chesterfield, and an estimated 25 percent of damage done to 25 percent of structures, an estimated damage due to dam failures is \$8,624,094. This estimate does not include building contents, land values or damages to utilities.

Vulnerability

Based on this analysis, Chesterfield faces a vulnerability of “5 — Lowest Risk” from dam failure.

Drought

Hazard Description

Drought is a normal, recurrent feature of climate. It occurs almost everywhere, although its features vary by region. In the most general sense, drought originates from a deficiency of precipitation over an extended period of time, resulting in a water shortage for some activity, group, or environmental sector. Reduced crop, rangeland, and forest productivity; increased fire hazard; reduced water levels; increased livestock and wildlife mortality rates; and damage to wildlife and fish habitat are a few examples of the direct impacts of drought. These impacts can then have far-reaching effects throughout the region and even the country.

Location

Because of this hazard's regional nature, a drought would impact the entire Town. This means that the location of occurrence is "large," with more than 50 percent of the Town affected.

Extent

The severity of a drought would determine the scale of the event and would vary among Town residents based on the sources of their private wells, as well as on the need and source of water for agriculture. The U.S. Drought Monitor records information on historical drought occurrence and categorizes drought on a D0-D4 scale as shown below.

U.S. Drought Monitor		
Classification	Category	Description
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies

Source: US Drought Monitor, <http://droughtmonitor.unl.edu/classify.htm>

Previous Occurrences

Chesterfield has had limited experience with severe drought conditions in the past, although this is changing as drought conditions related to climate change become more frequent. According to data in the Massachusetts SHMCAP, between 2001 and 2017 Hampshire County experienced up to 69 weeks of Severe Drought and 14 weeks of Extreme Drought.

Table 3.xx below shows the previous occurrences of drought since 2000, based on the US Drought Monitor. Since 2000, the longest duration of drought (D1-D4) in Massachusetts lasted 48 weeks beginning on June 07, 2016, and ending on May 2, 2017. The drought impacted the agricultural sector, some water supplies, the natural environment and many habitats and species in the state.⁶ However, the impact in Chesterfield was minor (check with B of H about well failures).

Table 3.8: Drought Classification Status 2000-2022
Annual Drought Classification Status in Massachusetts

Year	Maximum Severity
2000	No drought
2001	D2 conditions in 21% of state
2002	D2 conditions in 99% of state
2003	No drought
2004	D0 conditions in 44% of state
2005	D1 conditions in 7% of state
2006	D0 conditions in 98% of state
2007	D1 conditions in 71% of state
2008	D0 conditions in 57% of state
2009	D0 conditions in 44% of state
2010	D1 conditions in 27% of state
2011	D0 conditions in 0.01% of state
2012	D2 conditions in 51% of state
2013	D1 conditions in 60%, D0 in 99.9% of state
2014	D1 conditions in 26%, D0 in 99.99% of state
2015	D1 conditions in 72%, D0 in 100 % of state
2016	D3 conditions in 52%, D2 in 90%, D1 in 98%, D0 in 100% of state
2017	D3 conditions in 9%, D2 in 69%, D1 in 98%, D0 in 99% of state
2018	D1 conditions in 36%, D0 in 85% of state
2019	D0 in 85% of state
2020	D3 conditions in 37%, D2 in 83%, D1 in 96%, D0 in 100% of state
2021	D1 conditions in 2.5%, D0 in 6% of state
2022	D3 conditions in 39%, D2 in 96%, and D1 in 100% of state

⁶ <https://www.mass.gov/info-details/drought-status>

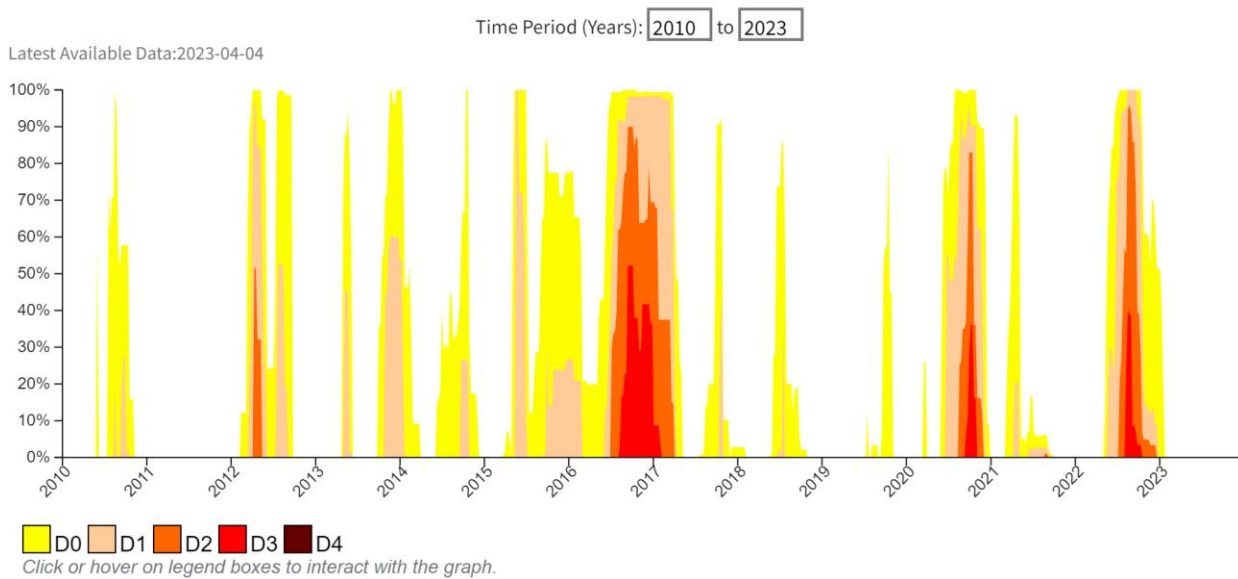
Source: US Drought Monitor

Figure 3.4 also shows the occurrences and intensity level of droughts in Hampshire County specifically from 2010 – 2022. The 2016-2017 drought can be seen to have the longest duration of drought at the D3 level (extreme drought). The droughts in 2020- 2021 and 2022-2023 also reached the D3 level for a significant amount of time.

Figure 3.8: Incidences of drought in Hampshire County from 2010 – 2023

2000–Present

The U.S. Drought Monitor (2000–present) depicts the location and intensity of drought across the country. Every Thursday, authors from NOAA, USDA, and the National Drought Mitigation Center produce a new map based on their assessments of the best available data and input from local observers. The map uses five categories: Abnormally Dry (D0), showing areas that may be going into or are coming out of drought, and four levels of drought (D1–D4). [Learn more.](#)



There have been (?) shallow well failures in the last 10 years due to low water levels during droughts.

Probability of Future Events

Based on past events and current criteria outlined in the Massachusetts Drought Management Plan, it appears that western Massachusetts may be more vulnerable than eastern Massachusetts to severe drought conditions. However, many factors, such as water supply sources, population, economic factors (i.e., agriculture-based economy), and infrastructure, may affect the severity and length of a drought event. Climate change is likely to increase the risk of drought. Projected higher average temperatures, combined with the likelihood of more consecutive days without precipitation in summer and fall, will increase the probability of more severe and longer-lasting droughts.

In Chesterfield, the probability of a future event is “low,” with between a 1 and 10 percent chance of occurring in any given year.

Impact

The impact of a drought is considered to be “minor,” with only minor property damage and minimal disruption to quality of life to town residents. Due to the water richness of western Massachusetts, Chesterfield is unlikely to be adversely affected by anything other than a major, extended drought. While such a drought would require water saving measures to be implemented, there would be no foreseeable damage to structures or loss of life resulting from the hazard.

Vulnerability

Based on the above assessment, Chesterfield’s vulnerability from drought is “5 – Lowest Risk.”

Extreme Temperatures

Hazard Description

Massachusetts has four clearly defined seasons. Extreme temperatures are considered outliers, or temperatures that fall outside the typical range for each season. Extreme temperatures can last from an afternoon to a few days. Day and nighttime temperature fluctuations also factor into the overall effects of temperature. For example, when the temperature does not cool off at night during an extreme heat wave, the risk of heat related illnesses is intensified.

Extreme Cold

Extreme cold does not have a threshold temperature, but rather is defined as prolonged periods of excessively cold weather. This may vary by region based on average temperatures in the region. In Massachusetts, where temperatures regularly go below freezing during winter months, the community is often used to these temperatures. However, this does not lessen the risk. Extremely cold temperatures can create dangerous conditions for homeless populations, stranded travelers, and residents without sufficient insulation or heat in their homes. The homeless, the elderly, and people with disabilities are often most vulnerable. In Chesterfield, 22% of the population is over 65 years old and 11.5% of the population has a disability (2021 American Community Survey and 2010 Census). Cold weather events can also have significant health impacts such as frostbite and hypothermia. Furthermore, power outages during cold weather may result in inappropriate use of combustion heaters, cooking appliances, and generators in poorly ventilated areas, which can lead to increased risk of carbon monoxide poisoning. During extreme cold, pipes may freeze and burst in many buildings with unreinforced masonry.

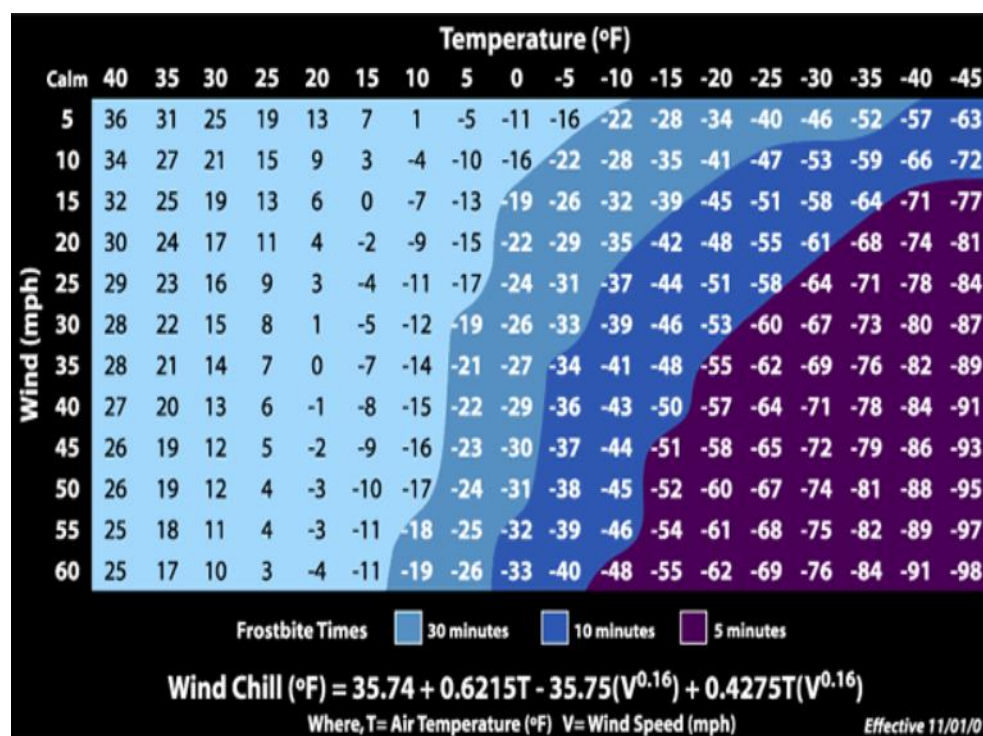
Extent

Extremely cold temperatures are measured using the Wind Chill Temperature Index provided by the National Weather Service (NWS). The updated index was implemented in 2001 and helps explain the impact of cold temperatures on unexposed skin. Figure 3.8 below provides more information. According to NOAA's National Centers for Environmental Information Storm Events Database records data for extreme cold events, between 2000 and September 2020, Massachusetts experienced 20 extreme cold and wind chill events. None of these events were reported for Hampshire County, however.⁷

7

https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Extreme+Cold%2FWind+Chill&beginDate_mm=11&beginDate_dd=01&beginDate_yyyy=1999&endDate_mm=11&endDate_dd=30&endDate_yyyy=2021&county=ALL&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=25%2CMASSACHUSETTS

Figure 3.9: Extreme Cold and Wind Chill Index



Source: National Weather Service

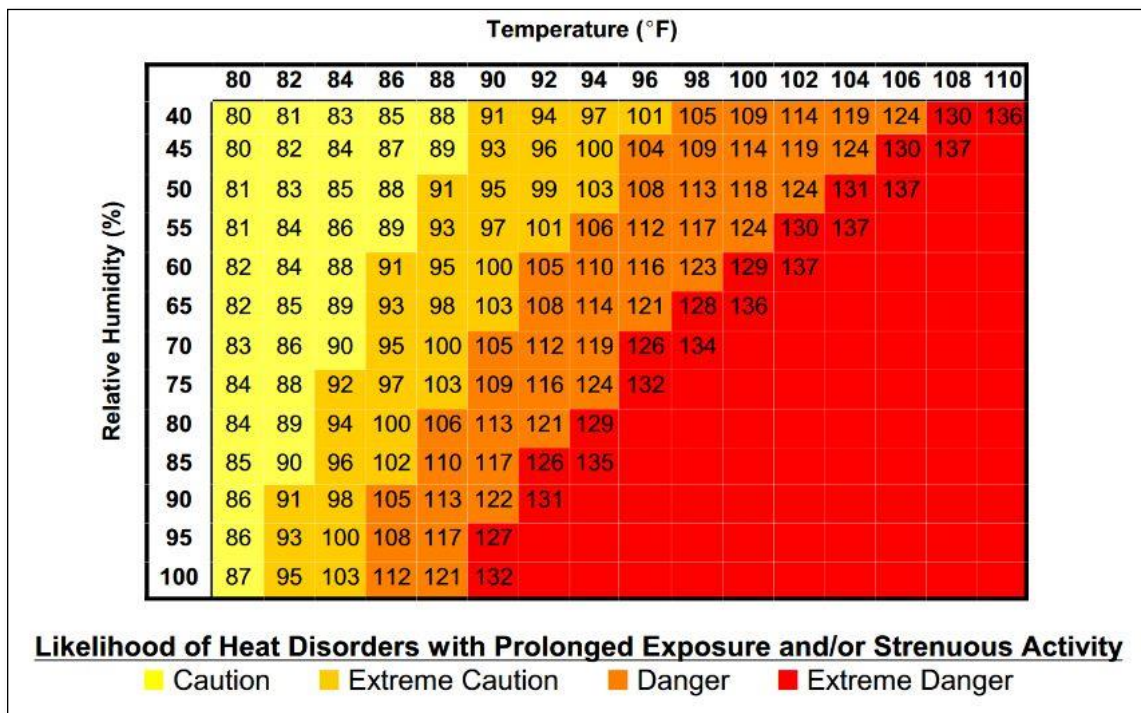
Extreme Heat

Extreme heat is when the maximum temperature reaches above 90°F during the day. A heat wave is defined as 3 or more days of temperatures of 90°F or above. Projected heat days and heat waves can have an increased impact in areas with a greater amount of impervious surface, such as buildings, roads, parking lots, and driveways. These can become “heat islands” as dark asphalt and roofs store the heat from the sun. Impacts from heat stress can exacerbate pre-existing respiratory and cardiovascular conditions.

Extent

The NWS issues a Heat Advisory when the Heat Index (Figure 3.9) is forecast to reach 100-104° F for two or more hours (NOAA, n.d.). The NWS issues an Excessive Heat Warning if the Heat Index is forecast to reach 105°+F for two or more hours. Heat waves cause more fatalities in the U.S. than the total of all other meteorological events combined. According to the SHMCAP, a study of heat-related deaths across Massachusetts estimated that when temperatures are between 85 and 92°F, there are between five and seven excess deaths per day in the state.

Figure 3.10: Heat Index Chart



Source: National Weather Service

Because most heat-related deaths occur during the summer, people should be aware of those at greatest risk and what actions can be taken to prevent a heat-related illness or death. According to the Centers for Disease Control and Prevention, the populations most vulnerable to extreme heat impacts include the following:

- People over the age of 65
- Children under the age of five
- Individuals with pre-existing medical conditions that impair heat tolerance
- Individuals without proper cooling
- Individuals with respiratory conditions
- Individuals that overexert themselves during extreme heat events

Location

Because of this hazard's regional nature, extreme temperatures would impact the entire town, resulting in a "large" location of occurrence, or more than 50 percent of total land area affected.

Previous Occurrences

NOAA's National Centers for Environmental Information Storm Events Database provides data on

excessive heat. Between 2000 and 2021, Massachusetts experienced 16 heat or excessive heat days, which did not result in any injury or property damage. None of these events were reported for Hampshire County.⁸ Extreme temperatures are classified as medium frequency events. As defined by the 2013 State Hazard Mitigation and Climate Adaptation Plan, these events occur from once in 5 years to once in 50 years or have a chance of occurrence of 2% to 20% per year. According to the 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan, between four and five heat waves (3 or more consecutive days of 90°F temperatures) occur annually in Massachusetts.

The following are some of the lowest temperatures recorded in parts of Massachusetts for the period from 1895 to present (Source: NOAA, www.ncdc.noaa.gov):

Blue Hills, MA – -21°F Boston,
MA – -12°F Worcester, MA – -
19°F

In 2015, the Chesterfield Office of Emergency Management weather station recorded a temperature of -11°F.

The following are some of the highest temperatures recorded for the period from 1895 to present (Source: NOAA, www.ncdc.noaa.gov):

- Blue Hills, MA – 101°F
- Boston, MA – 102°F
- Worcester, MA – 96°F

In the summer of 2015, the Chesterfield Office of Emergency Management recorded a temperature of 96°F.

Extreme heat usually requires the opening of shelters on a few occasions per year. In the winters of 2014 and 2015, warming centers were opened for extremely cold temperatures due to the “polar vortex.” The Community Center was opened as a cooling center on high heat days three times between 2017 and 2019, and was opened once as a warming center.

Probability of Future Events

The probability of future extreme heat and extreme cold in Chesterfield is considered to be "high," or between 40 and 70 percent in any given year.

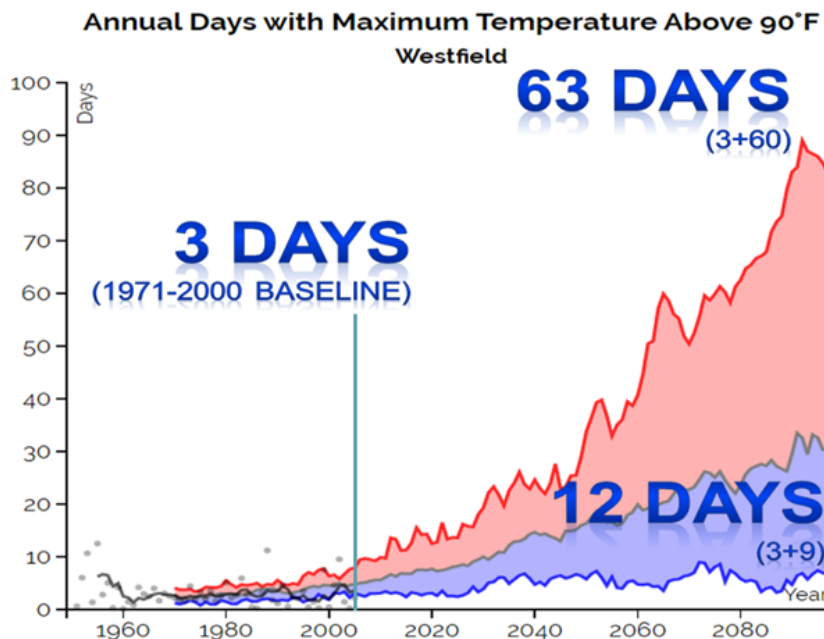
⁸

https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Excessive+Heat&beginDate_mm=11&beginDate_dd=01&beginDate_yyyy=1999&endDate_mm=11&endDate_dd=30&endDate_yyyy=2021&

The baseline average temperature for the Westfield River Basin in the years 1971-2000 was 45 degrees, and in 2021 it was approximately 47 degrees. By the end of the century, it is predicted to rise between 4.2 and 11.2 degrees, depending on levels of greenhouse gas emissions. Both the average temperature and number of extreme heat days are predicted to increase in future climate conditions.⁹

The number of days annually above 90 degrees in the Westfield River Basin is projected to rise dramatically, as shown in Figure 3.10 below. Projections indicate an increase of up to 60 more days of above 90 degrees per year by the end of the century from a baseline average of three days per year. At temperatures over 90°F, heat-related illnesses and mortality show a marked increase, and heat waves with multiple days over 90°F can be especially dangerous for vulnerable individuals. Higher temperatures can also exacerbate air pollution, which can lead to negative health impacts such as asthma and other respiratory problems.

Figure 3.11: Extreme Heat Projects for Westfield River Basin



Source: NECIA 2018

Impact

The impact of extreme heat or cold in Chesterfield is considered to be "minor," with no property damage and very limited effect on humans. Residents have dependable heat sources, other than in the event of a power outage. Because most of Chesterfield is wooded and has variability in elevation, temperatures lower significantly at night, and extended heat waves resulting in health impacts are unlikely.

⁹ <https://resilient.mass.gov/home.html>

Extreme heat usually requires the opening of shelters on a few occasions per year. In the winters of 2014 and 2015, warming centers were opened for extremely cold temperatures due to the “polar vortex.” The Community Center was opened as a cooling center on high heat days in three times between 2017 and 2019. Opened once as a warming center.

Increased temperatures can lead to a longer growing season but can negatively affect the growing of certain crops and can also negatively impact maple sugaring. Warmer average temperatures and a longer growing season can also result in a longer pollen season, as well as an increase in vector-borne diseases and populations of invasive species. Finally, increased temperatures can have negative impacts on native plants and on pollinators that rely on plants flowering at certain times.

Vulnerability

Chesterfield’s vulnerability from extreme heat and cold is considered to be, "4 - Low Risk."

Other Hazards

In addition to the hazards identified above, the Hazard Mitigation Team reviewed the full list of hazards listed in the SHMCAP. Due to the location and context of the Town, coastal erosion, landslides, and tsunamis were determined to not be a threat.

4: CRITICAL FACILITIES

Facility Classification

A Critical Facility is defined as a building, structure, or location that:

- Is vital to the hazard response effort;
- Maintains an existing level of protection from hazards for community residents and property; and,
- Would create a secondary disaster if a hazard were to impact it.

The Critical Facilities List for the Town of Chesterfield has been identified utilizing a Critical Facilities List provided by the State Hazard Mitigation Officer. Chesterfield's Hazard Mitigation Workgroup has broken up this list of facilities into three categories:

- Facilities needed for emergency response in the event of a hazard event.
- Facilities identified as non-essential and not required in an emergency response event, but which are considered essential for the everyday operation of the Town.
- Facilities or institutions that include special populations which would need additional attention in the event of a hazard event.

The critical facilities and evacuation routes potentially affected by hazard areas are identified following this list. The Past and Potential Hazards/Critical Facilities Map (Appendix D) also identifies these facilities.

Category 1 – Emergency Response Services

The Town has identified the Emergency Response Facilities and Services as the highest priority in regard to protection from natural and man-made hazards.

1. Emergency Operations Center

Davenport Town Offices – 422 Main Road
Alternate EOC – Chesterfield Fire Station, 5 North Road

2. Fire Station

Chesterfield Fire Department – 5 North Road

3. Police Station

Davenport Town Offices/Police Department – 422 Main Road

4. Highway Garage

Town Highway Garage –164 Main Road

5. Town Offices

Chesterfield Town Offices/Police Department – 422 Main Road

6. Mass Care Shelters and Reception Centers

Mass Care Shelters:

New Hingham Regional Elementary School (primary shelter, shared with Goshen) – 30 Smith Road (capacity = 750), Has a Generator

Church of Christ – Main Road (Route 143) (capacity = 200)

Reception Centers:

Chesterfield Community Center – 400 Main Road (capacity = 160), Has AC and a generator

7. Primary Evacuation Routes

Route 1 - East from center of town along Route 143 to Williamsburg

Route 2 - Southeast Area - East Street into Westhampton

Route 3 - South from center of town along South St to Westhampton

Route 4 - North from the center of town along North Road then right onto Damon Pond Road to Goshen

Route 5 - West from center of town along Route 143 to Worthington

Route 6 - North from Route 143 and West Chesterfield village along Cummington Road to Cummington

Route 7 - South from West Chesterfield village along Ireland Street to Worthington either via Partridge Road or Ireland Street

8. Bridges Located on Evacuation Routes

See Table 4-1 following “Category 3” and Critical Facilities Map at the back of plan

Category 2 – Non Emergency Response Facilities

The Town has identified these facilities as non-emergency facilities; however, they are considered essential for the everyday operation of Chesterfield.

1. Hospitals

Cooley Dickenson Hospital – 30 Locust Street, Northampton

2. Water Supply

New Hingham Regional Elementary School – 30 Smith Road

First Congregational Church – 404 Main Road

Chesterfield General Store and Café- 432 Main Road

Hilltown Community Development Corporation – 387 Main Road
Indian Hollow Campground (US Army Corps) – Indian Hollow Road
Dan Henshaw (Henshaw Farms) – 63 East Street (Pending)

3. Dry Hydrants/Fire Ponds/Water Sources

Damon Pond
Bisbee Pond Hydrant – East Street
Numerous locations in Chesterfield, see Critical Facilities Map at back of Plan

4. Transfer Station

Chesterfield Transfer Station – Willicutt Road

5. Communications

Communication Tower (cell & microwave) – Shaw Ledges (Bofat Hill Road)
Broadband Fiber Hut – 403 Main Road, rear
Telephone Crossboxes:
Verizon Switching Station – 2 Bryant Street

6. Alternate Transportation Pickup Points

First Congregational Church of Chesterfield (also known as United Church of Christ) –
43 Main Road

7. Transportation Resources

Airport: Worthington Airstrip – Route 112, Worthington for emergency use only
Helicopter Landing Sites: New Hingham Field – Ireland Street
Judd's Field – Bryant Street
Ambulance (Primary): Highland Ambulance, Williams Drive, Goshen
Ambulance (Secondary): Pioneer Valley Ambulance, Northampton
Towing: Hampshire Towing, Old Route 9, Cummington

8. Mortuary Facilities

Williamsburg Funeral Home, S. Main Street, Haydenville

9. Emergency Food Storage/Goods Warehousing

Chesterfield Town Hall – 405 Main Road, dry goods only
New Hingham Regional Elementary School – 30 Smith Road

Category 3 – Facilities/Populations to Protect

The third category contains people and facilities that need protection in the event of a disaster.

1. Special Institutions

Chesterfield Community Center – 400 Main Street

Father Freel Camp – Soaker Road

2. Schools

New Hingham Regional Elementary School – 30 Smith Road

3. Daycare or Nursery

Davenport Daycare at Hilltown CDC – 387 Main Road
“Bonnie’s Program” – 30 Smith Road

4. Historic Buildings/Sites

The Town of Chesterfield has 218 locations designated as a National Historic Landmark, a National Registry of Historic Places Property, or a National Registry of Historic Places Area/District. A comprehensive list of these properties is available at the Massachusetts Cultural Resource Information System (<http://mhc-macris.net/macrisdisclaimer.htm>).

5. Large Employment Centers

Davenport Town Offices – 422 Main Road
Hilltown Community Development Center – 397 Main Road
Chesterfield Products – 11 Bofat Hill Road
New Hingham Elementary School – 30 Smith Road
Chesterfield General Store – 432 Main Road

6. EPA Tier II Hazardous Materials Facilities

Verizon Chesterfield Dial OFC (MA823307) – 2 Bryant Street

Category 4 – Potential Resources

All resources for services and supplies related to food/water, hospitals/medical supplies, heating fuel, gas, building materials suppliers, heavy & small equipment suppliers, and gravel pits, are procured through existing town contracts with suppliers. Emergency animal services are supplied through the Hampshire Emergency Animal Response Team.

Critical Facilities and Evacuation Routes Potentially Affected by Hazard Areas			
Hazard Type	Hazard Area	Critical Facilities Affected	Evacuation Routes Affected
Flooding (100-year Flood)	100-year Floodplain along East Branch of the Westfield River	Bridge at the intersection of Main Road (Route 143)/Cummington Road in West Chesterfield	Main Road (Route 143)
Flooding (100-year Flood)	100-year Floodplain Areas along Tower Brook	Culvert at the intersection of Tower Brook/Cummington Road in West Chesterfield	None
		Bridge at the intersection of Tower Brook/Mount Road in West Chesterfield	None
Flooding (100-year Flood)	100-year Floodplain along West Falls Branch	Bridge and Dry Hydrant at the intersection of West Falls Branch/Main Road (Route 143) in West Chesterfield	Main Road (Route 143)
		Bridge at the intersection of West Falls Branch/Ireland Street in West Chesterfield	None
Flooding (100-year Flood)	100-year Floodplain along Damon Pond	Culvert and Dry Hydrant at the intersection of Dead Branch/Damon Pond Road in Northeast Chesterfield	Damon Pond Road
Flooding (100-year Flood)	100-year Floodplain around Dead Swamp	2 beaver dams Located off Route 143 (Main Road), 1 mile west of the Williamsburg/Chesterfield Town Line	Main Road (Route 143)
Flooding (100-year Flood)	100-year Floodplain west of Soaker Road	Box culvert on Soaker Road	None
Flooding (100-year Flood)	100-year Floodplain associated with Scout Pond	Bridge just north of Scout Pond on Old Chesterfield Road	None
Flooding (100-year Flood)	100-year Floodplain along Dead Branch	Bridge at the intersection of Dead Branch/Main Road (Route 143)	Main Road (Route 143)

Flooding (100-year Flood)	100-year Floodplain along Dead Branch	Bridge at the intersection of Dead Branch/Bisbee Road	None
		Bridge and Dry Hydrant at the intersection of Dead Branch/East Street	None
		3 Low Hazard Dams along Dead Branch	None
Ice	East Street	Bridge on East Street between Bisbee Road and Stage Road	Route 143 (main evacuation route) North Road/Damon Pond Road corridor (route to EMS provider)

5: MITIGATION STRATEGIES

One of the steps of this Hazard Mitigation Plan is to evaluate all of the Town's existing policies and practices related to natural hazards and identify potential gaps in protection. After reviewing these policies and practices, and the hazard identification and assessment, the Town's Hazard Mitigation Plan committee has developed a set of hazard mitigation strategies it would like to implement.

Goal Statement

To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to the following hazards: flooding, severe snowstorms/ice storms, severe thunderstorms / severe wind, hurricanes, tornadoes, wildfires/brushfires, earthquakes, dam failures, drought, and extreme temperatures.

For the extent of this analysis, the committee reviewed the following town documents:

- Zoning Bylaws
- Subdivision Rules and Regulations
- Comprehensive Emergency Management Plan
- Town Open Space and Recreation Plan

Overview of Chesterfield's Mitigation Capabilities

An overview of the town's capabilities underlying mitigation strategies for each of the hazards identified in this plan is as follows:

Chesterfield has many no cost or low-cost hazard mitigation capabilities in place. These capabilities are deployed for hazard mitigation as appropriate. Land use zoning, subdivision regulations and an array of specific policies and regulations that include hazard mitigation best practices, such as limitations on development in floodplains, stormwater management, tree maintenance, etc. Chesterfield also has appropriate staff dedicated to hazard mitigation-related work for a community of its size, including a Town Administrator, an Emergency Management Director, a professionally run Highway Department, a Building Inspector, and a Tree Warden. Chesterfield has recommended plans in place, including an Open Space and Recreation Plan and a Capital Improvements Plan. The Town also has paid department staff and numerous volunteer committees and boards. Committees that support natural hazard mitigation capabilities include the Municipal Vulnerability Preparedness (MVP) Committee, which focuses on climate resilience, the Westfield Wild & Scenic Committee, which focuses on land protection related to the Westfield River watershed; the Emergency Planning Committee, which focuses on disaster planning and response coordination; the Conservation Commission; and the Capital Improvement Planning Committee, which prepares the immediate and 5-year Capital Improvement Budget. The Town's ability to expand upon and improve the above capabilities is limited by volunteer availability and the Town's budget constraints, but includes the potential to increase collaboration with state and federal landowners in Town as mitigation issues warrant.

The Town collaborates closely with surrounding communities and is party to Mutual Aid agreements through MEMA. Chesterfield is also an active member community of the Pioneer Valley Planning Commission (PVPC). Chesterfield can take advantage of no cost local technical assistance provided by the professional planning staff at the PVPC as needed for certain mitigation planning activities.

Capabilities by Hazard

Flooding

The key factors in flooding are the water capacity of water bodies and waterways, the regulation of waterways by flood control structures, and the preservation of flood storage areas and wetlands. As more land is developed, more flood storage is demanded of the town's water bodies and waterways. The town currently addresses this problem with a variety of mitigation tools and strategies. First, land subject to flooding near the Westfield River is predominantly protected from development through fee-ownership or conservation restriction. Flood-related regulations and strategies are included in the town's general bylaws, zoning bylaws (including the Floodplain Protection District), and subdivision regulations. Infrastructure like dams and culverts are in place to manage the flow of water. The Town currently coordinates with the Westfield Wild & Scenic Committee on their project to inventory and assess all culverts in the Town of Chesterfield Hazard Mitigation Plan Update

Westfield River watershed, including those in Chesterfield, for wildlife passage and general condition, which serves as a source of information about local culverts.

Severe Snowstorms / Ice Storms

Winter storms can be especially challenging for emergency management personnel. The Massachusetts Emergency Management Agency (MEMA) serves as the primary coordinating entity in the statewide management of all types of winter storms and monitors the National Weather Service (NWS) alerting systems during periods when winter storms are expected. Even though the storm has usually been forecast, there is no certain way for predicting its length, size or severity. Therefore, mitigation strategies must focus on preparedness prior to a severe snow/ice storm.

The Town's current mitigation tools and strategies focus on preparedness, with many regulations and standards established based on safety during storm events. This occurs through the Emergency Planning Committee. To the extent that some of the damages from a winter storm can be caused by flooding, flood protection mitigation measures also assist with severe snowstorms and ice storms. Tree trimming is also regularly carried out by the Town for municipally-owned trees and by Eversource for trees in the electric right-of-way.

Hurricanes

Hurricanes provide the most lead warning time of all identified hazards, because of the relative ease in predicting the storm's track and potential landfall. MEMA assumes "standby status" when a hurricane's location is 35 degrees North Latitude (Cape Hatteras) and "alert status" when the storm reaches 40 degrees North Latitude (Long Island). Even with significant warning, hurricanes can do significant damage – both due to flooding and severe wind.

The flooding associated with hurricanes can be a major source of damage to buildings, infrastructure and a potential threat to human lives. Flood protection measures can thus also be considered hurricane mitigation measures. The high winds that often accompany hurricanes can also damage buildings and infrastructure, similar to tornadoes and other strong wind events.

Severe Thunderstorms / Winds / Tornadoes

Most damage from tornadoes and severe thunderstorms come from high winds that can fell trees and electrical wires, generate hurtling debris and, possibly, hail. According to the Institute for Business and Home Safety, the wind speeds in most tornadoes are at or below design speeds that are used in current building codes, making strict adherence to building codes a primary mitigation strategy. However, most of Chesterfield's building stock was built prior to current building codes, making structures in the town vulnerable to tornado damage. Current land development regulations, such as restrictions on the height of telecommunications towers, can also help prevent wind damages.

Wildfires / Brushfires

Wildfire and brushfire mitigation strategies involve educating people about how to prevent fires from starting, as well as controlling burns within the town through the issuance of permits.

Earthquakes

Although there are five mapped seismological faults in Massachusetts, there is no discernible pattern of previous earthquakes along these faults nor is there a reliable way to predict future earthquakes along these faults or in any other areas of the state. Consequently, earthquakes are arguably the most difficult natural hazard for which to plan.

Most buildings and structures in the state – and in Chesterfield – were constructed without specific earthquake resistant design features. In addition, earthquakes precipitate several potential devastating secondary effects such as building collapse, utility pipeline rupture, water contamination, and extended power outages. Therefore, many of the mitigation efforts for other natural hazards identified in this plan may be applicable during the Town’s recovery from an earthquake.

Dam Failure

Dam failure is a highly infrequent occurrence. It most often coincides with flooding, so its impacts can be multiplied, as the additional water has nowhere to flow. The only mitigation measures currently in place are the state regulations governing the construction, inspection, and maintenance of dams. This is managed through the Office of Dam Safety at the Massachusetts Department of Conservation and Recreation.

The Office of Dam Safety considers the following types of dams as “non-jurisdictional,” or not requiring inspections (registration may still be required):

- Any barrier not in excess of six feet in height, regardless of storage capacity, or
- Any barrier with storage capacity not in excess of 15 acre feet, regardless of height, or
- Any barrier with low hazard potential classification in the use of agriculture, or
- Any structure used to temporarily divert water on land in agricultural use (agricultural exemptions are found in 302 CMR 10.03 – Department of Conservation and Recreation).

Dams that are considered jurisdictional are required to be inspected according to their hazard potential. Hazard potentials are based on the potential consequences of a dam failure (loss of life and damage to property) and are not related to the current condition of the dam.

- High Hazard: Inspections required every two years
- Significant Hazard: Inspections required every five years
- Low Hazard: Inspections required every ten years

The completion of required inspections is the legal and financial responsibility of the dam owner.

Drought

Although Massachusetts does not face extreme droughts like many other places in the country, it is susceptible to dry spells and drought. Drought can most likely be effectively mitigated in regions like the Pioneer Valley if development measures are put into place, such as ensuring that groundwater is recharged by restricting development in aquifer recharge areas.

Extreme Temperatures

Extreme temperatures are likely to become more common due to climate change. The impacts of extreme temperatures are often emergency response-related, such as the provision of heating or cooling centers during extreme temperature events. Other mitigation measures include increasing awareness of extreme temperature risk to health and properties and assisting vulnerable populations in extreme temperature events. Chesterfield already has partnerships in place with the Council on Aging to identify vulnerable residents.

Existing Mitigation Capabilities

As described above, the Town of Chesterfield has many mitigation capabilities in place to effectively mitigate the impacts of natural hazards and climate change. These capabilities are described in Table 5.1 below, along with their effectiveness and potential changes to make.

Table 5.1 Existing Mitigation Capabilities				
Existing Mitigation Capability	Description	Hazards Mitigated	Effectiveness	Potential Changes
State Building Code	Chesterfield continues to follow the Massachusetts State Building Code	All hazards	Effective	None
Social media	Town uses Facebook and its web page to get information out about coming hazards, including road closures and any information put out by National Weather Service and MEMA.	All hazards	Somewhat Effective	Increase visibility of website and FB pages. Get on Instagram
Warning System – CodeRed	The Town uses CodeRed emergency alert system. Residents must enroll to get notifications.	All Hazards	Somewhat Effective	Reaches approximately 60% of town. Increase enrollment (text). Put alerts out on social media
CEMP	The CEMP ensures a coordinated response to emergencies. It delineates the roles and responsibilities of all Town departments, agencies, government orgs, volunteers and community partners that may be involved in response operations. Recently updated.	All Hazards	Effective	None

Table 5.1 Existing Mitigation Capabilities

Existing Mitigation Capability	Description	Hazards Mitigated	Effectiveness	Potential Changes
Back-up Generators	Back-up generators at Senior Center, Town Offices, Highway Garage, MLP	All hazards	Effectiveness	Permanent generator needed for Fire Station
Culvert Clearing and Outfall inspections	The DPW routinely clears and inspects outfalls to reduce the chance of drainage blockages that would cause localized flooding.	Flooding	Effective	None
Culvert Replacements	The Town has a prioritization plan for culvert replacement, and regularly seeks and provides funding for culvert replacement projects.	Flooding	Effective	None
Zoning Bylaws: Site Plan Review	Site plan must delineate wetlands, waterways, and floodplains, as well as erosion control, and drainage infrastructure.	Flooding	Effective	None
Zoning Bylaws: Floodplain Zone	Areas delineated as part of the 100-year floodplain are protected by strict use regulations that prevent structures from being constructed that will be damaged by flooding.	Flooding	Effective	None
Zoning Bylaws: Westfield River Protection District	Areas abutting the Westfield River encompassing floodplain areas or within 100 feet of the riverbank. Purpose is to preserve alterations to the natural river flow, protect habitat and protect environmentally sensitive areas along the shoreline, and preserve natural flood control and flood storage characteristics of the floodplain.	Flooding	Effective	None
Wetlands Protection	Town enforces the standards established by Wetlands Protection Act.	Flooding	Effective	None

Table 5.1 Existing Mitigation Capabilities

Existing Mitigation Capability	Description	Hazards Mitigated	Effectiveness	Potential Changes
Zoning Bylaws: Cluster Development	A cluster development allows lots to have less area and/or frontage than normally required in order to promote denser housing with surrounding land used for conservation or recreation.	Flooding, drought, wildfire	Effective, although underutilized	Has not been utilized yet
Zoning Bylaws: Creative Development/Common Driveway	Allows for alternate development of two or more lots in order to protect natural or historic resources or scenic views, protection of open space or provision of affordable housing.	Flooding, drought, wildfire, severe snow and ice	Effective although underutilized	None
Zoning Bylaws: Wireless Communication Overlay District and Design Standards	Imposes regulations on the design, height, location, fencing, and setback of wireless communication towers. Prohibited in historic district.	Severe thunderstorm/wind/tornado, hurricanes	Design standards effective, District restrictions are problematic	Should research/consider new technologies that would improve wireless coverage in historic district
Zoning Bylaws: Mobile Homes	Mobile Homes/Recreation Vehicles designed or used for human occupation as dwellings shall not be kept within the boundaries of the Town of Chesterfield unless they are in bona fide storage or unless they are being used as temporary dwellings.	Flooding, severe thunderstorm/wind/tornado, hurricanes	Effective but consider re-evaluating in light of reducing affordable housing options	Consider evaluating and possibly revising
Subdivision Regulations	Requires preservation of all significant natural features such as large trees and watercourses, and requires Low Impact Development drainage systems to closely mimic natural systems.	Flooding, Drought	Effective	None
Subdivision Regulations	The Fire Department is involved in the review of subdivision plans to ensure design does not increase risk of wildfire or brushfire.	Wildfire	Effective	None

Table 5.1 Existing Mitigation Capabilities

Existing Mitigation Capability	Description	Hazards Mitigated	Effectiveness	Potential Changes
Participation in the National Flood Insurance Program	The Town currently participates in the National Flood Insurance Program, which includes enforcing the requirements of the Floodplain Zone.	Flooding	Effective	Town to stay updated with any changes to Floodplain maps
Open Space and Recreation Plan	The Town regularly updates the OSRP and will be finished in 2024	Flooding, drought	Effective	None
Tree Management	The Town communicates with Eversource about trees that need to be trimmed or removed. Town maintains trees as well.	Severe snow and ice storms, severe thunderstorm/wind/tornado, hurricanes	Effective	None
Burn Permits	Residents are required to obtain a burn permit from the Town in order to have a controlled burn on their property.	Wildfires	Effectiveness	None
Fire Safety Education	The Fire Department leads fire safety classes four times per year at New Hingham Elementary School. They also run a "Safe Day" at the school with the Police Department and ambulance service that focuses on fire safety. The Senior Safe program at the Senior Center provided by Williamsburg and Cummington Fire Departments.	Wildfires	Effective	None.
Public Education and Outreach	Information is shared in the Town annual reports about preparing for natural hazards and emergencies.	All hazards	Somewhat effective	Add more information about preparing for natural hazards on the Town website; send out a flyer annually.

Previously Identified and New Strategies

Several of the action items previously identified in the 2016 Hazard Mitigation Plan are being carried over into the current plan. This is either because they are ongoing strategies that should be repeated over time, or because they were not completed or only partially completed due to lack of funding or staff and volunteer time. The Hazard Mitigation Plan Committee identified several new strategies that are also being pursued. These new strategies are based on experience with currently implemented strategies, as well as the hazard identification and risk assessment in this plan.

Prioritization Methodology

The Chesterfield Hazard Mitigation Planning Workgroup reviewed and prioritized a list of previously identified and new mitigation strategies using the following criteria:

- **Application to multiple hazards** – Strategies are given a higher priority if they assist in the mitigation of several natural hazards.
- **Time required for completion** – Projects that are faster to implement, either due to the nature of the permitting process or other regulatory procedures, or because of the time it takes to secure funding, are given higher priority.
- **Estimated benefit** – Strategies which would provide the highest degree of reduction in loss of property and life are given a higher priority. This estimate is based on the Hazard Identification and Analysis Chapter, particularly with regard to how much of each hazard's impact would be mitigated.
- **Cost effectiveness** – in order to maximize the effect of mitigation efforts using limited funds, priority is given to low-cost strategies. For example, regular tree maintenance is a relatively low-cost operational strategy that can significantly reduce the length of time of power outages during a winter storm. Strategies that have identified potential funding streams, such as the Hazard Mitigation Grant Program, are also given higher priority.
- **Eligibility Under Hazard Mitigation Grant Program** – The Hazard Mitigation Grant Program (HMGP) provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. Funding is made available through FEMA by the Massachusetts Emergency Management Agency. Municipalities apply for grants to fund specific mitigation projects under MEMA requirements

The following categories are used to define the priority of each mitigation strategy:

- **Low** – Strategies that would not have a significant benefit to property or people, address only one or two hazards, or would require funding and time resources that are impractical
- **Medium** – Strategies that would have some benefit to people and property and are somewhat cost effective at reducing damage to property and people
- **High** – Strategies that provide mitigation of several hazards and have a large benefit that warrants their cost and time to complete

Cost Estimates

Each of the following implementation strategies is provided with a cost estimate. Projects that already have secured funding are noted as such. Where precise financial estimates are not currently available, categories were used with the following assigned dollar ranges:

- **Low** – cost less than \$50,000
- **Medium** – cost between \$50,000 – \$100,000
- **High** – cost over \$100,000

Cost estimates take into account the following resources:

- **Municipal staff time** for grant application and administration
- **Consultant design and construction cost** (based on estimates for projects obtained from City and general knowledge of previous work in the city)
- **Municipal staff time** for construction, maintenance, and operation activities

Project Timeline

Each strategy is provided with an estimated length of time it will take for implementation. Where funding has been secured for the project, a specific future date is provided for when completion will occur. However, some projects do not currently have funding and thus it is difficult to know exactly when they will be completed. For these projects, an estimate is provided for the amount of time it will take to complete the project once funding becomes available.

Status of Previous Mitigation Strategies

Status of Previous Mitigation Strategies						
Type	Description	Status	Hazards Mitigated	Responsible Agency	Priority	Keep in updated plan?
Strategy	Inventory supplies at existing shelters as supplies are used.	<p>Completed, but ongoing. Western Regional Homeland Security Council has conducted surveys at existing shelters and developed a needs list and purchased regional sheltering equipment.</p> <p>The Hampshire Regional Emergency Planning Committee (HREPC) conducts an annual survey of shelter supplies owned by towns, colleges, and regional agencies</p>	All	EMD	Medium	Yes, ongoing
Strategy	Collect, periodically update, and disseminate information on natural hazard preparation (including home survival kit, preparing homes for flooding/high winds, sheltering in place, and evacuation procedures) online and in brochures.	<p>This has been partially completed. Radio stations disseminate this information, and town website has some information.</p> <p>Need to add a page on the website with more information and send out an annual flyer.</p>	All	EMD (lead) Police Dept. Fire Dept. Secondary – MLP, MVP, COA	Medium	Yes, ongoing

Strategy	Set up a system to document impacts (damage, costs) of undersized culverts throughout town.	This has not been completed, due to lack of staff time and capacity. List of undersized culverts has been started.	Flooding Hurricanes	Highway Dept.	Medium	Yes, keep in plan
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Status of Previous Mitigation Strategies

Type	Description	Status	Hazards Mitigated	Responsible Agency	Priority	Timeframe
Strategy	Seek funding through Hazard Mitigation Grant Program (HMGP) and other programs for the replacement of undersized culverts.	In progress for one culvert - Obtained funding through Mass Riverways/Westfield Wild and Scenic to do design work for one culvert	Flooding Hurricanes	EMD Highway Dept.	Medium	Yes, keep in plan
Strategy	Formalize a plan for providing access to water, information, shelter, and food stores to vulnerable residents in Town in the event of a severe hazard incident.	Plan was started but has not been completed due to lack of staff capacity. Need to update this strategy and coordinate with COA to make a map and list of vulnerable elderly	All Hazards	EMD	Low	Yes, keep in plan

Status of Previous Mitigation Strategies

Strategy	Develop a plan that identifies hazardous trees (with GPS) and outlines a maintenance plan to prevent structural or electrical damage in the event of a snow or ice storm. Eversource does this for trees in their right-of-way.	Not completed, due to time and funding constraints.	Severe snowstorm Ice storm	Tree Warden Eversource	Medium	Yes, keep in plan
Strategy	Replace the culvert on Damon Pond Road, which threatens the integrity of associated dam. Culvert could take out dam and result in blocking primary ambulance and mutual aid route.	In progress. On TIP list: Due to be replaced in 2027 State has assessed the culvert in conjunction with dam inspection.	Flooding Dam Failure	Highway Dept.	Medium	Yes, keep in plan until completed
Strategy	Appoint committee and revise Open Space and Recreation Plan (OSRP).	In progress. Subcommittee formed, draft was completed, and needs to be revised by committee.	All	Conservation Commission	Medium	No

Status of Previous Mitigation Strategies						
Strategy	Add more specific requirements to address flood related issues in the Special Permit and Site Plan Approval provisions in the Chesterfield Zoning Bylaw including topographic change, removal of cover vegetation, risk of erosion or siltation and increased stormwater runoff.	Completed	Town wide	Effective	Medium	No

Mitigation Strategies to Implement

Mitigation Capabilities and Strategies to Implement								
Type	Action	Description	Hazards Mitigated	Responsible Agency	Priority	Cost	Funding Source	Timeframe
Strategy	Inventory supplies at existing shelters as supplies are used.	Western Regional Homeland Security Council has conducted surveys at existing shelters and developed a needs list and purchased regional sheltering equipment. The Hampshire Regional Emergency Planning Committee (HREPC) conducts an annual survey of shelter supplies owned by towns, colleges, and regional agencies	All	EMD	Medium	Low	Local -Town Meeting Allocation*	Ongoing. Inventory takes one week to execute.
Strategy	Collect, periodically update, and disseminate information on natural hazard preparation (including home survival kit, preparing homes for flooding/high winds, sheltering in place, and evacuation procedures) online and in brochures.	<ul style="list-style-type: none"> Send out a flyer annually with this information Develop a webpage on town website with this information 	All	EMD (lead) Police Dept. Fire Dept. Secondary – MLP, MVP, COA	Medium	Low	Local -Town Meeting Allocation* Grant funding – MVP	Ongoing. Send out annually. Webpage will take 6 months to complete

Strategy	Set up a system to document impacts (damage, costs) of undersized culverts throughout town.	List of undersized culverts exists, but need to document impacts in order to get funding for replacement.	Flooding Hurricanes	Highway Dept.	Medium	Low	Local – Town Meeting Allocation*, State Grant funding	12 months to complete task
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Mitigation Capabilities and Strategies to Implement

Type	Action	Description	Hazards Mitigated	Responsible Agency	Priority	Cost	Funding Source	Timeframe
Strategy	Seek funding through BRIC and other grant programs for the replacement of undersized culverts.	Design In progress for one culvert, need funding for construction as well as for replacement of other culverts.	Flooding Hurricanes	Highway Dept., EMD	Medium	High	BRIC (FEMA), Local- Town Meeting Allocation*, MA DER, MVP	Three months to complete application, one year after funding received.
Strategy	Formalize a plan for providing access to water, information, shelter, and food stores to vulnerable residents in Town in the event of a severe hazard incident.	Plan has been started. Council on Aging and Highway Department need to be engaged to make a map and list of vulnerable residents.	All Hazards	EMD, COA, Highway, Fire	Low	Low	Local funding – Town Meeting Allocation	18 months to complete, then ongoing – will have to update list every year

Mitigation Capabilities and Strategies to Implement

Type	Action	Description	Hazards Mitigated	Responsible Agency	Priority	Cost	Funding Source	Timeframe
Strategy	Develop a tree maintenance plan	Develop a plan that identifies hazardous trees (with GPS) and outlines a maintenance plan to prevent structural or electrical damage in the event of a snow or ice storm.	Severe snowstorm/Ice storm, Severe thunderstorm/wind /tornado, hurricane	Tree Warden, Eversource	Medium	Low	Local funding-Town Meeting Allocation	18 months to develop
Strategy	Put a backup storage system in place for all Town data.	Research and purchase a cloud-based system for Town to use. Ensure all town documents are available/accessible in an electronic format	All Hazards	Select Board, Finance Committee	High	Medium	Local Funding – Town Meeting Allocation, State/grant funding	18 months to completion, including funding allocation and purchase.
Strategy	Develop a regional debris management plan	Work with other communities to develop a plan for separation, removal, collection, disposal and recycling of disaster-related debris.	Flooding, Severe snow/ice, hurricane, severe thunderstorm/wind /tornado	EMD	Medium	Low		

Mitigation Capabilities and Strategies to Implement

Type	Action	Description	Hazards Mitigated	Responsible Agency	Priority	Cost	Funding Source	Timeframe
Strategy	Explore possibility of Town/region purchasing a water distribution vehicle	Research the purchase of a device for potable water transportation and distribution for use during power outages when people cannot access water from private wells.	All Hazards	EMD	Low	Low/Medium	Local- Town Meeting Allocation, Grant Funding - WRHSAC, BRIC, MVP	One year to research and obtain funding, and six months to purchase
Strategy	Explore possibility of siren-based warning system for Town	Research the installation of a siren-based warning system for the town that can be activated during emergencies.	All hazards	EMD	Low	Low/Medium	Local for exploratory phase, grant funding to purchase	Six months for research, another six months for grant preparation and application.

*Town Meeting Allocation will determine source of local funding: General Fund, Operating Budget/Free Cash, Stabilization Fund, or Capital Fund

6: PLAN REVIEW, EVALUATION, IMPLEMENTATION, AND ADOPTION

Plan Adoption

Upon completion of the draft Hazard Mitigation Plan, a public engagement event was held on January 27, 2016, to request comments. No comments from the public were submitted. The Hazard Mitigation Plan was then submitted to the Massachusetts Emergency Management Agency (MEMA) and the Federal Emergency Management Agency for their review. Upon receiving conditional approval of the plan by FEMA, the plan was presented to the Town's Select Board and adopted.

Plan Implementation

The implementation of this plan begins upon its formal adoption by the Town Select Board and approval by MEMA and FEMA. Those town departments and boards responsible for ensuring the development of policies, bylaw revisions, and programs as described in Sections five and six of this plan will be notified of their responsibilities immediately following approval. The Town's Hazard Mitigation Plan Committee will oversee the implementation of the plan.

Integration into Town Planning Processes

After this plan has been approved by both FEMA and the local government, links to the plan will be emailed to all Town staff, boards, and committees, with a reminder to review the plan periodically and work to incorporate its contents, especially the action plan, into other planning processes and documents. In addition, during annual monitoring meetings for the Hazard Mitigation Plan implementation process, the Hazard Mitigation Working Group will review whether any of these plans are in the process of being updated. If so, the Hazard Mitigation Working Group will remind people working on these plans, policies, etc., of the Hazard Mitigation Plan, and urge them to incorporate the Hazard Mitigation Plan into their efforts. Specifically, over the next two years the HMP will be incorporated into the planning the Town does as part of the MVP (Municipal Vulnerability Preparedness) 2.0 process. The MVP 2.0 program helps communities to increase resilience to climate change by filling gaps from the original MVP Planning Grant (1.0) process. It focuses on addressing root causes of social vulnerability and moving from planning to implementation, and allows the Town to revisit resilience priorities defined during the original planning process. As the Town of Chesterfield creates new plans and documents, and updates existing planning documents, this plan and its implementation strategies will be incorporated as applicable. This process will be ongoing and part of the standard practice of reviewing other plans to ensure consistency between plans.

Plan Monitoring and Evaluation

The Town's Emergency Management Director or his/her designee will call meetings of all responsible parties to review plan progress on an annual basis in each of the following years: 2025, 2026, 2027, 2028, 2029 and as needed (*i.e.*, following a natural disaster). The public will be notified of these meetings in advance through a posting of the agenda at Town Hall. Responsible parties identified for specific mitigation actions will be asked to submit their reports in advance of the meeting.

Meetings will involve evaluation and assessment of the plan, regarding its effectiveness at achieving the plan's goals and stated purpose. The following questions will serve as the criteria that is used to evaluate the plan:

Plan Mission and Goal

- Is the Plan's stated goal and mission still accurate and up to date, reflecting any changes to local hazard mitigation activities?
- Are there any changes or improvements that can be made to the goal and mission?

Hazard Identification and Risk Assessment

- Have there been any new occurrences of hazard events since the plan was last reviewed? If so, these hazards should be incorporated into the Hazard Identification and Risk Assessment.
- Have any new occurrences of hazards varied from previous occurrences in terms of their extent or impact? If so, the stated impact, extent, probability of future occurrence, or overall assessment of risk and vulnerability should be edited to reflect these changes.
- Is there any new data available from local, state, or Federal sources about the impact of previous hazard events, or any new data for the probability of future occurrences? If so, this information should be incorporated into the plan.

Existing Mitigation Strategies

- Are the current strategies effectively mitigating the effect of any recent hazard events?
- Has there been any damage to property since the plan was last reviewed?
- How could the existing mitigation strategies be improved upon to reduce the impact from recent occurrences of hazards? If there are improvements, these should be incorporated into the plan.

Proposed Mitigation Strategies

- What progress has been accomplished for each of the previously identified proposed mitigation strategies?
- How have any recently completed mitigation strategies affected the Town's vulnerability and impact from hazards that have occurred since the strategy was completed?
- Should the criteria for prioritizing the proposed mitigation strategies be altered in any way?
- Should the priority given to individual mitigation strategies be changed, based on any recent changes to financial and staffing resources, or recent hazard events?

Review of the Plan and Integration with Other Planning Documents

- Is the current process for reviewing the Hazard Mitigation Plan effective? Could it be improved?
- Are there any Town plans in the process of being updated that should have the content of this Hazard Mitigation Plan incorporated into them?
- How can the current Hazard Mitigation Plan be better integrated with other Town planning tools and operational procedures, including the zoning bylaw, the Comprehensive Emergency Management Plan, and the Capital Improvement Plan?

Following these discussions, it is anticipated that the Workgroup may decide to reassign the roles and responsibilities for implementing mitigation strategies to different town departments and/or revise the goals and objectives contained in the plan. The Workgroup will review and update the Hazard Mitigation Plan every five years. In order to stay on the five-year schedule, the next updated plan will need to be submitted to MEMA and FEMA in 2029/2030.

Public participation will be a critical component of the Hazard Mitigation Plan maintenance process. The Hazard Mitigation Workgroup will hold all meetings in accordance with Massachusetts open meeting laws. The Chesterfield Local Emergency Planning Committee (LEPC), under the direction of the Emergency Management Director, will hold an annual review of Chesterfield's Hazard Mitigation Plan. This meeting will be held at the Chesterfield Town Offices and will focus on the LEPC's planning activities, and will also solicit public input on the plan's actions and priorities.

The Town of Chesterfield website will also have a link for the Town's Hazard Mitigation Plan, where a copy of the Plan will be posted. During LEPC annual review meetings, the Emergency Management Directory will make attendees aware of the presence of the HMP plan on the town's website.

7: APPENDICES

Appendix A – Technical Resources

Agencies

Massachusetts Emergency Management Agency (MEMA).....	508/820-2000
Hazard Mitigation Section	617/626-1356
Federal Emergency Management Agency (FEMA)	617/223-4175
Selected MA Regional Planning Commissions:	
Berkshire Regional Planning Commission (BRPC).....	413/442-1521
Central Massachusetts Regional Planning Commission (CMRPC).....	508/693-3453
Franklin Regional Council of Governments (FRCOG).....	413/774-3167
Metropolitan Area Planning Council (MAPC).....	617/451-2770
Pioneer Valley Planning Commission (PVPC).....	413/781-6045
MA Board of Building Regulations & Standards (BBRS).....	617/227-1754
MA Coastal Zone Management (CZM).....	617/626-1200
DCR Water Supply Protection.....	617/626-1379
DCR Waterways.....	617/626-1371
DCR Office of Dam Safety.....	508/792-7716
DFW Riverways.....	617/626-1540
DEP Wetlands and Waterways.....	617/292-5500
MA Dept. of Housing & Community Development.....	617/573-1100
Woods Hole Oceanographic Institute.....	508/457-2180
UMass-Amherst Cooperative Extension.....	413/545-4800
National Fire Protection Association (NFPA).....	617/770-3000
MA Board of Library Commissioners.....	617/725-1860
MA Highway Department, District.....	413/582-0599
MA Division of Marine Fisheries.....	617/626-1520
MA Division of Capital & Asset Management (DCAM).....	617/727-4050
Massachusetts Association of Regional Planning Agencies (MARPA).....	413/781-6045
University of Massachusetts/Amherst.....	413/545-0111
Natural Resources Conservation Services (NRCS).....	413/253-4350
MA Historical Commission.....	617/727-8470
U.S. Army Corps of Engineers.....	978/318-8502
Northeast States Emergency Consortium, Inc. (NESEC).....	781/224-9876
U.S. Department of Commerce: National Oceanic and Atmospheric Administration: National Weather Service; Tauton, MA	
U.S. Department of the Interior: US Fish and Wildlife Service.....	413/253-8200
U.S. Geological Survey	508/490-5000

Mitigation Funding Resources

Category	Agency/Grant	Description	Limitations & Stipulations
Community Development	MassWorks Infrastructure Program	Provides grants to communities to help them prepare for success and contribute to the long-term strength and sustainability of the Commonwealth.	None
Dam Repair and Removal	Dam and Seawall Program, EOEEA	Provides funding for repair or removal of dams	None
Dam Removal	Division of Ecological Restoration (DER)	Provides funding to remove dams and restore river processes.	Must provide a high enough ecological benefit
Drinking Water Supply Protection	Drinking Water Supply Protection (DWSP) Grant Program, MassDEP	Financial assistance for the purchase of land for protection of existing DEP-approved public drinking water supplies; protection of planned future public drinking water supplies; or groundwater recharge	For public water systems and municipal water departments
Emergency Management and Planning	Flood Mitigation Assistance Grant Program (FMA)	Implement cost-effective measures that reduce or eliminate the long-term risk of flood damage.	For buildings and other structures insured under the NFIP
Emergency Management and Planning	Hazard Mitigation Grant Program (HMGP)	Provides funding after a disaster to significantly reduce or permanently eliminate future risk to lives and property from natural hazards.	None
Emergency Management and Planning	Building Resilient Infrastructure & Communities (BRIC)	Provides funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event, with a focus on infrastructure projects and “community lifelines.” Replaced FEMA’s Pre-Disaster Mitigation (PDM) Program.	None
Emergency Management and Planning	MEMA Citizen Corps Program (CCP) Grant	Supports local Community Emergency Response Teams (CERT) and Volunteers in Police Service (VIPS) in preparing for all-hazards. Can be used for planning activities, equipment, training, and exercises.	None
Energy	Department of Energy Resources (DOER)	The DOER provides grant funding for clean energy-related programs.	None
Energy	Green Communities Designation and Grant Program	Provides a road map along with financial and technical support to municipalities that pledge to cut municipal energy and meet other criteria.	None
Environment	Community Forest Grant Program	Funding to establish community forests.	None

Category	Agency/Grant	Description	Limitations & Stipulations
Environment, Flood Mitigation	Culvert Replacement Municipal Assistance Grant Program	Grant to replace undersized, perched, and/or degraded culverts located in an area of high ecological value.	Culvert replacements must meet Massachusetts Stream Crossing Standards to the maximum extent feasible.
Environment	US Forest Service Community Forest Grant Program	Funding to acquire private forest land threatened by conversion and establish community forests.	None
Environment	Conservation Assistance Grant Program	Provides funding for property appraisals, OSRPs, other land conservation planning.	Towns with 6,000 residents or fewer
Environment	604b Grant Program	Water quality assessment and management planning.	None
Environment	Land Use Planning Grants	Support effort to plan, regulate, and act to conserve and develop land consistent with the Massachusetts' Sustainable Development Principles.	None
Environment	LAND Grant Program (Division of Conservation Services)	Helps cities and towns acquire land for conservation and passive recreation.	Municipality must have an approved OSRP
Environment	Federal Land & Water Conservation Fund (DCS)	Funding for the acquisition, development, and renovation of parks, trails, and conservation areas.	Municipality must have an approved OSRP
Environment	MassTrails Program	Trail protection, construction, and stewardship projects.	None
Environment	MVP Program	Provides support to implement climate change resiliency priority projects.	None
Environment	Natural Resource Damages Program	Funding for restoration projects. Funding comes from settlements, so it is does not follow a set schedule.	None
Public Safety	Emergency Management Performance Grant (EMPG)	Reimbursable grant program to assist local emergency management departments to build and maintain an all-hazards emergency preparedness system.	Reimbursable
Public Safety	Public Assistance Program	The state reimburses governments and other applicants for disaster related costs.	75% reimbursable
Public Works & Transportation	Chapter 90 Program	Reimbursable grants on approved projects.	None
Public Works & Transportation	Community Transit Grant Program	Funding to meet the transportation and mobility needs of seniors and people with disabilities.	Depends on project type
Public Works & Transportation	Municipal Small Bridge Program	Funding for small bridge replacement, preservation, and rehab projects.	Bridges with spans between 10 ft and 20 ft

Category	Agency/Grant	Description	Limitations & Stipulations
Transportation	Transportation Alternatives (TA)	Funding for smaller-scale transportation projects such as pedestrian and bicycle facilities, recreational trails, safe routes to school projects, community improvements such as historic preservation and vegetation management, and environmental mitigation related to stormwater and habitat connectivity.	None

†
NESEC – Northeast States Emergency Consortium, Inc. is a 501(c)(3), not-for-profit natural disaster, multi-hazard mitigation and emergency management organization located in Wakefield, Massachusetts. Please, contact NESEC for more information.

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

Appendix B – Documentation of the Planning Process

Committee and Public Meeting Agendas, Meeting Minutes and Records of Attendance

Chesterfield Emergency Planning Committee

Meeting Notice

The Chesterfield Emergency Planning Committee will meet:

Date: Thursday, April 27, 2023
Time: 6:00 pm
Location: Davenport Town Offices Meeting Room
422 Main Road
Chesterfield, MA

Agenda

1. Begin updating Chesterfield's *Natural Hazards Mitigation Plan*. Mimi Kaplan of the Pioneer Valley Planning Commission has been hired to lead the project. Representatives from the Planning board, Conservation Commission, Council on Aging, Wild & Scenic Westfield River, MVP Committee, and the Building Inspector have been invited to participate in the planning process.
2. Update Committee on the chesterfield CEMP Plan.
3. Other business not reasonably foreseen

For further information contact: Larry Holmberg, Chair, at 413-296-4247

Chesterfield Emergency Planning Committee

Minutes of the April 27, 2023 Meeting

Present: Larry Holmberg, EMD; Fred Drake, Planning Board; David Hewes, Fire Dept; Trish Colson-Montgomery, Select Board; John Follet, Conservation Commission; Mike Malouin, Police Dept; Joe Gazillo, MVP Committee; John Chandler, Board of Health; Mimi Kaplan, PVPC

Called to order at 18:05 hours

1. Hazard Mitigation Plan Update

This is the kickoff meeting for the update of the Hazard Mitigation Plan, last reviewed in 2016 and will take several meetings. Mimi Kaplan of the Pioneer Valley Planning Commission (PVPC) was introduced as the consultant for this work. PVPC has been retained by the Town to assist the Committee. This work is being paid for by a grant which requires a 5% match that will come from volunteer and staff time. This will require Committee members to keep track of their time spent.

Mimi Kaplan provided an overview of the Hazard Mitigation Plan review process.

Joe Gazillo observed that there were similarities between the FEMA Hazard Mitigation Grant process and the Municipal Vulnerability Project Grant process, both of which includes a Benefit-Cost Analysis (BCA) component. In order to qualify for a Hazard Mitigation grant, the town must show that it is a repetitive historical problem. Onetime events in general don't qualify. The town must also show through historical data the continuing costs to repair the problem. The BCA is a quantitative matrix where for any given problem the town must show that the benefits outweigh the costs.

Section 3 of the current plan, *Hazard Identification & Risk Assessment*, was reviewed. Several revisions were suggested based on the experiences over the last seven years. John Follet opined these assessments were done on a subjective basis rather than using a quantitative approach.

Section 4 of the current plan, *Critical Facilities*, was reviewed. Several revisions were made due to facilities being built or no longer in existence or change in ownership.

The next Committee meeting will be on May 31, 2023 at 18:00 hours and most likely at the Community Center.

The first public information session will be June 14, 2023 at 18:30 hours, location to be determined.

Chesterfield Emergency Planning Committee

Meeting Notice

The Chesterfield Emergency Planning Committee will meet:

Date: Wednesday, May 31, 2023
Time: 6:00 pm
Location: **Chesterfield Community Center**
400 Main Road
Chesterfield, MA

Agenda

1. Approve minutes of the April 27, 2023
2. Continue updating Chesterfield's *Natural Hazards Mitigation Plan*.
 - a. Review/update locations and previous occurrences for flooding, snowstorms/ice storms, severe thunderstorms/wind/tornadoes, wildfire/brushfire, dam failure, drought, extreme temperatures
 - b. Update recent and potential development, and development in hazard-prone areas
 - c. Complete mitigation capabilities assessment
 - d. Review the critical facilities map
 - e. Public Informational session
3. Final review and approval of the Chesterfield CEMP Plan.
4. Other business not reasonably foreseen
5. Schedule next meeting.

For further information contact: Larry Holmberg, Chair, at 413-296-4247

Chesterfield Emergency Planning Committee

Minutes of the May 31, 2023 Meeting

Present: Larry Holmberg, EMD; Fred Drake, Planning Board; Trish Colson-Montgomery, Select Board; Mike Malouin, Police Dept; Joe Gazillo, MVP Committee; John Chandler, Board of Health; Jan Gibeau, COA; Matt Smith, Highway Dept.; Mimi Kaplan, PVPC

Called to order at 18:02 hours

1. Minutes of the April 27, 2023 meeting were approved.
2. Hazard Mitigation Plan Update
 - a) Reviewed and updated locations and previous occurrences of
 - Flooding: mainly caused by beavers; add the area on Cummington Rd near the intersection with Main Rd as area susceptible to flooding.
 - Major Snowstorms: December 2022 and March 2023; nothing remarkable recalled from 2016 to 2021.
 - Tornado: Noted the February 2017 which did some damage in Chesterfield but mainly impacted Goshen and Conway.
 - Dams: no failures, Kaplan will update the hazard ranking from DCR. Add Hammond Pond dam as an area of concern for Chesterfield.
 - Drought: over the last 10 years, 25± shallow wells have been affected by drought.
 - b) Reviewed capability assessment worksheet
 - c) Reviewed the critical facilities map. Some minor changes were suggested
 - d) Reviewed logistics for informational meeting to be held on June 14. Ms. Kaplan will create flyer that will distributed; she will send to the Town Administrator. She will also ask the Administrator to put out robo calls prior to the meeting date.
 - e) The next Committee meeting will be on June 29, 2023 at 18:00 hours at the Community Center.
3. CEMP Plan update

The final version of the plan was reviewed by individual members of the Committee prior to the meeting. A motion was made and seconded to approve the Plan as presented; approval was unanimous. Mr. Holmberg will take the plan to the Select Board for their endorsement.

Meeting adjourned at 19:45 hours

Respectfully Submitted,

Larry Holmberg

Chesterfield Emergency Planning Committee

Meeting Notice

The Chesterfield Emergency Planning Committee will meet:

Date: Thursday, June 29, 2023
Time: 6:00 pm
Location: **Chesterfield Community Center**
400 Main Road
Chesterfield, MA

Agenda

1. Approve minutes of the May 31, 2023 meeting.
2. Continue updating Chesterfield's *Natural Hazards Mitigation Plan*.
 - a. Review and update Existing Mitigation Capabilities Table (p. 77 in 2016 plan)
 - b. Review Status of Previous Mitigation Strategies (p. 86 in 2016 plan)
 - c. Re-prioritize/update previous mitigation strategies to be carried over to new plan
 - d. Develop new mitigation strategies to be implemented
3. Other business not reasonably foreseen
4. Schedule next meeting.

For further information contact: Larry Holmberg, Chair, at 413-296-4247

Chesterfield Emergency Planning Committee

Minutes of the June 29, 2023 Meeting

Present: Larry Holmberg, EMD; Fred Drake, Planning Board; Trish Colson-Montgomery, Select Board; Joe Gazillo, MVP Committee; John Chandler, Board of Health; Jan Gibeau, COA; Matt Smith, Highway Dept.; John Follet, Conservation Commission; Mimi Kaplan, PVPC

Called to order at 18:07 hours

- 1) Minutes of the May 31, 2023 meeting were approved.
- 2) Reviewed the results of the public information session held June 14, 2023. See attached notes. Main concerns and points were:
 - a) Water – drought and power failure, how do residents get and maintain the minimum amount of daily water/person needed.
 - b) Education and communication are vitally important and are related issues
 - i) MVP is having an event in the fall to educate the residents and garner a consensus on several issues including 6 North Rd.
 - ii) Develop a flyer on emergency preparedness – what's commercially available
- 3) Hazard Mitigation Plan Update
 - a) Mitigation Strategies – reviewed and updated the items from the 2016 Plan. Several items were removed. An enhanced education capability was strongly desired.
 - b) Ms. Kaplan will review the capability chart and takeout redundant items
- 4) The next Committee meeting will be on July 27, 2023 at 18:00 hours at the Community Center.

Meeting adjourned at 19:45 hours

Respectfully Submitted,

Larry Holmberg

Chesterfield Emergency Planning Committee

Meeting Notice

The Chesterfield Emergency Planning Committee will meet:

Date: Thursday, July 27, 2023
Time: 6:00 pm
Location: **Chesterfield Community Center**
400 Main Road
Chesterfield, MA

Agenda

1. Approve minutes of the June 29, 2023 meeting.
2. Continue updating Chesterfield's *Natural Hazards Mitigation Plan*.
 - a. Review Status of Previous Mitigation Strategies (p. 86 in 2016 plan) and determine which to delete and which to carry over to new plan
 - b. Update/revise previous mitigation strategies to be carried over to new plan
 - c. Develop new mitigation strategies to be implemented, and determine cost, priority level, responsible parties and timeline.
 - d. Discuss next steps and timeline for completion of HMP
3. Chesterfield CEM Plan – next phase
4. Other business not reasonably foreseen
5. Schedule next meeting.

For further information contact: Larry Holmberg, Chair, at 413-296-4247

Chesterfield Emergency Planning Committee

Minutes of the July 27, 2023 Meeting

Present: Larry Holmberg, EMD; Trish Colson-Montgomery, Select Board; Joe Gazillo, MVP Committee; John Chandler, Board of Health; Matt Smith, Highway Dept.; John Follet, Conservation Commission; Mike Malouin, Police Dept.; Mimi Kaplan, PVPC

Called to order at 18:15 hours

- 1) Minutes of the June 29, 2023 meeting were approved.
- 2) Continue Update Hazard Mitigation Plan
 - a) Reviewed and updated existing hazard mitigation capabilities.
 - b) Reviewed and updated mitigation strategies. Several new items were added based upon comments received during the public information session.
 - c) PVPC will now compile the plan and submit to the Committee for review prior to scheduling the second public information session, which will be held at the Community Center.
- 3) Discussion on the next phase of the Chesterfield Comprehensive Emergency Management Plan (CEMP) development.

EMD Holmberg expressed the desire to add functional annexes to the CEMP such as sheltering, point of distribution, debris management, transportation, evacuation, etc. He opined that that moving to Phase 2 required that the Committee support for the project since everybody would have to be involved. All departments attending this meeting were asked to state their support of the project.

EMD, yes
Conservation
Commission, yes

Board of Health, yes
Highway, yes
MVP, yes

Police, yes

EMD Holmberg expressed his thanks to the group.

- 4) No Committee meeting has been scheduled as we are waiting for the compiled plan.

Meeting adjourned at 19:35 hours

Respectfully Submitted,

Larry Holmberg

Public Meeting Publicity and Outreach

MEDIA RELEASE

CONTACT: Mimi Kaplan, PVPC Senior Planner, (413) 285-1188 or mkaplan@pvpc.org

FOR IMMEDIATE RELEASE

June 5, 2023

Town of Chesterfield to hold Public Engagement Event for Hazard Mitigation Plan Update

Chesterfield residents, businesses, and surrounding community residents and representatives are invited to learn about and provide input on the Town of Chesterfield Hazard Mitigation Plan, on Wednesday, June 14, 2023 at 6:30 pm at the Chesterfield Community Center (also the Council on Aging), 400 Main Road, Chesterfield.

The purpose of the Hazard Mitigation Plan is to identify and assess the risk to Chesterfield from natural hazards and climate change impacts, and to determine how to best mitigate these. A mitigation action is any action taken to reduce or eliminate the long-term risk to human life and property from hazards.

The meeting will include an overview of the hazard mitigation planning process, a discussion of natural hazards and climate change impacts in Chesterfield, and the mitigation strategies currently in place. Municipal officials and PVPC staff will be available to answer questions and respond to comments about the project. The meeting provides an opportunity for you to share your opinions and participate in the mitigation planning process. All members of the public, representatives from surrounding communities and other interested parties are welcome to attend the event. Public participation and input are essential!

The plan is being updated by the Town with assistance from the Pioneer Valley Planning Commission and is funded by the Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA).

Upon completion, the plan will be submitted to MEMA and FEMA for review and approval. A FEMA approved plan makes the community eligible for federal and state mitigation grant funding.

For more information, please contact PVPC's Mimi Kaplan at mkaplan@pvpc.org or (413) 285-1188.

Town of Chesterfield
Hazard Mitigation Plan
Public Meeting –
Wednesday, June 14
at 6:30 pm

Chesterfield Community
Center, 400 Main Road

Learn about Natural Hazards
and Climate Change Impacts
affecting Chesterfield, Hazard
Mitigation Plans and the
Planning Process, and ask
questions and/or provide
comments.

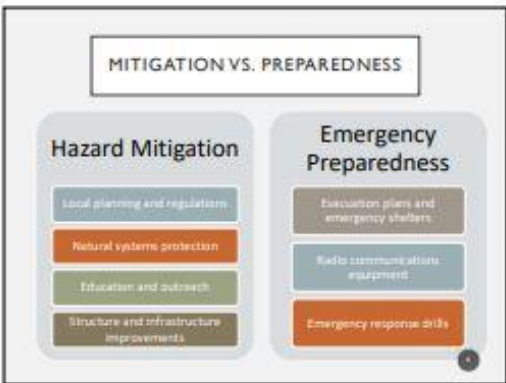


Photo credit: [Kam Osborne](#)

Public Meeting Presentation - June 14, 2023



1



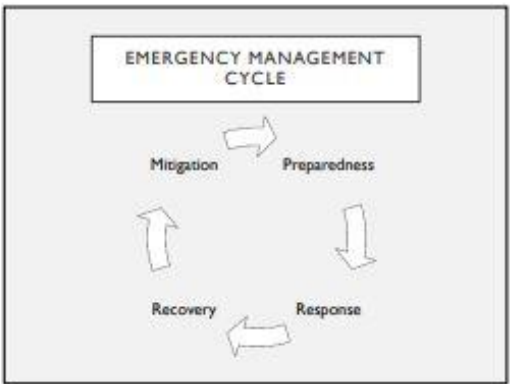
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EXISTING MITIGATION STRATEGIES									
Mitigation Capabilities and Strategies to be Implemented by Chesterfield									
Type	Description	Status	Hazard Mitigated	Responsible Agency	Priority	Cost	Funding Source	Timeline	
Feasibility	Local Emergency Management Program (LEMP) Review: replacement of outdated strategy.	On order to date.	Threatening	Local Emergency	High	High	Local Funding, State Grants	1 month to completion	
Warning	Complete fire safety, providing fire extinguishers, detectors, smoke and carbon monoxide detectors in public buildings, based on the most appropriate codes (NFPA).	Procedures adopted through signage and signage replacement must be adopted.	Active	Fire Department	Low	Low	Local Funding	1 year to complete	
Warning	Develop a plan for evacuation procedures from public buildings and enforce a mandatory evacuation plan for all personnel in public buildings in order to ensure safety during an emergency (NFPA).	The plan has been adopted with NFPA's guidance, but the plan is not yet adopted.	Active	Fire Department	Medium	Low	Local Funding	12 months to complete	
Warning	Establish a plan for evacuation procedures from public buildings and enforce a mandatory evacuation plan for all personnel in public buildings in order to ensure safety during an emergency (NFPA).	The plan has been adopted with NFPA's guidance, but the plan is not yet adopted.	Active	Fire Department	Medium	Low	Local Funding	12 months to complete	
Warning	Establish a plan for evacuation procedures from public buildings and enforce a mandatory evacuation plan for all personnel in public buildings in order to ensure safety during an emergency (NFPA).	The plan has been adopted with NFPA's guidance, but the plan is not yet adopted.	Active	Fire Department	Medium	Low	Local Funding	12 months to complete	

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PUBLIC COMMENT PERIOD

Please ask any questions or provide comments about the Hazard Mitigation Plan or planning process at this point.

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THANK YOU!

FEEL FREE TO CONTACT ME AT THE EMAIL OR PHONE NUMBER BELOW WITH ANY ADDITIONAL COMMENTS OR QUESTIONS

Mimi Kaplan
Pioneer Valley Planning Commission
mkaplan@pvp.org
413-285-1188

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Second Public Meeting Publicity and Outreach

Appendix C: List of Acronyms

FEMA	Federal Emergency Management Agency
MEMA	Massachusetts Emergency Management Agency
PVPC	Pioneer Valley Planning Commission
EPA	Environmental Protection Agency
DEP	Massachusetts' Department of Environmental Protection
NWS	National Weather Service
HMGP	Hazard Mitigation Grant Program
FMA	Flood Mitigation Assistance Program
SFHA	Special Flood Hazard Area
CIS	Community Information System
DCR	Massachusetts Department of Conservation and Recreation
FERC	Federal Energy Regulatory Commission
TRI	Toxics Release Inventory
FIRM	Flood Insurance Rate Map
NFIP	National Flood Insurance Program
CRS	Community Rating System
BOS	Board of Selectmen
DPW	Department of Public Works
LEPC	Local Emergency Planning Committee
EMD	Emergency Management Director
Con Com	Conservation Commission
Ag Com	Agricultural Commission
EOC	Emergency Operations Center
CEM Plan	Comprehensive Emergency Management Plan
EMA	Emergency Management Agency
RACES	Radio Amateur Civil Emergency Service
WMECO	Western Massachusetts Electric Company
HAZMAT	Hazardous Materials

Appendix D: Critical Facilities Map

