Richmond, RI

Hazard Mitigation Plan

2022 Update

AUGUST 2022

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Hazard Mitigation Plan

Richmond, RI

2022 Update

FINAL

Prepared by: BETA GROUP, INC.
Prepared for: Town of Richmond, RI

August 2022

Acknowledgements

The Town of Richmond commends the efforts of its Hazard Mitigation Committee in completing this important plan. The effort is sure to result in the protection of life and property and special thanks are extended to Committee members:

Joseph Arsenault, Resident, former Richmond Emergency Management Agency
Scott Barber, Public Works Director, Richmond-Carolina Fire Chief
Randall Gemme, Emergency Management Director
Elwood Johnson, Police Chief
Shaun Lacey, Town Planner
Karen Pinch, Town Administrator

Town Administrator

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RESOLUTIONS
Instr: 2022-12

06/29/2022
1 Pages

TOWN OF RICHMOND, RHODE ISLAND
TOWN COUNCIL RESOLUTION # 2022-13
ADOPTING THE RICHMOND, RHODE ISLAND
HAZARD MITIGATION PLAN - 2022 UPDATE

WHEREAS, the TOWN OF RICHMOND recognizes the threat that natural hazards pose to people and property within THE TOWN OF RICHMOND; and

WHEREAS the TOWN OF RICHMOND has prepared a multi-hazard mitigation plan, hereby known as RICHMOND, RI HAZARD MITIGATION PLAN 2022 UPDATE in accordance with federal laws, including the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended; the National Flood Insurance Act of 1968, as amended; and the National Dam Safety Program Act, as amended; and

WHEREAS the RICHMOND, RI HAZARD MITIGATION PLAN 2022 UPDATE identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the TOWN OF RICHMOND from the impacts of future hazards and disasters: and

WHEREAS adoption by the RICHMOND TOWN COUNCIL demonstrates its commitment to hazard mitigation and achieving the goals outlined in the RICHMOND, RI HAZARD MITIGATION PLAN 2022 UPDATE.

NOW THEREFORE, BE IT RESOLVED BY THE TOWN OF RICHMOND, RHODE ISLAND, THAT: In accordance with Article 3, Section 4 of the Home Rule Charter, the RICHMOND TOWN COUNCIL adopts the RICHMOND, RI HAZARD MITIGATION PLAN 2022 UPDATE. While content related to THE TOWN OF RICHMOND may require revisions to meet the plan approval requirements, changes occurring after adoption will not require RICHMOND TOWN COUNCIL to re-adopt any further iterations of the plan. Subsequent plan updates following the approval period for this plan will require separate adoption resolutions.

GIVEN UNDER THE SEAL OF THE TOWN COUNCIL OF THE TOWN OF RICHMOND ADOPTED THIS 21ST DAY OF JUNE, 2022.

ATTEST: E F Liese
Erin F. Liese, CMC
Town Clerk

TOWN COUNCIL RICHMOND RHODE ISLAND

Nell Carpenter
Council President

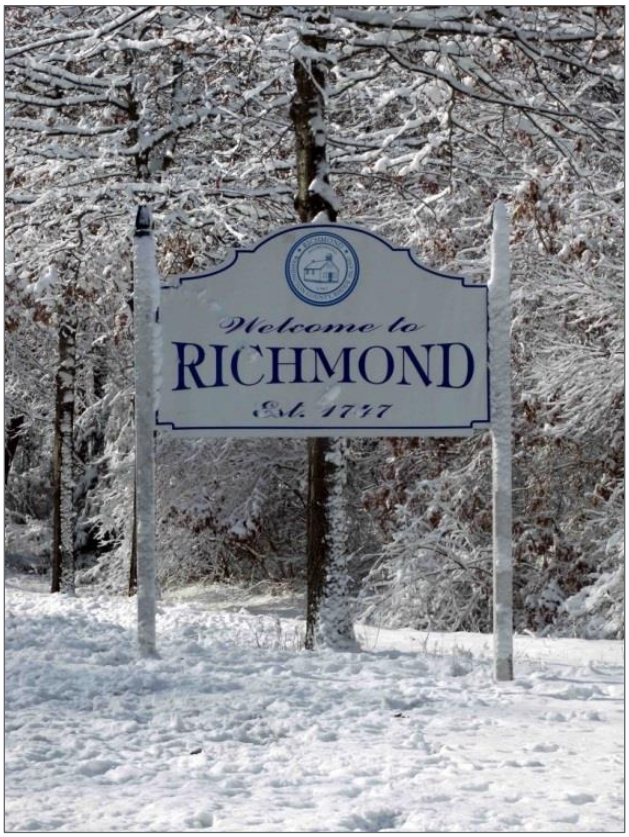
EXECUTIVE SUMMARY

This Hazard Mitigation Plan (HMP) is a product of the Richmond Hazard Mitigation Committee (RHMC). It has been approved by the Richmond Town Council, the Rhode Island Emergency Management Agency, and the Federal Emergency Management Agency in accordance with the Disaster Mitigation Act of 2000.

The RHMC's overview of past natural hazard occurrences verifies that the Town is vulnerable to diverse events including blizzards, floods and hurricanes. The discussion puts the likelihood of these events into historical perspective and recognizes that although the probability of thunderstorm, high wind and lightning events may be higher, the intensity and potential impacts from less likely events such as hurricanes and earthquakes can be far greater.

The risk assessment portion of the plan confirms that the Town has much to lose from these events. The four highest ranking hazards identified include riverine and stormwater flooding, extreme storm events like hurricane, nor'easter, and winter storm, potential dam failures, and drought.

To address these risks the 2022 HMP update put forth a clear mission, a distinct set of goals and 22 specific mitigation actions. Each of the subsequent mitigation actions for achieving these goals summarizes specific problems and possible solutions, details the primary tasks to be undertaken, identifies an appropriate lead and anticipated funding sources.



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CHAPTER 1: INTRODUCTION

1.1 PLAN PURPOSE

The purpose of the Richmond Hazard Mitigation Plan (HMP) is to set forth guidelines of short-term and long-term actions, which will reduce the actual or potential loss of life or property from a hazardous event such as flooding, severe winter storms and extreme cold, lightning, hurricanes and Nor'easters, drought and extreme heat, dam failure, brushfires, tornadoes, earthquakes, and solar flares. This plan was constructed using input from a variety of municipal and private stakeholders and the general public involved in the planning process. This plan serves as a guide to help the Town reduce their losses and vulnerabilities relating to natural hazards.

1.2 HAZARD MITIGATION AND ITS BENEFITS

Hazard mitigation planning is advance action taken to identify specific areas that are vulnerable to natural hazards within a town and seeks to permanently reduce or eliminate the long-term risk to human life and property. It coordinates available resources and identifies community policies, actions, and tools for implementation that will reduce risk and the potential for future losses town wide. The process of natural hazard mitigation planning sets clear goals, identifies appropriate actions, and produces an effective mitigation strategy that can be updated and revised to keep the plan current.

The Town of Richmond recognizes the importance to be proactive and plan for natural hazards and impacts of climate change, rather than simply responding to these events without addressing ways to minimize their potential effect. Striving to prevent unnecessary damage from natural disasters through proactive planning that characterizes the hazard, assesses the community's vulnerability, and designs appropriate land-use policies and building code requirements is a more effective and fiscally sound approach to achieving public safety goals related to natural hazards. [1]

In the past, federal legislation has provided funding for disaster relief, recovery, and some hazard mitigation planning. The Disaster Mitigation Act of 2000 (DMA 2000) is the latest federal legislation to improve this planning process. It reinforces the importance of natural hazard mitigation planning and establishes a pre-disaster hazard mitigation program and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP) or other annual Federal Emergency Management Agency (FEMA) mitigation funding opportunities. Section 322 of the Act specifically addresses mitigation planning at the state and municipal levels of government. It identifies new requirements that allow HMGP funds to be used for planning activities. As a result of this Act, states and communities must have an approved natural hazard mitigation plan in place prior to receiving post-disaster HMGP funds. In the event of a natural disaster, municipalities that do not have an approved natural hazard mitigation plan will not be eligible to receive post-disaster HMGP funding.

The Town of Richmond recognizes the important benefits associated with hazard mitigation, its interaction with municipal land use and infrastructure planning, and the need for a comprehensive planning approach to accommodate these interdependencies. The Town's state-approved CCP (2021) addresses open space and recreation, natural and cultural resources, economic development, circulation, public services and facilities, housing, and land use.[1] While the entire hazard mitigation plan will not be formally incorporated into the CCP, certain, applicable mitigation actions will be incorporated. The Town recognizes coordination between the HMP and the CCP to be of benefit because it will ensure a unified

[1] Town of Richmond, RI, Comprehensive Community Plan, 2021.

planning approach into the future and ensure that risk reduction remains a critical element of municipal planning. This is also in alignment with current goals of Rhode Island Statewide Planning.

A second benefit of hazard mitigation allows for a careful selection of risk reduction actions through an enhanced collaborative network of stakeholders whose interests might be affected by hazard losses. Working side by side with this broad range of stakeholders can forge partnerships that pool skills, expertise, and experience to achieve a common goal. Proceeding in this manner will help the Town ensure that the most appropriate and equitable mitigation projects are undertaken.

A third benefit of hazard mitigation is the endorsement of a proactive planning approach focused on sustainability, whereby the Town of Richmond could minimize the social and economic hardships that have resulted from the occurrence of previous natural disasters and prevent future hardships that may develop as a result of climate change. These social and economic hardships include: the loss of life, destruction of property, interruption of jobs, damage to businesses, and the loss of historically significant structures and facilities. This proactive planning approach would look for ways to combine policies, programs, and design solutions to bring about multiple objectives and seek to address and integrate social and environmental concerns. Linking sustainability and loss reduction to other goals can provide a framework within the state and local governments that will bring the planning process full circle.

Lastly, the participation in a hazard mitigation planning process will establish funding priorities. The formal adoption and implementation of this plan will allow the Town of Richmond and its residents to become more involved in several programs offered by the Federal Emergency Management Agency (FEMA) including: the Community Rating System Program (CRS); the Building Resilient Infrastructure and Communities (BRIC) program, Flood Mitigation Assistance Program (FMA); and the Hazard Mitigation Grant Program (HMGP). It will also help to define and advance the Town's climate adaptation priorities. Climate adaptation planning recognizes that climate change will exacerbate the vulnerabilities and risks associated with natural hazards and is a natural partner of hazard mitigation planning. Money spent today on natural hazard mitigation and climate adaptation measures can significantly reduce the cost of post-disaster recovery tomorrow.

1.3 BACKGROUND

The Town of Richmond was incorporated on August 18, 1747 and named in honor of Edward Richmond, Attorney General of the Colony of Rhode Island from 1671 to 1680. Situated in the heart of Washington County and encompassing an area of 40.7 square miles, the rural town it is bordered northerly and northeasterly by the Town of Exeter, southeasterly by the Town of South Kingstown, southerly by the Town of Charlestown and to the west by the Town of Hopkinton. Three rivers also bound the Town; to the east is Queens River, to the west is Wood River, to the south is Pawcatuck River and the Beaver River horizontally transverse the mid-section of town north to south. In total, 123 miles of rivers and streams run through the Town.

According to the 2020 U.S. Census, the Town of Richmond has a population of roughly 8,020 residents with a 48/52 proportion of male to female. Approximately 15% of the population is over 65. School-aged residents (between 5 and 18 years of age) make up roughly 15% of our residents. According to the 2019 American Community Survey data from the US Census Bureau the town is predominantly white 95.9%, and Black or African Americans make up 1.4% of the population. Just over 3% of the population over 5 years old speaks a language other than English in the home. In 2019, 2.4% of Richmond's population was living in poverty according to the Census Bureau, and the median income for a family household (in 2019 dollars) was $95,391. According to the Town's 2018 Build-out Analysis, Richmond has approximately 3,090

housing units with an occupancy rate of 95%. 11% of the homes were built before 1940. A majority of homes are occupied by residents ages 45-64.

Private wells are the principal source of household water with approximately 10% of the households in town on the municipal water supply. Richmond has no public wastewater collection or disposal system; therefore, all residences in Richmond are served by Onsite Wastewater Treatment Systems (OWTS) or older septic systems. Disposal of wastewater through inadequately maintained or failing on-site disposal systems can adversely affect the Town's drinking water supply.

In general, the majority of an evacuated population (87%) do not use public shelters.[2] Evacuees will likely seek shelter by making other arrangements such as staying with family or friends, particularly if the event is forecasted or predicted to occur. The same trend is anticipated in Richmond. The Chariho Middle School is designated as the American Red Cross shelter in Richmond. The Chariho School District has taken a pro-active approach in hazard mitigation. The District has employed and will continue to implement wind-resistant construction methods for its facilities by installing hurricane screws for its roofing sheathing and wind resistant panels for windows. They have also installed generators at the high school and middle school.

The Town of Richmond is a blended community with agricultural, rural, commercial and industrial areas. Natural disasters could have a devastating effect on the whole community or one particular neighborhood. Homes are nestled among forests, along rivers, next to businesses. As of December 31, 2020, the total gross assessed property value in the Town of Richmond was $1,087,606,811[3].

There are more than 8,280 acres of protected lands in Richmond (32% of Richmond's total land mass) and an additional 6,835 acres (roughly 22%) in the Farm, Forest and Open Space Program, although these lands are not permanently protected from development. The 2018 estimate of single-family dwelling units on a parcel-by-parcel basis is 3,090 (across all zoning districts). According to the 2018 Build-out Analysis, there is sufficient suitable land inventory to build 5,879 dwelling units (across all zoning districts). At buildout it is projected that Richmond's population could increase by 90%, or 7,447 persons, bringing the total population to 15,697 persons[4].

About 3.6% of homes in the town are mobile or manufactured homes; almost all of them reside in the Hillsdale Park neighborhood located on Gardiner Road. The neighborhood is a 55 and older community. The Town has held meetings to encourage residents to relocate if a disaster is predicted or register with the Rhode Island Department of Health Special Needs Registry and have also considered rehabilitation into low- or moderate-income units, but no further progress has been made to this end.

The Town has several group homes with less than five residents each. Staff live full time in these residences, and they have emergency plans. There are a few daycare centers in town, but they do not have large populations.

1.3.1 Government Structure

A five member Town Council, elected bi-annually, governs the general affairs of the Town. In November of 2008, the Town adopted its first Home Rule Charter, which now makes provisions for a Town Administrator and two-year terms for the Town Council. However, town government continues many

2 Mileti, Dennis S., John H. Sorensen and Paul W. O'Brien. 1992. "Toward an Explanation of Mass Care Shelter Use in Evacuations." International Journal of Mass Emergencies and Disasters 10 (1): 25-42.

3 Assessor's Statement of Assessed Values and Tax Levy, 2021

4 Richmond Comprehensive Community Plan Update, 2021

traditional features under the new Charter, such as appointing its Town Clerk and holding a Financial Town Meeting annually in June to adopt the Town's budget for the fiscal year ensuing on July 1.

1.3.2 Public Safety

The Town is protected by a full-time Police Department. Two volunteer fire districts provide the fire protection: Richmond Carolina Fire Department and Hope Valley Wyoming Fire Department. Hope Valley Ambulance Squad, Inc. provides the emergency medical services for the town. The Richmond Emergency Management Agency and the Richmond Public Works Department round out the public safety team. The Rhode Island State Police also have a barracks located in the town.

1.3.3 Roads and Bridges

The Town has around 90 miles of local roads (excluding State roads) within its borders. Around 95% are paved and 5% are gravel. There are ten bridges and boxed culverts across the rivers throughout Richmond and numerous culverts (24 inches or less).[5] The Rhode Island Department of Transportation owns and maintains a number of state roads that traverse the town, including Routes 112, 138, 91, and 2. Interstate 95 passes through the northwest part of Richmond, as does State Route 3 (Nooseneck Hill Rd.), and the two roadways are thought to contribute significant stormwater runoff to recurrent flooding in the Valley Lodge neighborhood.

1.3.4 Housing and Development

Richmond is made up of approximately 3,090 residential homes. The majority of these properties were built in the last half of century and are almost all wooden construction. Close to 90 percent of the Town is zoned to allow residential uses. According to the 2021 Community Comprehensive Plan (CCP), a sufficient amount of land is available to meet Richmond's near-future development needs for both residential and non-residential structures. Richmond's 20-year buildout scenario projects that an additional 2,150 residential lots could be created, and an additional 2,789 residential units could be built. The R-2 district has the most land suitable for development (6,263 acres) and over 73% of new lots will occur here.

Approximately 140 new residential units have been built since the 2018 Hazard Mitigation Plan, with around 130 more planned residential unit developments in the next few years[6]. According to some residents who participated in the recent Comprehensive Community Plan update process, recent developments in Town have placed increased strain on the roadway network which, in many places, is already in need of repair. Participants identified the Preserve Sporting Club and Residences on SR 138 and the newly constructed Richmond Ridge apartments off of West Shannock Road as examples of recent development that will increase the burden on local infrastructure. A common concern expressed by residents was the potential risk of flooding due to increased impervious surfaces, deforestation and erosion related to larger-scaled developments. Despite these concerns, the Town has not reported any increases in risk to the natural hazards of concern in Richmond because of development in the past five years.

Encouraging in-fill projects such a residential, mixed-use and non-residential development in existing villages such as Wyoming, Shannock, and Kenyon, and ensuring compliance with the latest Rhode Island Stormwater Design and Installation Standards Manual are the Town's best tools to ensure future growth can occur without increasing local risk to natural hazards. While the development that has occurred since

[5] RIDOT 2016

[6] Richmond Comprehensive Community Plan Update, 2021

2018 has not changed the Town's overall risk to the identified natural hazards, future development proposals should be carefully reviewed to ensure the impacts to neighboring properties are mitigated. Furthermore, the Town should assess all critical transportations routes that are required for emergency evacuations, to access critical facilities, or to access vulnerable populations. If future development increases along these routes, additional investment should be made to improve the road conditions to accommodate additional traffic and maintain route operationality during natural disasters.

1.3.5 Utilities

The Town has one public utility. The Richmond water system services over 230 customers including 56 commercial and industrial customers, two schools, and 179 residential customers. The system has two well heads in the aquifer and two storage towers. The storage tower on Old Kenyon Road has a 300,000 gallon capacity, and the one behind Richmond elementary school holds 500,000 gallons. Engineering has been completed on a chlorination system that is scheduled to be installed in 2022. The Richmond Water Department currently maintains a potable water agreement with Town of Westerly Water Division (in place through 2030) to provide emergency water service in case of a failure.

1.3.6 Forest and Open Space

The Town is mostly a rural community. Farmlands and agriculture account for 2,782 acres (11.2%). Several large tracts of forested land are reserved as open space. The Carolina Management Area, parts of the Arcadia Management Area and de Coppet property are controlled by the Rhode Island Department of Environmental Management (DEM). There are many smaller tracts, less than 500 acres each, controlled by the Richmond Land Trust, State of Rhode Island, Nature Conservancy, and private owners.

CHAPTER 2: PLANNING PROCESS

2.1 OVERVIEW

The Town of Richmond initiated a hazard mitigation plan update in 2021 as the previous HMP neared expiration. The Town's previous HMP was prepared from 2015 – 2016 and was adopted in June 2018 after receiving FEMA approval. The Town elected to hire a consultant to support the plan update process, and BETA Group, Inc. was brought on in late 2021 to lead the effort under the guidance of the Richmond Planning Director and Town Administrator. This Hazard Mitigation Plan (HMP) is the result of a dedicated group of individuals working for several months identifying natural hazards and proposing ways to improve Richmond's resiliency.

2.2 RICHMOND HAZARD MITIGATION COMMITTEE

This HMP is a product of the Richmond Hazard Mitigation Planning Committee (RHMC). Committee members include:

Joseph Arsenault*, Resident, former Richmond Emergency Management Agency
Scott Barber*, Public Works Director, Richmond-Carolina Fire Chief
Randall Gemme, Emergency Management Director
Elwood Johnson, Police Chief
Shaun Lacey, Town Planner
Karen Pinch, Town Administrator[7]

2.3 THE PLANNING PROCESS

This 2022 HMP is the result of a seven-step process. The plan was initiated in November 2021 with the establishment of the RHMC by invitation from the Town Administrator. The individuals listed above represent the original list of committee members invited to participate and provide technical expertise throughout the planning process. All members that were asked to participate as subject matter experts on the committee remained active throughout the planning process. Prior to the formation of the RHMC the Town had been engaged in updating the Town's 2021 CCP. Public participation outreach efforts for the CCP began in 2019.

Step Two started the plan development process and included the first meeting of the RHMC on November 15, 2021. The first meeting focused on reviewing the project scope, proposed schedule, and the role of the committee, outlining data collection needs, and updating the hazards of concern. The RHMC met regularly for the following months. The resulting process is summarized below for convenience and detailed procedural methodologies are presented within the HMP's respective chapters.

Step Three of the hazard mitigation planning process began with the RHMC meeting on November 29, 2021. After reviewing the hazards of concerns, the RHMC identified critical infrastructure and community assets within the town. Eight categories of critical infrastructure and community assets were identified: flood prone drainage systems, municipal wells and pumping stations, dams, care facilities, critical municipal hazard response facilities, electrical facilities, recreational facilities, and historic resources. During this time, the Town's consultant reviewed the CCP and other relevant plans and gathered information on current infrastructure projects going on within the Town.

[7] * Denotes Richmond resident

Step Four was the review of mitigation items proposed in the 2018 HMP that would help reduce the risk from natural hazards. Included in this step were proposing new actions, establishing action timelines, costs, and identifying responsible parties.

Step Five entailed the RHMC reviewing and adjusting specific mitigation goals and individual mitigation actions. Follow-up meetings of the RHMC were held to review the drafts and finalize the content of Chapters 5 and 6.

Step Six focused on the prioritization of the mitigation actions and the development of the implementation, evaluation and revision schedule. This prioritization was completed through individual reviews of the draft actions.

Step Seven furthered the public input and review process with the Richmond Planning Board, Town Council, and the general public for review and comment. The plan was posted on the Town's website, Facebook, and made available at Town Hall and Library for municipal officials and the public to access for review. Announcement of the plan update was also emailed to Emergency Management Directors in the neighboring towns of Hopkinton, Charlestown, South Kingstown, and Exeter for their review and comments. No comments were received from the general public or the neighboring communities, however the Town Solicitor recommended a variety of typographical edits and clarification on some aspect of the hazard profiles and Programmatic Capability Assessment. Under the direction of the Town Administrator and Planning Director, the Town's consultant made suggested edits to the HMP and submitted the complete draft to the Rhode Island Emergency Management Agency and FEMA for review. Table 1 below provides a summary of the RHMC meeting dates and the activities that they conducted:

Table 1 Summary of RHMC Activities

Date	Meeting Summary
11/15/21	Kick off meeting. RHMC discussed the plan purpose and hazards of concern
11/29/21	The RHMC reviewed the hazards of concern and listed critical infrastructure and community assets
12/7/21	RHMC posted a Hazard Mitigation Plan Survey to the web, made announcements on the Town website and Facebook page to solicit public participation
12/13/21	The RHMC continued its review and update of critical facilities and began reviewing existing capabilities that help reduce risk from natural hazards and the impacts of climate change.
1/24/22	Continued discussion about existing mitigation capabilities
2/16/22	Virtual public meeting to gather public input about hazards of concern and mitigation opportunities
3/14/22	Finalized mitigation actions, discussed prioritization and current capabilities
4/4/22	Draft of 2022 HMP update posted on Town website for public comment. Announcements on Facebook and the News Flash section of the Town homepage directed people towards the draft plan. The draft was also emailed to town boards and committees, neighboring Emergency Management Directors and other partners for review.
5/4/22	Town's consultant made minor edits to the draft plan in response to public comments.

Date	Meeting Summary
5/5/22	Sent to RIEMA for review.
5/5/22	RIEMA completed a review of the updated HMP and forwarded the plan to FEMA for review.
6/6/22	Comments received from both FEMA. Edits made to draft plan by Town's consultant under the guidance of the Emergency Management Director and Hazard Mitigation Committee
6/10/22	Revised draft plan sent to FEMA for review and Approval Pending Adoption.
6/21/22	2022 HMP Update was presented to Town Council for adoption
7/27/22	FEMA issued Approval Pending Adoption
8/1/22	Final plan with Certificate of Adoption submitted to RIEMA and FEMA for approval
August, 2022	Final approval issued by FEMA

CHAPTER 3: NATURAL HAZARDS

3.1 OVERVIEW

This history of natural hazard events verifies that the Town of Richmond is vulnerable to diverse events including blizzards, floods and strong storms. This discussion puts the likelihood of these events into historical perspective and recognizes that although the probability of brushfires, thunderstorms, high wind and lightning events may be higher; the intensity and potential impacts from less likely events such as hurricanes and earthquakes can be far greater.

The hazards identified by the RHMC are in line with those discussed in the Rhode Island State Hazard Mitigation Plan (SHMP) and are of greatest concern to the Town. The Rhode Island SHMP was reviewed for comparison, but the RHMC chose to exclude the following hazards due to the lack of frequency in which they occur and the minimal probability of their occurrence. Wildfires that burn through thousands of acres of forest are not a concern for the Town. The RHMC chose to discuss the brushfire threat rather than wildfires. Other hazards not addressed in this HMP include avalanche, expansive soils, land subsidence, landslides, sea level rise, storm surge, urban flooding, volcanoes and tsunamis.

The primary sources of data researched to identify occurrences of natural hazard events in Richmond were the Rhode Island State Hazard Mitigation Plan 2018 Update, National Climatic Data Center within the National Oceanic Atmospheric Administration (NCDC-NOAA) (http://www.ncdc.noaa.gov/stormevents/, the United States Geological Survey (USGS) Earthquake Hazards Program (http://neic.usgs.gov.), the 1998 Journal-Bulletin: Rhode Island Almanac, and the Taunton, MA, National Weather Service Forecast Office. The parameters and description of particular events are limited to the availability of information contained in the aforementioned sources.

In 2018 the Governor's office of Rhode Island released the "Resilient Rhody" plan to address climate change, sustainability, and mitigation statewide. The report was officially titled "Resilient Rhody: An Actionable Vision for Addressing the Impacts of Climate Change in Rhode Island"[8] and describes Rhode Island on the forefront of sustainability in the United States. It identifies the in-state tools, resources, organizations, and plans that give Rhode Island an advantage to preparing for climate resilience in a state that is "already experiencing climate change, and the impacts are placing communities, coastlines, forests and aging, vulnerable infrastructure at risk."[9] A state-wide plan addressing climate change is the first step to helping to protect Rhode Island communities like Richmond.

The United Nations describes climate change as long-term shifts in temperatures and weather patterns that though sometimes natural, are enhanced and accelerated by human-made activities like burning fossil fuels and greenhouse gases.[10] Climate change impacts global populations differently, but each year sees more climate refugees, displaced persons and homes, and ruined ecosystems because of the effects of climate change. Rhode Island's coastal nature subjects the state to oceanic changes alongside land and weather-based impacts, and hazard mitigation allows a way for communities to prepare and prevent damage from the impacts of hazards enhanced by climate change.

Climate change impacts and will continue to impact worldwide populations at many different scales, including locally. Resilient Rhody specifically identifies six Rhode Island-based manifestations of climate change: sea level rise, warming air temperatures, warming water temperatures, increased storm

[8] Resilient Rhody: An Actionable Vision for Addressing the Impacts of Climate Change in Rhode Island, 2018.
[9] Resilient Rhody, 6
[10] United Nations Climate Action, https://www.un.org/en/climatechange/what-is-climate-change

frequency and intensity, changing biodiversity, and increased precipitation and inland flooding. This HMP update bases its selection of hazards on the 2018 Rhode Island State Hazard Mitigation Plan, but much of the description below mirrors the manifestations of climate change identified in Resilient Rhody. Each hazard assessment will consider previous occurrences of the hazard along with the possible increases in occurrence and severity based on the impacts of climate change.

3.2 HAZARDS

The Hazard Mitigation Planning Committee recognizes the following hazards as having the most potential to inflict damage to people and or property of the Town of Richmond.

- Flooding (Riverine and Runoff)
- Winter Storms (Including Extreme Cold)
- Thunderstorm / Lightning
- Hurricane / Nor'easter
- Drought (Including Extreme Heat)
- Dam Failure
- Tornado
- Earthquake
- Brushfire
- Geomagnetic Storms (Solar Flares)

At the kick-off meeting on November 15, 2021, the Committee identified the following hazards in Table 2and discussed associated risks. After all hazards were profiled, the Hazard Priority Rank for two hazards of concern, Hurricane/Nor'easter hazard and the Brushfire Hazard, were updated to reflect current and projected future conditions. All other hazard rankings remained the same from the 2018 plan.

Table 2 Hazard Impacts and Risk Assessment

Type	Frequency	Damage Potential	Impacts (Populations, infrastructure, natural environment, economy)	Future Probability	Priority Rank
Flooding (Riverine and Runoff)	High	Medium	Property damage, life safety, road and bridge damage, businesses shut down	Highly Likely	High
Winter Storm (Including Extreme Cold)	High	Medium	Power outages, tree damage, roof collapse, businesses shut down, roads heaving or damage	Highly Likely	Medium
Thunderstorm and Lightning	High	Low	Brush and wildfires, house fires, power loss, propane tank explosion	Likely	Medium
Hurricane and Nor'easter	Medium	High	Power loss, property damage, economic losses, debris	Highly Likely	High
Drought (Including Extreme Heat)	Medium	Medium	Loss of crops, low drinking and fire suppression wells, health and sanitation, low stream flow (affects fish and wildlife populations)	Likely	Medium
Dam Failure	Low	High	Life safety, property damage	Not Very Likely	Medium
Tornado	Low	Medium	Life safety, property damage, power loss, debris	Unlikely	Low
Earthquake	Low	Medium	Life safety, property damage, dam failure, damage to businesses	Unlikely	Low
Brushfire	Low	Medium	Property damage, forest damaged, power lines damaged, life safety	Highly Likely	Medium
Geomagnetic Storms (Solar Flares)	Low	Medium	Disruption of electromagnetic fields, internet connectivity issues, radio transmissions, and wireless communications	Unlikely	Low

Frequency

Low: 1%- 10% probability within 100 years
Medium: 10%-100% probability within 10 years
High: 100% probability within 1 year-5 years

Damage Potential

Low: Some local property damage not town wide, minor injuries or loss of life
Medium: 50 % of property could be damaged and possible injuries or loss of life
High: Major town wide property damage, injuries and loss of life

Priority Rank
Developed by the RHMC to rank the various hazards based on frequency and damage potential.
Low: Not expected to occur with any frequency, damages will be limited.
Medium: Will occur within the next 10 years but the Town has resources to reduce risks.
High: Expected to occur within the next 5 years and is a major concern for the Town.

Future Probability
Developed by the RHMC based on past events and future predictions.
Highly Likely: Will occur every 1-5 years
Likely: Will occur every 5-10 years
Not Very Likely: Will occur every 10-50 years
Unlikely: In intervals greater than 50 years

3.2.1 Flooding (Riverine and Runoff)

Flooding at Tall Timbers Drive

Woodville Road, Richmond

DESCRIPTION

The Rhode Island 2018 Hazard Mitigation Plan Update uses the National Flood Insurance Program's (NFIP) definition of floods to standardize the identification of flooding hazards.

"A flood, which can be slow or fast rising but generally develops over a period of days, is defined by the National Flood Insurance Program (NFIP) as:

- A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from: overflow of inland or tidal waters; unusual and rapid accumulation or runoff of surface waters from any source; or a mudflow; or
- The collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above."[11]

[11] Rhode Island Emergency Management Agency (RIEMA), Rhode Island 2014 Hazard Mitigation Plan Update

For the purpose of this plan, flooding related hazards include riverine flooding and flash floods. Historically, runoff and stream bank overtopping from torrential rainfall is the main cause of flooding in Richmond. Riverine flooding occurs when persistent moderate to heavy rain falls over a period of time causing local rivers and streams to crest their banks and flow into the adjacent floodplain.[12] This overbank flooding is the most common type of flooding that affects Richmond. Severe storms with heavy rain can generate flash floods which strike and end quickly. Flooding due to runoff occurs when water runs over the land's surface impervious surfaces (paved areas, building subdivisions, and highways). Two major environmental modifications are primarily responsible for drastically altering the rain fall-runoff relationship.

1. Making the land surface impervious by covering it with pavement and construction work.
2. Installing storm sewer systems that collect urban runoff rapidly discharging large volumes of water into stream networks and/or freshwater wetland system

In the state of Rhode Island, "Intense rainfall events have increased 71% since 1958."[13] With increased risk of more severe storms and heavier rainfall as a result of climate change, Richmond has a higher chance of experiencing flooding related hazards. Using historic flood data and understanding the context and impact of these flooding related hazards will aide in the mitigation of future damages.

LOCATION

Richmond is surrounded and divided by rivers and streams. The Town has approximately 3,000 acres of flood hazard areas representing 11% of total acres town-wide. Floodplains in Richmond are designated as either A or AE zones which means these areas are susceptible to inundation during the one percent annual chance event also known as the base flood. "The A Zone is that portion of the Special Flood Hazard Area (SFHA) that is not subject to high velocity wave action during the base flood. The source of flooding in an A Zone can be a stream or river that overflows its banks; a lake; or coastal storm surge accompanied by wave heights and wave run-up depths less than 3 feet."[14] The AE zones are high-risk flood hazard areas depicted on the Federal Emergency Management Agency's Flood Insurance Rate Map (FIRM) using specific elevation data displayed as the Base Flood Elevation (BFE). FEMA flood zones in Richmond are displayed on the FEMA Flood Zone Map in Appendix A: Maps. For the purposes of this plan, the impact area of potential damage for the flood hazard is considered to be all areas within the FEMA Special Flood Hazard Area, plus other locations of known flooding.

HISTORY

Historically, in Richmond, torrential rainfall, thunderstorms, and snowmelt are the causal events that result in street, basement, and stream flooding. The table below summarizes recent flooding events in Washington County. The most reliable flood data is tracked by NOAA by county. Due to the small geographic size of municipalities in Rhode Island, it is likely that flooding will impact more than one community during an event.

[12] Federal Emergency Management Agency (FEMA), NFIP Floodplain Management Requirements, FEMA 480. February 2005.
[13] Resilient Rhody: An Actionable Vision for Addressing the Impacts of Climate Change in Rhode Island, 2018.
[14] "CRS Credit for Coastal A Zone Regulations." http://training.fema.gov/EMIWeb/CRS/

Table 3 Recent Flood Events[15]

Date	Type	Damage (Washington County-Wide)	Comments
3/12/2010	Flood	$350,000 est.	3-6 inches of rain caused rivers to rise above flood stage. Beaver River Schoolhouse Road in Richmond was closed after a culvert under the road was washed away, making the road impassable.
3/30/2010	Flood	$24,760,000 est.	5-10 inches of rain fell across Washington County and Southern New England, resulting in rivers overtopping their banks causing widespread flooding.[16]
3/30/2014	Flood	$5,000 est.	4-5 inches of rain across portions of Washington County (highest recorded discharge since the 2010 flooding incidents).[17]
7/22/2019	Flood	-	Typical summer weather prevailed with just some widely scattered showers and thunderstorms, a few of which produced locally heavy rain.
8/17/2019	Flood	-	Typical summer weather prevailed on August 17th with just some widely scattered showers and thunderstorms, a few of which produced locally heavy rain.
8/22/2021	Tropical Storm	$1,000,000 est.	Tropical Storm Henri brought strong winds and flooding to Washington County and around southern New England.

As illustrated above, significant flood events have occurred in Richmond with great regularity, and the frequency will only increase with the impacts of climate change. The frequency of this hazard is estimated to be **High** - 100% probability within 1 year-5 years.

[15] NOAA http://www.ncdc.noaa.gov/stormevents
[16] USGS Peak Streamflow for Pawcatuck River ay Wood River Junction https://nwis.waterdata.usgs.gov/nwis/peak?site_no=01117430&agency_cd=USGS&format=html
[17] Providence Journal, 2014. https://www.providencejournal.com/story/news/crime/2014/04/01/20140331-soggy-rhode-island-dodges-major-flooding-ece/35219094007/.

EXTENT

The extent of a flooding event is a direct result of the extent of the causing event. The most severe flood of record in Richmond occurred in the spring of 2010. The total precipitation was 10 inches, and Richmond experienced flood depths up to six feet.[18] Severe riverine flooding cut off road access in multiple locations across town, isolating homes and community assets. The floods of 2010 particularly affected homes that were located close to the rivers and streams that meander through the town.

Beaver River Schoolhouse Road (2010 Floods)

Since the 2010 floods several other weather systems have brought flood hazards that impacted Richmond and the state, though none as severely. In March into April 2014 Richmond experienced nearly 4 feet of flooding due to heavy rain recorded on local gages.[19] Additionally, local flooding and drainage issues off K.G. Ranch Road in the Valley Lodge neighborhood have been consistent with heavy rains for the past several years. Stormwater flows off of nearby RI DEM-owned land (Arcadia Management Area) and DOT-owned or managed roadways Route 3 and Interstate 95) often resulting in impassable roads and flooded homes. The Town is currently pursuing funding to address this issue for local residents, and though some progress has been made on the 2018 Richmond Hazard Mitigation Plan mitigation actions proposed for this area, more work needs to be done to secure the area from flood risks as flooding events continue.

Access to the Wood River Drive pump station is routinely inhibited by flooding along the roadway that accesses the facility. Previous efforts to elevate the access road have provided some benefit, continued flooding in this location is considered an inevitability. Since the pump station itself does not flood, the Town is willing to accept the risk associated with the limited access.

Based on past damage records and projections for increased intensity of future precipitation events which could lead to even higher riverine flows, the damage potential for the flood hazard is **Medium** - 50 % of property (in the area of impact) could be damaged and possible injuries or loss of life.

In an effort to prevent future losses or repetitive losses this HMP will identify projects to reduce losses from flooding in Chapter 5.

3.2.1.1 Probability of Future Occurrence

Based on the frequency of past flood events, and the projections for increased frequency and intensity of precipitation events in the coming years due to climate change, the probability of future occurrence of the flood hazard is **Highly Likely** - will occur every 1-5 years.

3.2.2 WINTER STORM (INCLUDING EXTREME COLD)

DESCRIPTION

The majority of Rhode Island lies outside the heavy snow and ice regions of the northeast. Due to its maritime climate, Rhode Island generally experiences cooler summers and warmer winters than inland

[18] USGS Historical Observations for Pawcatuck River at Kenyon, RI. Gage, 2010.
[19] Ibid. 2014

areas. However, snow and ice do occur and can cause extensive damage. The two (2) major threats from these hazards are loss of power due to ice on electrical lines and snow loading on rooftops.

For the purpose of this plan, winter storms include heavy amounts of snow, ice, and extreme cold. All of which may occur independently or at the same time. Winter storms vary in size and strength and can be accompanied by strong winds that create blizzard conditions and dangerous wind chill. There are three categories of winter storms that impact Rhode Island:

Snowstorm of 2013 (Blizzard Nemo)

1. A blizzard is the most dangerous of the winter storms. It consists of low temperatures, heavy snowfall, and winds of at least 35 miles per hour.
2. Snow squalls are brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.
3. An ice storm occurs when moisture falls and freezes immediately upon impact. Ice storms result from the accumulation of freezing rain, which is rain that becomes super-cooled and freezes upon impact with cold surfaces.[20]

Extreme cold is regionally defined. In Rhode Island, it usually involves temperatures below zero degrees Fahrenheit.[21] Wind conditions can drive the temperature down even further. The wind chill index attempts to quantify the cooling effect of wind with the actual outside air temperature to determine a wind chill temperature. The wind chill temperature represents how cold it feels to humans and animals, based on the rate of heat loss from exposed skin. Extreme cold conditions may occur during, after, or without any connection to a winter storm.

Because of climate change, Richmond is more susceptible to increased freeze and thaw events that have the potential to impact local infrastructure like roads and pipes. Richmond may also experience a decrease in snowpack from winter storms, which further influences the number of freezing events and water resources in the warmer months, having widespread impacts on wildfire season, stream flow, drought, agriculture, etc. [22]

LOCATION

Heavy snow can affect the entire State of Rhode Island, but the highest amounts or snow occur in the northern and northwestern areas of the State. Northwest portions of Providence and Kent counties see these heavy snowfall events with greater frequency (roughly five or six events per year) compared to Bristol, Newport, and Washington counties that tend to have less than two significant events per year. Therefore, the entire Town is susceptible to impacts from winter storms each year.

[20] NOAA National Severe Storms Laboratory, https://www.nssl.noaa.gov/education/svrwx101/winter/types/.

[21] National Weather Service.

[22] EPA, https://www.epa.gov/climate-indicators/climate-change-indicators-snowpack.

HISTORY

Severe winter storms for Rhode Island have historically resulted in the closing of schools and businesses, power outages, fallen trees and wires, disruption of transportation systems, and damage to commercial and residential property. Table X below summarizes the winter events that have affected Richmond. The most accurate recorded winter related weather data is tracked at the county level by NOAA. The winter of 1978 is considered one of the worst winters on record for the State. On January 13, 1978 an ice storm hit the State creating significant ice cover in Cranston and Warwick. The storm destroyed thousands of trees and left nearly 120,000 people statewide without power and heat in some circumstances. A little more than three weeks later, on February 6, 1978, the State was devastated by the Blizzard of 78.' In Warwick, the official measure of snowfall at T.F. Green Airport was 28.6 inches. Snow accumulations ranged from 10 inches on Block Island to 56 inches in northern areas. Because the heavy snowfall arrived during rush hour, nearly 30,000 vehicles were left stranded. The State was immobilized for almost a week and the President declared Rhode Island a disaster area. The statewide estimated losses from the blizzard were near $110 million and there were 26 storm-related deaths.

Richmond was impacted by a significant winter snowstorm from February 8-9, 2013. This event resulted in accumulations up two feet of heavy wet snow and caused widespread power outages. National Grid estimated more than 180,000 customers in Rhode Island lost power. As a result of the storm, Richmond opened an emergency shelter which housed approximately 170 residents. Vegetative debris was also generated because of this storm's heavy snow and high winds, which gusted between 50 and 60 mph. On March 22, 2013, a federal disaster (DR-4107) was declared due to the significant impact of the storm.

The winter of 2015 produced record snow in Rhode Island. On April 3, 2015, a federal disaster (DR-412) declaration was made for the winter storm that occurred from January 26-29, 2015. In 48 hours, record amount of heavy snow had accumulated throughout the region and forced road closures to ensure public safety. After the storm, temperatures remained frigid. As a result, subsequent storms added to the already large piles of snow that were beginning to form on the side of the roads.

March 2018 saw a winter storm that dropped two inches of snow in Washington County and caused several downed wires and trees in the area, while a February 2021 winter storm dropped from seven to twelve inches of snow across the county, again resulting in downed trees and wires in the Richmond area. Though less significant events in terms of damage, these two storms show how winter events consistently impact Richmond.

Table 4 Recent History of Winter Weather in Washington County, RI[23]

Date	Type	Comments
1/4/2018	Winter Storm	Eleven to fourteen inches of snow fell on Washington County.
1/29/2018	Winter Storm	From six to nine inches of snow fell on Washington County.
3/7/2018	Winter Weather	From two to four inches of snow fell on interior Washington County. Wires were reported down in Richmond.
3/12/2018	Winter Storm	From seven to fifteen inches of snow fell on Washington County, and from seven to eight inches reported on Block Island.

[23] NOAA http://www.ncdc.noaa.gov/stormevents

Date	Type	Comments
3/3/2019	Blizzard	From four to eight inches of snow fell on Washington County.
12/16/2020	Heavy Snow	Snow ranged from 5 to 10 inches in the eastern part of Washington County, some of the higher totals 11.5 in Richmond.
2/1/2021	Winter Storm	Snowfall amounts generally ranged from 7 to 12 inches in the western part of the county, Richmond trees and wires were down due to the weight of snow.
2/7/2021	Heavy Snow	In Washington County, heavy snowfall averaged 5 to 8 inches.

Source: NOAA NCDC 2018-2022

As noted in the chart above, winter storms are a common occurrence in Richmond, and in New England as a whole, especially as climate change increases freeze and thaw events and snow events. This makes the frequency of this event estimated as **High** - 100% probability within 1 year-5 years.

EXTENT

Based on data collected from 1981 to 2010, the average annual snowfall for the Rhode Island is 33.8 inches, eleven inches higher than the national average (22.4 inches). The record snowfall event recorded closest to Richmond occurred on February 7, 1978 producing 21.3 inches of snow. There have been a number of heavy winter weather seasons since the historic accumulation in 1978.

The Northeast Snowfall Impact Scale (NESIS) developed by Paul Kocin and Louis Uccellini of the National Weather Service (NWS) 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 shown in Table 5. 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.

Table 5 NESIS 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: NOAA

Winter storms can range from a few inches of snow to a coating of ice to a major blizzard. The National Weather Service defines a blizzard as a storm that contains a large amount of snow, with winds in excess of 35 mph, and visibility of less than ¼ mile for an extended period of time. As noted in the list of previous events, the Town is accustomed to experiencing moderate storms that occur throughout the season with melting time between events. The Town has experienced a number of large snowfall events that resulted in federal disaster declarations.

Ice storms can be the most devastating winter weather phenomena and are often the cause of automobile accidents, power and communication system outages, personal injury, and death. Moreover, they can hinder the delivery of emergency services needed in response to these catastrophes and endanger the responders. Ice storms accompanied by wind gusts cause the most damage.

The Sperry–Piltz Ice Accumulation (SPIA) Index is a scale for rating ice storm intensity, based on the expected storm size, ice accumulation, and damages on structures, especially exposed overhead utility systems. Sid Sperry of the Oklahoma Association of Electric Cooperatives and Steven-Piltz from the National Weather Service office in Tulsa, Oklahoma developed the index together. The SPIA Index uses forecast information to rate an upcoming ice storm's impact from zero (little impact) to five (catastrophic damage to exposed utility systems) show below in Table 6

Table 6 Sperry–Piltz Ice Accumulation Index

Ice damage index	Average Ice Amount	Wind	Damage and impact descriptions
0	0–0.25 in	0–15 mph	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	0.10–0.25 in	15–25 mph	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 in	0–15 mph	
2	0.10–0.25 in	25–35 mph	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 in	15–25 mph	
	0.50–0.75 in	0–15 mph	
3	0.10–0.25 in	Over 35 mph	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 to 5 days.
	0.25–0.50 in	25–35 mph	
	0.50–0.75 in	15–25 mph	
	0.75–1.00 in	0–15 mph	
4	0.25–0.50 in	Over 35 mph	Prolonged and widespread utility interruptions with extensive damage to main distribution feeder lines and some high voltage transmission lines/structures. Outages lasting 5 to 10 days.
	0.50–0.75 in	25–35 mph	
	0.75–1.00 in	15–25 mph	
	1.00–1.50 in	0–15 mph	
5	0.50–0.75 in	Over 35 mph	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 in	Over 25 mph	
	1.00–1.50 in	Over 15 mph	
	Over 1.50 in	Any	

Source: SPIA Index, https://www.spia-index.com/

Because the extent of snow events, extreme cold, and other winter storm events is often county or state-wide, the damage potential is rated as **Medium** - 50 % of property could be damaged and possible injuries

or loss of life. This is due to the broad range of impact beyond just the borders of Richmond and the already robust response system to such events in the area. Their widespread impacts include power outages, tree damage, roof collapse, businesses shut down, roads heaving or damage, etc.

PROBABILITY OF FUTURE OCCURRENCE

Based on the frequency of past winter storm and extreme cold events, and the projections for increased freeze and thaw events in the coming years due to climate change, the probability of future occurrence of the winter storm including extreme cold hazard is **Highly Likely** - will occur every 1-5 years.

3.2.3 THUNDERSTORM / LIGHTNING

DESCRIPTION

Thunderstorms are formed when the right atmospheric conditions combine to provide moisture, lift, and warm unstable air that can rise rapidly. Thunderstorms occur any time of the day and in all months of the year but are most common during summer afternoons and evenings and in conjunction with frontal boundaries. These events usually bring heavy rains (which can cause flash floods), strong winds, hail, lightning, and tornadoes.[24] Thunderstorms affect a smaller area compared to winter storms or hurricanes, but they can be dangerous and destructive for a number of reasons. Storms can form in less than 30 minutes, giving very little warning; they have the potential to produce lightning, hail, tornadoes, powerful straight-line winds, and heavy rains that produce flash flooding.[25] During a thunderstorm, severe downdrafts may cause microbursts, a rapid column of airflow with the force of tornado able to knock down mature trees. Microbursts are capable of creating wind speeds over 150 mph. In 2002, the Town of Hopkinton suffered a microburst resulting down trees and minor damage to property. A similar event occurred in 2015 in the cities of Cranston and Warwick. Though there have been no recorded microbursts since that time, high winds and thunderstorms still damage the area with severe consequences.

Hail is formed in towering cumulonimbus clouds (thunderheads) when strong updrafts carry water droplets to a height at which they freeze. Eventually, these ice particles become too heavy for the updraft to hold up, and they fall to the ground at speeds of up to 120 MPH. Hail falls along paths called swaths, which can vary from a few square acres to up to 10 miles wide and 100 miles long.[26] Hail larger than ¾ inch in diameter can do great damage to both property and crops, and some storms produce hail over two inches in diameter. Hail causes about $1 billion in damages annually in the U.S.

Lightning is one of the most underrated severe weather hazards yet ranks as the second-leading weather killer in the United States. Lightning events are caused by the attraction between positive and negative charges in the atmosphere, resulting in the buildup and discharge of electrical energy. Most thunderstorms produce lightning and are dangerous. Lightning often strikes as far as 10 miles away from any rainfall. In Richmond, strong windstorms usually result in downed trees because of Washington County's risk of high winds due to its proximity to the coast.

Due the high potential for hail, lightning, and wind to occur concurrently during thunderstorms, the RHMC elected to combine the hazards together under the Thunderstorm profiles. The diverse aspects of the profile also correlate with the increasing impacts of climate change on the severity and frequency of storms.

[24] National Oceanic and Atmospheric Administration, https://www.nssl.noaa.gov/education/svrwx101/thunderstorms/.
[25] Rhode Island Emergency Management Agency (RIEMA), Rhode Island 2014 Hazard Mitigation Plan Update
[26] NOAA National Severe Storms Laboratory, https://www.nssl.noaa.gov/education/svrwx101/hail/.

LOCATION

New England, with Rhode Island in particular, has a low incidence of lightning-related fatalities and damages (Figure 1). Severe storms and the damage they cause are rarely isolated, localized events in Rhode Island. Storm systems move through the state, affecting many municipalities, including Richmond. The entire community is vulnerable to damage from thunderstorm and/or lightning events.

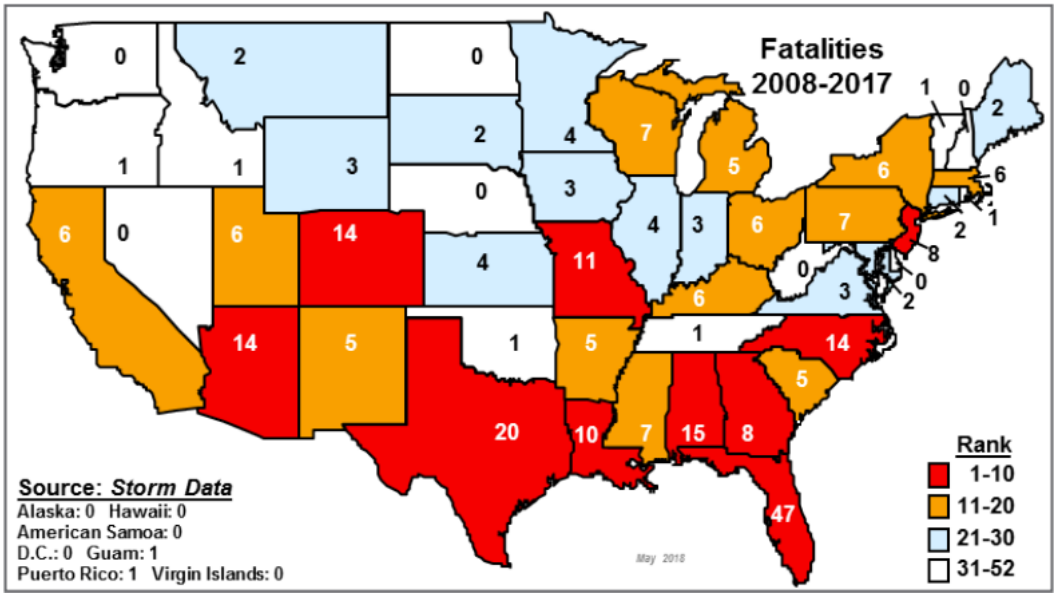


Figure X. Number of lightning deaths in the United States, 2008-2017
Source: National Lightning Safety Institute, NOAA.

HISTORY

Rhode Island does not experience severe thunderstorms with the same frequency as the Midwestern and Southeastern states, but there have been several destructive wind, hail, and lightning events in recent history. Lightning strikes and hail have occurred in and around Richmond but have generally caused little, if any, damage. In 2013, a barn was struck by lightning in Wyoming, causing a fire and the loss of two horses. Table 7 highlights recent thunderstorms, lightning, and hailstorms that have affected Richmond and other parts of Rhode Island.

Table 7 Recent Thunderstorm Events near Richmond[27]

Date	Type	Damage
8/4/2015	Thunderstorm Wind	$3,000
7/28/2018	Lightning	$5,000
6/30/2019	Thunderstorm Wind	$6,000
8/27/2021	Dime-sized Hail	$0

The frequency of thunderstorm and lightning events is deemed as **High** - 100% probability within 1 year-5 years because of the consistency of smaller, not necessarily damaging events that occur yearly in Richmond. With increased intensity and frequency of storms due to climate change the frequency of these events will only increase with time.

[27] NOAA http://www.ncdc.noaa.gov/stormevents

EXTENT

Richmond is susceptible to a variety of severe weather events including thunderstorms, hailstorms, and lightning. The thunderstorm event of record for Richmond occurred on June 16, 2002, which produced over 50 MPH winds and $5,000 in damage. Hail events are not a regular occurrence for Richmond but do occur, on June 30, 1998, a localized hail event took place producing the 2.75-inch hail, the largest to date. More recently, dime-sized hail was reported over Richmond during a strong thunderstorm in August 2021. Often the most damaging aspects of thunderstorm related events are damaging winds.

Thunderstorm, lightning, and hail events are rated at a **Low** damage potential - Some local property damage not town wide, minor injuries or loss of life. This is due to the localization and size of each event, though they are still able to cause large damage when conditions are especially dangerous as their impacts may include brush and wildfires, house fires, power loss, propane tank explosions, etc.

3.2.3.1.1 THUNDERSTORMS

The National Oceanic and Atmospheric Administration (NOAA) classifies types of thunderstorms as single-cell, multi-cell, squall line, supercell, vow echo, mesoscale convective system, mesoscale convective complex, mesoscale convective vortex, and derecho. The National Weather Service (NWS) designates a thunderstorm as severe if it produces hail at least one inch in diameter, winds of 58 MPH or greater, or a tornado. About 10 percent of the estimated 100,000 annual thunderstorms that occur nationwide are considered severe.[28]

Table 8 Storm Wind Speed[29]

WIND SPEED ESTIMATE	DESCRIPTION
25-31 mph	Large branches in motion; whistling heard in telephone wires
32-38 mph	Whole trees in motion; inconvenience felt walking against the wind
39-54 mph	Twigs break off trees; wind generally impedes progress
55-72 mph	Damage to chimneys and TV antennas; pushes over shallow rooted trees
73-112 mph	Peels surfaces off roofs; windows broken; light mobile homes pushed or overturned; moving cars pushed off road
113-157 mph	Roofs torn off houses; cars lifted off ground

Source: National Weather Service, Burlington VT Weather Forecast Service.

3.2.3.1.2 HAIL

High winds and damaging hail can take down trees, knock out power, and damage infrastructure. The size of hailstones is best determined by measuring their diameter with a ruler.

[28] National Oceanic and Atmospheric Administration, https://www.nssl.noaa.gov/education/svrwx101/thunderstorms/.
[29] National Weather Service. https://www.weather.gov/btv/skywarn_hailwind.

Table 9 Hail Diameter Chart[30]

HAIL DIAMETER	SIZE DESCRIPTION
1/4"	Pea Size
1/2"	Mothball Size
3/4"	Penny Size
7/8"	Nickel Size
1" **(Severe Criteria)**	Quarter Size

Source: National Weather Service, Burlington VT Weather Forecast Service.

3.2.3.1.3 LIGHTNING

There is no single standard for measuring the strength or magnitude of a lightning storm. Lightning events are often measured by the damage they produce. The charge and temperature of each bolt of lightning is different yet could be lethal or cause damage. June, July, and August are peak months for lightning activity in the United States. This holds true for the Town of Richmond. In general, buildings are more likely to be struck by lightning if they are located on high ground or if they have tall protrusions such as steeples or poles. Electrical and communications utilities are also vulnerable to direct lightning strikes. Damage to these lines has the potential to cause power and communications outages for businesses, residences, and critical facilities (Rhode Island 2014 State Hazard Plan). According to the National Lightning Detection Network, there was an average of 2,210 lighting flashes in Rhode Island from 2009-2018. In 2018, there were 1,223 lightning flashes in Rhode Island.

PROBABILITY OF FUTURE OCCURRENCE

Based on the frequency of extreme thunderstorm and lightning events, the projections for climate change, and the lower potential for significant damage from these events, the probability of future occurrence of the thunderstorm hazard is **Likely** - will occur every 5-10 years.

3.2.4 HURRICANE / NOR'EASTER

DESCRIPTION

Tropical cyclone is a general term for tropical storms and hurricanes, low pressure systems that usually form over the tropics. These storms are referred to as cyclones due to their rotation. Tropical cyclones are among the most powerful and destructive meteorological systems on earth. Their destructive phenomena include very high winds, heavy rain, lightning, tornadoes, and storm surge. As tropical storms move inland, they can cause severe flooding, downed trees and power lines, and structural damage.[31]

There are three categories of tropical cyclones:

1. Tropical Depression: maximum sustained surface wind speed is less than 39 mph.
2. Tropical Storm: maximum sustained surface wind speed from 39-73 mph.
3. Hurricane: maximum sustained surface wind speed exceeds 73 mph.

Once a tropical cyclone no longer has tropical characteristics it is then classified as an extratropical system. Most Atlantic tropical cyclones begin as atmospheric "easterly waves" that propagate off the coast of Africa and cross the tropical North Atlantic and Caribbean Sea. When a storm starts to move toward the

[30] Ibid.

[31] NOAA, https://oceanservice.noaa.gov/facts/cyclone.html

north, it begins to leave the area where the easterly trade winds prevail and enters the temperate latitudes where the westerly winds dominate. This produces the eastward curving pattern of most tropical storms that pass through the Mid-Atlantic region. When the westerly steering winds are strong, it is easier to predict where a hurricane will go. When the steering winds become weak, the storm follows an erratic path that makes forecasting very difficult. Howling winds associated with Nor'easters also have the potential to produce significant storm surge, similar to that of a Category 1 hurricane. In addition, these types of storms can produce wind gusts to near hurricane force as well as flooding rain and crippling snowfall.[32]

An extra-tropical coastal storm, known as a nor'easter, is typically a large, counterclockwise wind circulation around a low pressure center. The storm radius is often as large as 1,000 miles, and the horizontal storm speed is about 25 miles per hour, traveling up the eastern United States coast. Sustained wind speeds of 10-40 MPH are common during a nor'easter, with short term wind speeds gusting up to 70 MPH. Unlike hurricanes and tropical storms, nor'easters can sit offshore, wreaking damage for days.[33]

LOCATION

Hurricanes that strike the Eastern United States originate in the tropical and subtropical North Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico. The Atlantic hurricane season spans a six-month period (June 1 through November 30). Being an inland community, Richmond may not be susceptible to tide surges associated with coastal storms, but the entire town is vulnerable to hurricane-force winds and rain. Because of the state's already high susceptibility to hurricanes and Nor'easters, the enhanced risks of stronger storms due to climate change are an immediate issue. To mitigate the risks of storms the Town will need to consider the historic events that have caused damage and consider how increased storm-related events like wind, flooding, and heavy rain.

HISTORY

The two hurricanes that resulted in the largest loss of life in the State were "The Great New England Hurricane of 1938" and "Hurricane Carol." "The Great New England Hurricane" occurred on September 21, 1938 and is considered the worst disaster in Rhode Island history. It resulted in the deaths of 262 people and caused damage estimated at $100,000,000. The eye of this hurricane tracked to the west of Rhode Island and hit at high tide. During the storm, two storm surges almost 30' high destroyed most of the beach homes along the south shore of Rhode Island. In downtown Providence, the surge flooded the area to a depth of more than 13'9" above the mean high-water mark. As a result, persons drowned trying to escape automobiles submerged in the streets and from buildings where the first floors were flooded to the ceiling.[34]

[32] NWS, https://www.weather.gov/jetstream/tc_classification.
[33] Rhode Island Emergency Management Agency (RIEMA), Rhode Island 2018 Hazard Mitigation Plan Update
[34] Providence Journal-Bulletin, 1998 Journal-Bulletin: Rhode Island Almanac 112th ed. (Providence, RI: Providence Journal Company, 1998) 255.

On August 31, 1954, "Hurricane Carol" hit Rhode Island, in the same manner as "The Great New England Hurricane of 1938." As a result, downtown Providence was flooded when the water reached 13' above mean high-water level.

The winds from Hurricane Gloria in 1985, Hurricane Bob in 1991, and Tropical Storm Irene in 2011 caused downed tree limbs and power outages.

More recent significant weather events to affect the state were downgraded hurricanes. On October 29, 2012, Hurricane Sandy which had been sweeping up the Mid-Atlantic Coast had been downgraded by the time it had reached Rhode Island. Super Storm Sandy hit Rhode Island with strong winds, and storm surge, causing significant coastal erosion. Along the south coast, the storm surge was four to six feet and seas from 30 to a little over 35 feet were observed in the outer coastal waters. The very large waves on top of the storm surge caused destructive coastal flooding along stretches of the Rhode Island exposed south coast. Washington and Newport counties suffered the most damage and received FEMA disaster declarations. More than $39 million has been paid in federal support. Sadly, at least 182 people nationwide lost their lives in what turned out to be the nation's second most costly weather disaster. Fortunately, there were no disaster-related deaths in Rhode Island. Richmond did not have any significant damage from Super Storm Sandy, just fallen trees and brush.

Tropical Storm Hermine impacted Washington county in September of 2016 and did some significant damage in the area due to high winds. Most impacted were power lines and downed trees. On August 22, 2021, Tropical Storm Henri made landfall in southwest Rhode Island, with wind speeds up to 60 to 70 miles per hour. With significant power outages and around 33 homes damaged in Washington County, Henri is caused enough damage to be declared a FEMA emergency.[35]

Though Hurricanes and Nor'easters often get much more press that other weather events, their frequency is predicted to be **Medium** - 10%-100% probability within 10 years. They will still occur frequently but are not considered High frequency events because of the unpredictability of their schedule and strength.

EXTENT

Hurricanes that reach Rhode Island are usually weak (Category 1) or downgraded tropical systems. The wind speeds may be less, but the storms can still bring a lot of rain. Nor'easters are not frequent (one every couple of years) but have a tendency to stall and unload precipitation for a few days.

Hurricanes are categorized according to the Saffir-Simpson Hurricane Wind Scale (SSHWS), which was developed in the 1970s by Herbert Saffir and Robert Simpson, with ratings determined by wind speed and central barometric pressure. Hurricane categories range from one through five, with Category 5 being the strongest (winds greater than 155 MPH). A hurricane watch is issued when hurricane conditions could occur within the next 36 hours. A hurricane warning indicates that sustained winds of at least 74 MPH are expected within 24 hours or less.

Hurricanes are classified by their damage potential according to the SSHWS. The scale is designed to give public officials and the general public usable information on the magnitude of a storm. It gives an indication of the potential flooding and wind damages associated with each hurricane category. The scale rates the intensity and effects of hurricanes based on wind speed and barometric pressure measurements as shown in Table 10.

[35] NOAA National Center for Environmental Information's Storm Events Database.

Table 10 Saffir-Simpson Scale of Hurricane Intensity

Wind Speed	Typical Effects
Category 1 Hurricane- Weak	
74-95 mph **(64-82 kts)**	Minimal Damage: Damage is primarily to shrubbery, trees, foliage, and unanchored mobile homes. No real damage occurs in building structures. Some damage is done to poorly constructed signs.
Category 2 Hurricane- Moderate	
96-110 mph **(83-95 kts)**	Moderate Damage: Considerable damage is done to shrubbery and tree foliage, some trees are blown down. Major structural damage occurs to exposed mobile homes. Extensive damage occurs to poorly constructed signs. Some damage is done to roofing materials, windows, and doors; no major damage occurs to the building integrity of structures.
Category 3 Hurricane- Strong	
111-129 mph **(96-112 kts)**	Extensive Damage: Foliage torn from trees and shrubbery; large trees blown down. Practically all poorly constructed signs are blown down. Some damage is done to roofing materials, windows, and doors. Some structural damage occurs to small buildings, residences and utility buildings. Mobile homes are destroyed. There is a minor amount of failure of curtain walls (in framed buildings).
Category 4 Hurricane- Very Strong	
130-156 mph **(113-136kts)**	Extreme Damage: Shrubs and trees are blown down; all signs are down. Extensive roofing material and window and door damage occurs. Complete failure of roofs on many small residences occurs, and there is a complete destruction of mobile homes. Some curtain walls experience failure.
Category 5 Hurricane- Devastating	
Greater than 157 mph **(136 kts+)**	Catastrophic Damage: Shrubs and trees are blown down; all signs are down. Considerable damage to roofs of buildings. Very severe and extensive window and door damage. Complete failure of roof structures occurs on many residences and industrial buildings, and extensive shattering of glass in windows and doors occurs. Some complete buildings fail. Small buildings are overturned or blown away. Complete destruction of mobile homes.

Source: National Hurricane Center and RI 2018 State Hazard Mitigation Plan

The extensiveness and significance of damage caused by the multiple aspects of hurricanes and Nor'easters puts their damage potential at **High** - Major town wide property damage, injuries and loss of life. They have the potential to impact the power grid, property damage, economic losses, debris, etc.

PROBABILITY OF FUTURE OCCURRENCE

Based on the frequency of past hurricane and Nor'easter events, the projections for increased frequency and intensity of storm events in the coming years due to climate change, and the probability for significant damage because of these events, the probability of future occurrence is **Highly Likely** - will occur every 1-5 years.

3.2.5 Drought (Including Extreme Heat)

3.2.5.1 Description

Drought is characterized as a continuous period of time in which rainfall is significantly below the norm for a particular area. These events are a gradual phenomenon that occur slowly, over a multi-year period. Drought is unlike other natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. There are four different ways that a drought can be defined:

1. Meteorological – A measure of departure of precipitation from normal. Due to climatic differences, what is considered a drought in one location may not be a drought in another location.
2. Agricultural – refers to a situation when the amount of moisture in the soil no longer meets the needs of a particular crop.
3. Hydrological- occurs when surface and subsurface water supplies are below normal.
4. Socioeconomic- refers to the situation that occurs when physical water shortage begins to effect people.

Location

Drought season, like wildfire season for Rhode Island is typically early July to September or October, when the weather is the driest. Current drought conditions in Rhode Island and the nation are tracked by the U.S. Drought Monitor, a partnership between the University of Nebraska-Lincoln, as well as various Federal and state agencies and other experts. Graphic and text summaries of current and projected drought conditions are updated on a weekly basis and are available through the Drought Monitor website.[36]

According to the Rhode Island Water Resource Board, the potential for a drought exists every eleven years in Rhode Island. Although temporary drought conditions may occasionally exist in Rhode Island, affecting all of Richmond, devastating, long term drought conditions are not indicative of this temperate region.

History

Due to its temperate climate, Rhode Island rarely experiences extended periods of drought. However, seasonal droughts have occurred when precipitation levels are low. Drought conditions can impact crops, water available for fire suppression, and reservoir levels. Periods of two or more months of severe or extreme drought were documented in 1911, 1925, 1930, 1943-1944, 1947, 1949-1950, 1957, 1965-1967, and 1985.[37]

[36] http://droughtmonitor.unl.edu
[37] Source of historic data for droughts consisting of a two or more-month period of severe or extreme drought: http://www.nrcc.cornell.edu/drought/RI_drought_periods.html.

Table 11 Rhode Island historical droughts and locations of impacts

Date	Area Affected	Remarks
1930-31	Statewide	Estimated stream flow about 70% of normal
1941-45	Statewide. Particularly severe in the Pawtuxet and Blackstone Rivers	Estimated stream flow about 70% of normal
1949-50	Statewide	Estimated stream flow about 70% of normal
1963-67	Statewide	Water restrictions and well replacements common
1980-81	Statewide. Groundwater deficient in eastern part of State	Considerable crop damage in 1980
1987-88	Southern part of State	Crop damage, $25 million
2016	Statewide	Severe Drought from September to November

Source: Northeast Regional Climate Center, Palmer Drought Severity Index.

Three notable drought events have occurred throughout Rhode Island since 1993, two occurred in the spring and summer of 2012. A meteorological drought was documented by precipitation that had been approximately one half of normal from January 2012 through April 2012. Rivers and streams were most affected as most ran at record low levels during the spring run-off season. However, Rhode Island did not issue drought declarations as reservoirs were at normal levels, due to above normal precipitation falling between August 2011 and November 2011. The third instance was in fall of 2016, when lower levels of precipitation were recorded in New England, resulting in a Severe Drought designation from September through November in Rhode Island.

Past drought events in Rhode Island have affected the entire state. It is generally not an issue that is handled at the local level although the Town can enforce particular water bans as dictated by the State. Due to the broad nature of droughts, the Town of Richmond does not have specific mitigation actions. While storms are at increased risk of dropping more rain on the town, higher sustained temperatures also put Richmond at risk for more severe and prolonged droughts. With this in mind, some drought mitigation actions may be helpful in preventing future impacts.

Noting the frequency of drought and extreme heat events in the table above puts these events at **Medium** frequency - 10%-100% probability within 10 years. Richmond is more at risk of flooding events happening than drought events when looking back at historic instances.

EXTENT

The average rainfall in the Richmond area is 54.19 inches[38] which is above the national average annual precipitation of 37 inches. Even though the State historically receives more rain than the national average, Rhode Island does experience extended periods of dry weather. The most severe drought event that has occurred in Rhode Island was in 1966 when the lowest Palmer Drought Severity Index was -4.60.

Characteristics and impacts of drought differ in many ways, so it is difficult to quantify drought. An existing index called the Palmer Drought Severity Index (PDSI) 39 (Figure 2) used temperature and precipitation levels to determine dryness, measuring a departure from the normal rainfall in a given area. The PDSI uses

[38] Kingston Station, 2000-2022.
[39] NOAA Drought Information Center, http://www.drought.noaa.gov/palmer.html (February 2012)

temperature and precipitation levels to determine dryness. The advantage of the PDSI is that it is standardized to local climate, so it can be applied to any part of the country to demonstrate relative drought or rainfall conditions. A monthly PDSI value below -2.0 indicates moderate drought, and a value below -3.0 indicates severe drought.

Table 12 Palmer Drought Severity Index

Severity	Index Value
Extreme Drought	-4 or less
Severe Drought	-4 to -3
Moderate Drought	-3 to –2
Mild Drought	-2 to –1
Incipient Dry Spell	-1 to –0.5

Source: U.S. Drought Monitor

Rhode Island, as with most states within the United States, use both the PDSI and the Crop Moisture Index (CMI) as indices for a drought occurrence.[40] The CMI, a derivative of the PDSI, provides information on the short-term or current status of purely agricultural drought or moisture surplus. The PDSI is most effective for determining long-term drought conditions, while the CMI is effective at helping determine short-term droughts.

Long term or widespread droughts are not likely to occur in Richmond. Shorter droughts have presented higher than normal fire dangers and lowered the water table. However, if a drought event were to occur, it may reduce the availability of water in the private drinking water wells as well as increase the fire risk. Most of the Town residents get their water from private wells on their property. Many of those wells are shallow and use ground water for their source. A long-term drought could affect those wells and their homes water supply leading to health and sanitation issues. Further, the Town of Richmond has approximately 2,000 acres of land used for agricultural purposes: a large dairy farm, numerous turf farmers and small mixed-use farms. Long-term drought could have a major effect on these farmers suffering crop loss. An extended period of drought would also degrade stream health and impact recreational fishing areas.

Droughts have a damage potential of **Medium** - 50 % of property could be damaged and possible injuries/ loss of life because of their potential impacts including loss of crops, low drinking and fire suppression wells, health and sanitation, low stream flow (affects fish and wildlife populations).

PROBABILITY OF FUTURE OCCURRENCE

Based on the frequency of past drought events, and the projections for differing levels of wetness and higher temperatures due to climate change, the probability of future occurrence of the drought and extreme heat hazard is **Likely** - will occur every 5-10 years.

[40] Sources: NOAA Climate Prediction Center and National Drought Mitigation Center websites.

3.2.6 DAM FAILURE

DESCRIPTION

Wyoming Dam

Dam failures can result from natural events, human-induced events, or a combination of the two. Failures due to natural events such as prolonged periods of rainfall and flooding can result in overtopping, which is the most common cause of dam failure. Overtopping occurs when a dam's spillway capacity is exceeded and portions of the dam which are not designed to convey flow begin to pass water, erode, and ultimately fail.[41] Other causes of dam failure include design flaws, foundation failure, internal soil erosion, inadequate maintenance, or misoperation. Complete failure occurs if internal erosion or overtopping results in a complete structural breach, releasing a high-velocity wall of debris-laden water that rushes downstream, damaging or destroying everything in its path. An additional hazard concern is the cascading effect of one dam failure causing multiple dam failures downstream due to the sudden release of flow.

Dams are classified by size and hazard ratings. The size classification provides a relative description of small, medium, or large, based on the storage capacity and height of the impounded water. The hazard classification relates to the probable consequences of failure or misoperation of the dam; however, it does not relate to the current condition or the likelihood of failure of the dam. The hazard classifications are defined in the Rhode Island Dam Safety Regulations as follows:

The hazard classifications are defined in the Rhode Island Dam Safety Regulations as follows:

- High Hazard – means a dam where failure or misoperation will result in a probable loss of human life.
- Significant Hazard – means a dam where failure or misoperation results in no probable loss of human life but can cause major economic loss, disruption of lifeline facilities, or impact other concerns detrimental to the public's health, safety, or welfare.
- Low Hazard – means a dam where failure or misoperation results in no probable loss of human life and low economic losses. Intense storms may produce a flood in a few hours or even minutes for upstream locations. Flash floods occur within six hours of the beginning of heavy rainfall, and dam failure may occur within hours of the first signs of breaching. Other failures and breaches can take much longer to occur, from days to weeks, as a result of debris jams or the accumulation of melting snow.

LOCATION

There are 20 dams throughout the Town of Richmond listed on the Rhode Island Department of Environmental Management (DEM) 2020 Dam Safety Annual Report. The majority are privately owned with approximately half owned by the State. One State owned, and one privately owned dam have been classified as high hazard (Wyoming Upper, and White's Pond). Browning Mill Pond in neighboring Exeter

[41] Rhode Island Emergency Management Agency (RIEMA), Rhode Island 2018 Hazard Mitigation Plan Update

is a significant hazard dam and Metcalf Wildlife Marsh dam also in Exeter is a high hazard dam that could cause Richmond issues. Should either dam fail, there would be adverse impacts on Richmond.

A list of Richmond dams as identified by the Rhode Island Department of Environmental Management is available in Appendix B: Dams in Richmond.

HISTORY

Rhode Island has experienced many dam failures, mainly resulting from major flood events. Historically, however, the consequences of dam failures have not been well documented. Richmond has not experienced a significant number of dam failures in recent years beyond the major flood events in 2010. Table 13 highlights the dam failures in and around Richmond.

Because of the state of the dams in Richmond and state laws about dam upkeep, the frequency level for dam failure events is listed to be **Low** - 1%- 10% probability within 100 years.

Table 13 Recent Dam Failures in and around Richmond[42]

Date	Location	Estimated Gallons	Damage/Death
3/30/2010	Blue Pond, Hopkinton	179 million	Moderate/none
3/30/2010	Usquepaugh Dam, Richmond	Unknown	Partial failure/minor to moderate/none
3/30/2010	Hope Valley Mill Pond	Unknown	Partial failure/minor/none

Source: Rhode Island Department of Environmental Management (DEM) 2020 Dam Safety Annual Report

EXTENT

Depending on the location and population density around a dammed area, a dam failure can cause loss of life in addition to the inevitable economic damages associated with dam failure. A dam failure in Richmond would have local effects especially to residents and infrastructure below the high and significant hazard dams. The resulting magnitude of the flooding would be dependent upon the type of failure and location. The most devastating event in recent memory was the Blue Pond dam failure in Hopkinton during the March 2010 floods. There were no injuries, but a significant amount of damage was done to the built infrastructure in the immediate area.

The RHMC recognizes that a dam failure is not a natural hazard but several of the hazards identified in the hazard list could bring dam failure upon the Town of Richmond. Severe winter storms, flooding, and a hurricane have the potential to produce enough rain and or snowfall to cause a dam failure. The age and lack of maintenance of these dams also pose a serious risk to the structural integrity of these dams. A failure of the Wyoming Upper Dam could cause considerable loss of life, property and economy.

The acuteness of dam failure impacts puts the damage potential at **High** - Major town wide property damage, injuries, and loss of life. A dam failure can result in serious life safety and property damage, making consistent maintenance and review critical.

PROBABILITY OF FUTURE OCCURRENCE

Based on the overall state of dams and their locations in Richmond, the probability of future occurrence of dam failure is **Not Very Likely** - will occur every 10-50 years.

[42] Source: Richmond EMA Director

3.2.7 TORNADO

DESCRIPTION

A tornado is a violent windstorm with a twisting, funnel-shaped cloud. Winds in most tornadoes are 100 MPH or less, but in the most violent, and least frequent tornadoes, wind speeds can exceed 250 MPH. Tornadoes typically track along the ground for a few miles or less and are less than 100 yards wide, though some can remain in contact with the earth for well over fifty miles and exceed one mile in width. They are often spawned by thunderstorms or hurricanes. Tornadoes are produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. The damage from a tornado is a result of the high wind velocity and wind-blown debris.

Tornado in Springfield, Massachusetts in 2011

Tornado season is generally March through August, although tornadoes can occur at any time of year. Over 80 percent of all tornadoes strike between noon and midnight. During an average year, about 1,000 tornadoes are reported across the United States, resulting in 80 deaths and over 1,500 injuries. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of one mile wide and 50 miles long.

LOCATION

Rhode Island is not located in the area of Tornado Alley; however, tornadoes do occur. While tornadoes do not occur frequently, they may occur anytime and anywhere in Rhode Island (and the rest of New England). This situation may be more dangerous than states in Tornado Alley because Rhode Island residents do not expect severe tornadoes and are ill-prepared to respond to a tornado strike. Rhode Island ranks 49th out of 50 states for the occurrence of tornadoes. Rhode Island does not typically experience tornadoes; there is approximately one every four years. The entire Town of Richmond is susceptible to the impacts of a tornado.

HISTORY

According to the Rhode Island State Hazard Mitigation Plan, Rhode Island has had twenty tornadoes since 1950 with property damages amounting to $3.545 million. There have been no fatalities, but 23 injuries were reported.[43] A devastating tornado occurred across the border in Worcester, Massachusetts in 1953. More than 90 people were killed, over 1,300 injured with damage estimates were over $52 million. There were reports of four tornadoes as Hurricane Bob came ashore in Rhode Island in 1991[44]. More recently in 2011, an F3 tornado struck Springfield, Massachusetts (90 miles away), killing three people and injuring hundreds.

[43] Rhode Island Hazard Mitigation Plan, 2013 http://www.riema.ri.gov/prevention/mitigation/RI%20SHMP%2011-26-2013.pdf

[44] National Weather Service, https://www.weather.gov/box/hurricane_bob

On August 7, 1986, a rare outbreak of seven tornadoes occurred in New England. An F2 on the Fujita Scale carved its way through Cranston and Providence causing twenty injuries and $2,500,000 in damages. Table 14 highlights tornado events that have affected Rhode Island.

Table 14 Recent Tornado Events in Rhode Island[45]

Date	F-Scale	Injuries	Damage	Location
7/23/2008	1	0	$47,987	Bristol County
8/10/2012	-	0	$50,000	Washington County
10/23/2018	1	0	N/A	Providence County

The inconsistency and low occurrence rate of tornadoes in Richmond puts tornado events at a **Low** frequency - 1%- 10% probability within 100 years.

EXTENT

Tornadoes are categorized according to the damage they produce using the Fujita Scale (F-scale). An F0 tornado causes the least amount of damage, while an F5 tornado causes the most amount of damage. Relatively speaking, the size of a tornado is not necessarily an indication of its intensity. Based on the previous occurrences statewide, it is anticipated that if a tornado were to impact the Town it may have a magnitude of an F2 as that is the greatest extent experienced in the State to date. However, the most severe event in Washington County has been an F1. If a tornado were to touchdown in the Richmond area, it would likely be on the lower end of the Enhanced Fujita scale.

Direct measurements of tornado wind speeds are difficult (and dangerous) to obtain. The Fujita scale, introduced in 1971 by Theodore Fujita, provided a way to characterize tornadoes based on the damage they produced and relating that damage to the fastest quarter-mile wind at the high of a damaged structure. The F-scale ranks tornado damage as weak (F0 and F1), strong (F2 and F3), or violent (F4 and F5). The weakest tornadoes (F0) may damage chimneys and signs, whereas the most violent tornadoes (F5) can blow houses completely off their foundations. Scientists are able to correlate F-scale values roughly using only wind speeds. The F-scale system is a convenient means for scientists to classify and discuss the intensity of tornadoes. In 2007, the National Weather Service updated the Fujita scale to the Enhanced Fujita Scale. Table 15 compares the original Fujita Scale and the Enhanced Fujita Scale.[46]

[45] Rhode Island Emergency Management Agency (RIEMA), Rhode Island 2018 Hazard Mitigation Plan Update

[46] http://www.spc.noaa.gov/efscale/

Table 15 Tornado Fujita Scale

Enhanced Fujita Scale:	Fujita Scale:	Typical Damage:
EF-0 (65-85 mph)	F0 (40-72 mph)	**Light Damage.** Some damage to chimneys; branches broken off trees, shallow-rooted trees uprooted, sign boards damaged. .
EF-1 (86-110 mph)	F1 (73-112 mph)	**Moderate damage.** Roof surfaces peeled off; mobile homes pushed foundations or overturned; moving autos pushed off road.
EF-2(111-135 mph)	F2 (113-157 mph)	**Considerable damage.** Roofs torn from frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light objects become projectiles
EF-3 (136-165 mph)	F3 (158-206 mph)	**Severe damage.** Roofs and some walls torn from well- constructed houses; trains overturned; most trees in forested area uprooted; heavy cars lifted and thrown.
EF-4 (166-200 mph)	F4 (207-260 mph)	**Devastating damage.** Well- constructed houses leveled; structures with weak foundation blown some distance; cars thrown; large missiles generated
EF-5 (>200 mph)	F5 (261-318 mph)	**Incredible damage.** Strong frame houses lifted off foundations, carried considerable distances, and disintegrated; auto-sized missiles airborne for several hundred feet or more; trees debarked.

Source: The Enhanced Fujita Scale (EF Scale) (weather.gov)

Tornadoes could cause significant damage to structures, trees, and utility lines. Flying debris could be cause injuries to residents. Mobile homes are generally more vulnerable to damage than steel framed structures. About 3.6% of the Town's homes are mobile or manufactured homes and these properties are more susceptible to the threat of a tornado. The campground located on Gardiner Road would also be in great danger during a tornado event.

The low chance of strong tornadoes touching down in Richmond put the damage potential rating at **Medium** - 50 % of property could be damaged and possible injuries or loss of life because of the potential for tornadoes to cause a threat to life safety, property damage, power loss, debris, etc.

PROBABILITY OF FUTURE OCCURRENCE

The inconsistency and low occurrence rate of tornadoes in Richmond puts the probability of future occurrence as **Unlikely** - will occur in intervals greater than 50 years.

3.2.8 EARTHQUAKE

DESCRIPTION

An earthquake (also known as a quake, tremor, or temblor) is the result of a sudden release of energy in the Earth's crust that creates seismic waves. The ultimate cause of these deep ruptures has not been established. All earthquakes produce both vertical and horizontal ground shaking. This ground movement begins at the focus or hypocenter, deep in the earth, and spreads in all directions. The felt motion is the result of several kinds of seismic vibrations. The primary, or P, waves are compressional. The secondary, or S, waves have a shear motion. These body waves radiate outward from the fault to the ground surfaces where they cause ground shaking.

The fast-moving P waves are the first waves to cause the vibrations of a building. The S waves arrive next and may cause a structure to vibrate from side to side. Rayleigh and Love waves (surface waves), which arrive last, cause low-frequency vibrations and are more likely than P and S waves to cause tall buildings to vibrate. Surface waves decline less rapidly than body waves, so as the distance from the fault increases, tall buildings located at relatively great distances from the epicenter can be damaged.

LOCATION

The entire Town of Richmond has the potential to be impacted by earthquakes. Rhode Island is located in the North Atlantic tectonic plate and is in a region of historically low seismicity. Only three or four earthquakes of Modified Mercalli-Intensity Scale (MMI) V or greater have been centered in Rhode Island, including the 1951 South Kingstown earthquake of magnitude 4.6 on the Richter scale.[47] The Town of Richmond is adjacent to South Kingstown.

HISTORY

In general, the region around Richmond does not suffer from frequent earthquakes; however historical events in New England have been of moderate to high intensity and impact area. Of the three types of earthquakes (subduction zone, Benioff, and crustal), crustal earthquakes are currently thought to present the greatest risk to the Rhode Island. While they tend not to last as long as the other types of earthquakes, the short shock waves associated with them cause more violent ground shaking for the entire region than the other types of earthquakes. Table 16 reflects the magnitude of the significant earthquakes in the region when they happened. No major earthquakes have occurred in Richmond but the resulting damage it could produce makes it a hazard worth noting.

Table 16 Historic Seismic Activity in or near Rhode Island

Date	Epicenter	Epicenter Magnitude	Mercalli Intensity Level
02/28/25	St. Lawrence River Region	7	Intensity level V shock effects were felt on Block Island. Intensity level IV effects were felt in Charlestown. The total area affected by this earthquake was over 5,000,000 sq. km.
11/01/35	Quebec, Canada	6.25	Intensity level IV shock effects were felt on Block Island and at Providence and Woonsocket. The total area affected by this earthquake was about 2,500,000 sq. km.
6/10/51	North Kingstown, Rhode Island	4.6	Felt in Rhode Island
10/16/63	Massachusetts Coast	4.5	Intensity level V shock effects felt at Chepachet. Other places in the Northern Rhode Island felt shock effects with less intensity.
06/14/73	Western Maine	5.2	Intensity level IV shock effects were felt at Charlestown. Intensity level I - III shock effects were felt at Bristol, East Providence, Harmony, and Providence. This earthquake was felt over an area of 250,000 sq. km.
03/11/76	Near Newport, Rhode Island	3.5	Intensity level VI shock effects felt throughout Southern New England. This earthquake has the distinction of being the largest earthquake to originate in Rhode Island.

[47] Rhode Island Emergency Management Agency (RIEMA) Rhode Island 2014 Hazard Mitigation Plan Update

Date	Epicenter	Epicenter Magnitude	Mercalli Intensity Level
04/20/02	Plattsburgh, New York	5.2	Intensity level II to III shock effects felt throughout Rhode Island.
6/23/10	Ontario-Quebec	5.0	Felt throughout Rhode Island.
2011	Rhode Island	0.9	Felt locally
2012	Rhode Island	1	Felt locally
2013	Kingston, Rhode Island	Unknown	Felt locally
11/8/2020	Buzzards Bay, Massachusetts	3.6	Felt in Connecticut, Massachusetts, and Rhode Island.
9/19/2021	Block Island, Rhode Island	2.6	Felt in New Shoreham, Rhode Island (felt throughout southern RI and eastern CT)

Source: United States Geologic Survey

The inconsistency and low occurrence rate of earthquakes in Richmond puts earthquake events at a **Low** frequency - 1%- 10% probability within 100 years.

EXTENT

The largest earthquake event in Rhode Island's history, with a magnitude of 4.6, occurred on June 10, 1951, near North Kingstown. Earthquakes with a magnitude of four or less are classified as light and result in minimal structural damage. The seismicity or seismic activity of an area refers to the frequency, type and size of earthquakes experienced over a period of time. Earthquakes are measured with a seismometer. Rhode Island is considered to be in an area with low seismic activity but is still susceptible to earthquake events with a MMI greater than V. It is anticipated that any earthquakes in the Richmond area are felt locally, and not be greater than a 3.0 on the Richter Scale. Considering the location of historical earthquake epicenters, it is anticipated that earthquake events in the Richmond area are more likely to be felt as a result of an earthquake that occurs in the surrounding region rather than originating within Rhode Island and to not exceed a magnitude of 3.0 on the Richter Scale. Earthquakes with a magnitude of 3 or lower are mostly imperceptible (too low to recognize) and magnitude 7 earthquakes cause serious damage over large areas.

Although earthquakes are not considered to be a major problem in the Northeast United States, they are more prevalent than one might expect. Table 16 presents historical seismic activity for Rhode Island. It highlights the earthquake epicenter, the Richter magnitude at the epicenter, and the Mercalli Intensity Level. Richter magnitudes are technical quantitatively based calculations that measure the amplitude of the largest seismic wave recorded. Richter magnitudes are based on a logarithmic scale and are commonly scaled from 1 to 8. See the graphic below. The higher the magnitude on the Richter Scale, the more severe the earthquake. Mercalli intensity levels are based on qualitative criteria that use the observations of the people who have experienced the earthquake to estimate the intensity level. The Mercalli scale ranges from I to XII. The higher the intensity level on the scale, the closer the person is to the epicenter.[48]

[48] Michelle Wood. "UPSeis: An Educational Site for Budding Seismologists," 21 May. 1997, 5 January 2004. http://www.geo.mtu.edu/UPSeis/intensity.html.

Earthquake Magnitude Scale

Magnitude	Earthquake Effects	Estimated Number Each Year
2.5 or less	Usually not felt, but can be recorded by seismograph.	Millions
2.5 to 5.4	Often felt, but only causes minor damage.	500,000
5.5 to 6.0	Slight damage to buildings and other structures.	350
6.1 to 6.9	May cause a lot of damage in very populated areas.	100
7.0 to 7.9	Major earthquake. Serious damage.	10-15
8.0 or greater	Great earthquake. Can totally destroy communities near the epicenter.	One every year or two

Source: Michigan Tech University

The committee recognizes that the potential for an earthquake to strike the Town of Richmond is low, but the hazard could afflict town wide damage, causing; power outages, building collapses, water main breaks, dam failures, gas leaks, fires and injuries or deaths. Buildings that are most at risk from earthquakes are the old masonry buildings and large structures such as those in the Carolina Village Historic District.

Similar to tornadoes, the low chance of strong earthquakes occurring in Richmond put the damage potential rating at **Medium** - 50 % of property could be damaged and possible injuries/ loss of life. Earthquakes do have a wide range of impacts including life safety, property damage, dam failure, and damage to businesses, all of which could have subsequent impacts on the community.

PROBABILITY OF FUTURE OCCURRENCE

The inconsistency and low occurrence rate of severe earthquake events in Richmond puts the probability of future occurrence as **Unlikely** - will occur in intervals greater than 50 years.

3.2.9 BRUSHFIRE

DESCRIPTION

A brushfire is a fire burning in vegetation that is predominantly shrubs, brush, and scrub growth.[49] Favorable fire conditions arise from extended periods of hot, dry weather and accumulated vegetation. While wildfires are generally associated with thousands of acres of trees burning, brushfires tend to be smaller, confined to the understory, and manageable.

Various natural (i.e., lightning) and human actions (i.e., campfires or auto accidents) can ignite brushfires. Fuel (dry grasses, leaves, and dead trees), topography and weather (wind conditions and humidity) will dictate the extent of a brushfire.

Sam Evans-Brown, 2015

[49] National Park Service, USDA Forest Service http://www.fs.fed.us/nwacfire/home/terminology.html

Climate change increases the drier season and warmer temperatures, leaving Richmond more at risk for drought, leading to drier vegetation and increased risk of brushfire.

LOCATION

When drought conditions are present, the brushfire threat increases – especially in unimproved land. Approximately 6,835 acres of unimproved land in Richmond are protected under the Farm, Forest, and Open Space Program. That protected land and the rest of the unprotected land in Richmond outside the program is at increased risk of brush fire.[50] The natural resource protection areas are largely in the southwest and north central part of Richmond.

Appendix A: Maps includes a map of fuels coded by their impact on flame height in Richmond provided by the Rhode Island Department of Environmental Management, specifically those that have the potential to produce flame lengths of six feet or greater. While some of the red, or more severe height areas are populated by phragmites, meaning they are within wetlands, there is still a risk of higher flames in the area. Higher flames are more dangerous to combat, and while unrelated to the spread of fire (which is related to the exposure to wind and topography alongside fuel sources) higher flame heights have the potential to cause significant damage.[51]

Several of the fire gates in the area (an estimated 10 gates in the Carolina Management Area) are located on Rhode Island Department of Environmental Management land, which means upkeep is outside of the Town's jurisdiction. Local fire officials have also reported large swaths of Gypsy Moth damaged or destroyed trees in this conservation area. Upon visual inspection, many of the gates appear to be blocked by downed trees restricting access to the corridors that would need to be accessed for fire suppression. Partnerships with landowners and caretakers are necessary for a unified approach to combating the risk of brushfire in the area.

HISTORY

Richmond has been fortunate never to have any of these large fires devastate the town, however there is potential for all of them to occur. In May 1951, a major forest fire started in West Greenwich and burned through 7,000 acres before it was brought under control on Spring Street in Hope Valley that same day.[52] Despite being spared most large-scale historical fires, according to the RI Department of Environmental Management Forest Fire Program Coordinator, Richmond has a significant fire history and potential. Historically, smaller brushfires (up to 3-4 acres) have burned through vegetated areas. Some of the smaller brushfires were at the Carolina Management Area, and some were on private property. Brushfires usually occur at least 3 times a year during the spring and summer months. However, due to improved fire prevention and firefighting efforts in the area, the brushfires are quickly extinguished.

The Rhode Island Department of Environmental Management tracks the number of wildfires occurrences in the state and provided data for the Richmond area for 2020 and 2021. Table 17 shows the reported brushfires for Richmond in these years, as well as several other aspects about damage to structures and people

[50] Richmond Comprehensive Community Plan, 2021

[51] Forest Fire Program Coordinator, RI Department of Environmental Management

[52] Hope Valley Wyoming Fire District. http://www.hvwfd.org/content/firecompany

Table 17 Verified Brushfires in Richmond, 2020 and 2021

Year to Date Totals 2021			
Fires	101	Acres	178.1
Prescribed	1	Acres	0.8
	Residential	Outbuilding	Commercial
Threatened	32	21	0
Damaged	4	2	0
Destroyed	0	4	0
Injuries	3	Fatalities	0

Year to Date Totals 2020			
Fires	113	Acres	85.3
Prescribed	0	Acres	0
	Residential	Outbuilding	Commercial
Threatened	34	21	1
Damaged	1	0	0
Destroyed	0	2	0
Injuries	4	Fatalities	1

Source: RIDEM

Though not common or often pervasive, brushfires still have a significant impact on the area when they do occur.

The inconsistency and low occurrence rate of wildfires in Richmond and the quick response rate of local emergency services puts wildfire events at a **Low** frequency - 1%- 10% probability within 100 years.

EXTENT

Greater wildfires that cover thousands of acres of land are classified by their size and progression. Once a wildfire has been detected and the area assessed, the wildfire is assigned one of the following categories from lowest to highest: Category 1 (incipient- initial), Category 2 (growing and threatening), Category 3 (major aggressive fires), Category 4 (major aggressive fire of at least 5,000 acres expanding at 400 acres per hour), or Category 5 (major very aggressive fire of at least 16,000 acres expanding at 1000 acres per hour or more).[53] These categories may change as the wildfire continues to burn. Due to the small land area, lack of available fuel, and quick response by area fire departments, brushfires are not expected to burn through more than a couple of acres at most.

The Rhode Island Department of Environmental Management's Division of Forest Management updated the State's Forest Fire Program in 2020, giving local towns the most-up-to-date information on how to prepare, respond, and fund fire-related protection programs. The plan provides educational and training programming, equipment and work assistance, and community adaptation methods in case of wildfire events. The Forest Fire Program plan is a crucial resource for Richmond fire hazard mitigation tactics as it falls in-line with state protocols.[54]

A large brushfire in Richmond could destroy large tracts of forest, homes, and utility lines affecting power, internet, and phone service. Smoke inhalation could cause breathing problems to residents. Because of

[53] U.S. Department of Agriculture, https://www.fs.usda.gov/detail/cibola/landmanagement/resourcemanagement/?cid=stelprdb5368839.

[54] Rhode Island Division of Forest Environment State Forest fire Plan, 2020.

this, the damage potential for brushfires in Richmond is rated as **Medium** - 50 % of property could be damaged and possible injuries or loss of life.

PROBABILITY OF FUTURE OCCURRENCE

There has been an increased interest in the topic of wildland fire in Rhode Island as a result of recent forest pests' outbreaks that have left approximately 226,880 acres of defoliated oak forest across the western and southern part of the state (Ricard, 2017)[55]. Fire managers, natural resource and land managers have recognized the potential for catastrophic wildland fire because of this increased fuel loading. Warmer temperatures due to climate change and the abundance of burnable fuel in Richmond puts the probability of future occurrence as **Highly Likely** - will occur in every 1-5 years.

3.2.10 GEOMAGNETIC STORMS (SOLAR FLARES)

DESCRIPTION

"Geomagnetic storms — a type of space weather that creates disturbances that affect the planet's magnetic field—have the potential to cause significant damage across the globe with a single event. Severe geomagnetic storms can disrupt the operation of electric power transmission systems and critical infrastructures relying on space-based assets. A geomagnetic storm that degrades the electric power grid would affect not only the energy sector but the transportation, communications, banking, and finance sectors, as well as government services and emergency response capabilities".[56]

LOCATION

Northern locations, such as Canada and the United States are particularly vulnerable to geomagnetic storms. High-tension lines and communication towers throughout town are at risk in Richmond.

HISTORY

While there is no history of geomagnetic storms in just Richmond, there is a low probability for future occurrence. Geomagnetic storms are broad reaching and usually impact global hemispheres. A minor storm would result in weak power grid fluctuations and cause minimal damage.

Geomagnetic storms have a **Low** frequency - 1%- 10% probability within 100 years.

EXTENT

The National Oceanic and Atmospheric Administration (NOAA) monitors space weather and has developed scales listing potential space weather impacts. Space weather scales have five levels, from minor to extreme. If a geomagnetic storm were to occur in Richmond, it is anticipated to be at the G-1 level that results in weak power grid fluctuations.

[55] Ricard, P. (2017). "Gypsy Moth in Rhode Island 2014-2016" 2017 Update. Rhode Island Department of Environmental Management. http://www.dem.ri.gov/programs/bnatres/forest/pdf/health/17gmr.pdf

[56] Department of Homeland Security https://www.dhs.gov/xlibrary/assets/rma-geomagnetic-storms.pdf

Table 18 NOAA Space Weather Scales

NOAA Space Weather Scales

Category		Effect	Physical measure	Average Frequency (1 cycle = 11 years)
Scale	Descriptor	Duration of event will influence severity of effects		
Geomagnetic Storms			Kp values* determined every 3 hours	Number of storm events when Kp level was met; (number of storm days)
G 5	Extreme	Power systems: widespread voltage control problems and protective system problems can occur, some grid systems may experience complete collapse or blackouts. Transformers may experience damage. Spacecraft operations: may experience extensive surface charging, problems with orientation, uplink/downlink and tracking satellites. Other systems: pipeline currents can reach hundreds of amps, HF (high frequency) radio propagation may be impossible in many areas for one to two days, satellite navigation may be degraded for days, low-frequency radio navigation can be out for hours, and aurora has been seen as low as Florida and southern Texas (typically 40° geomagnetic lat.).**	Kp=9	4 per cycle (4 days per cycle)
G 4	Severe	Power systems: possible widespread voltage control problems and some protective systems will mistakenly trip out key assets from the grid. Spacecraft operations: may experience surface charging and tracking problems, corrections may be needed for orientation problems. Other systems: induced pipeline currents affect preventive measures, HF radio propagation sporadic, satellite navigation degraded for hours, low-frequency radio navigation disrupted, and aurora has been seen as low as Alabama and northern California (typically 45° geomagnetic lat.).**	Kp=8	100 per cycle (60 days per cycle)
G 3	Strong	Power systems: voltage corrections may be required, false alarms triggered on some protection devices. Spacecraft operations: surface charging may occur on satellite components, drag may increase on low-Earth-orbit satellites, and corrections may be needed for orientation problems. Other systems: intermittent satellite navigation and low-frequency radio navigation problems may occur, HF radio may be intermittent, and aurora has been seen as low as Illinois and Oregon (typically 50° geomagnetic lat.).**	Kp=7	200 per cycle (130 days per cycle)
G 2	Moderate	Power systems: high-latitude power systems may experience voltage alarms, long-duration storms may cause transformer damage. Spacecraft operations: corrective actions to orientation may be required by ground control; possible changes in drag affect orbit predictions. Other systems: HF radio propagation can fade at higher latitudes, and aurora has been seen as low as New York and Idaho (typically 55° geomagnetic lat.).**	Kp=6	600 per cycle (360 days per cycle)
G 1	Minor	Power systems: weak power grid fluctuations can occur. Spacecraft operations: minor impact on satellite operations possible. Other systems: migratory animals are affected at this and higher levels; aurora is commonly visible at high latitudes (northern Michigan and Maine).**	Kp=5	1700 per cycle (900 days per cycle)

* Based on this measure, but other physical measures are also considered.
** For specific locations around the globe, use geomagnetic latitude to determine likely sightings (see www.swpc.noaa.gov/Aurora)

Earth-orbiting satellites can be impacted by geomagnetic storms, creating disruptions in communication satellites, Global Positioning Systems (GPS) accuracy, and radio communication. The power grid can be also disrupted by geomagnetic storms. Geomagnetically induced currents can flood and potentially damage transformers that send energy throughout the grid. If a backup system (i.e. generators, or bypass) is not in place, power cannot be restored until the fried components are fixed. [57]

Though unlikely, geomagnetic storms have a damage potential rating of **Medium** - 50 % of property could be damaged and possible injuries or loss of life because of their possibility of widespread damages to communications and technology.

PROBABILITY OF FUTURE OCCURRENCE

The probability of future occurrence or Geomagnetic storms is **Unlikely** - will occur in intervals greater than 50 years.

CHAPTER 4: RISK ASSESSMENT

This chapter presents the natural hazard risk assessment performed for the Town by the Committee. The purpose of the assessment is to identify those facilities and population at risk from natural hazards and to gauge the potential level of impact on people and property. This chapter will also assess the level of risk posed within the Town and consider the specific concerns based on the critical facilities and most at-risk populations.

[57] NOAA Space Weather Prediction Center http://www.swpc.noaa.gov/phenomena/geomagnetic-storms

The Assessment has six primary components that culminate in the Risk Assessment Matrix (Table 2). The primary components include the following: Facilities Inventory (Section 4.1), Hazard Mitigation Mapping (Section 4.2), Fiscal Impact Analysis (Section 4.3), Built Environment (Section 4.4), Population Impact Analysis (Section 4.5), Natural Environment (Section 4.6) and Vulnerability of Future Structures (Section 4.7).

Data was gathered from a multitude of sources including the Town's Geographic Information System (GIS), the U.S. Census Bureau, an anonymous community-wide survey, and several previous Richmond and Rhode Island based plans and documents.

4.1 Facilities Inventory

The first step in the assessment process was to create the inventory of facilities of special concern to the Town. This list includes facilities that would be places of shelter or resources during a hazard event, or places that provide care and services that would be crucial for the Town to operate during a hazard event. Community assets are also listed as places of Town importance whether culturally or recreationally. These places are significant to the culture or community of Richmond.

The RHMC identified the following as critical infrastructure and community assets: Flood Prone Drainage Systems, Dams, Care Facilities, Fire and Police Stations, Town Hall, Town EOC, Shelters, and Communication Infrastructure, Electrical Facilities, and Water Pump Stations. Recreational Facilities and Historic Resources were included as community assets. These inventories can either be found depicted on the map presented in the Appendices.

4.2 Hazard Mitigation Mapping

The Town's GIS database, including parcel data and FEMA flood zone information were utilized to complete the spatial assessment. The use of this system allowed the RHMC to estimate potential fiscal and population impacts for individual parcels and allowed for an analysis of the spatial relations between variables including the critical facilities and flood-prone areas.

The final output of this exercise is the Town of Richmond Critical Facilities map in Appendix A: Maps. The focus of the maps is not to duplicate the spatial information generated through the inventory process but rather to present the location of the identified risks as they relate to the Town's response facilities in a spatial manner.

4.3 Fiscal Impact Analysis

The Town of Richmond's parcel data and FEMA's one percent annual chance floodplain data were utilized to generate estimates of potential fiscal impacts from flooding hazard and other water-related events. The information utilized from the 2021 Richmond CCP, 2018 Buildout Analysis, and GIS data included the assessed building values, land usage, and unit counts. The analysis showed that Richmond is comprised of 24,903 acres of land, with at least 13,580 acres[58] in the regulatory floodplain spread throughout the Town.

A flooded home on the Wood River

[58] This value is base don the GIS analysis of parcels within the SFHA.

Table 19 displays potential damage estimates of property values of parcels that are located wholly or partially within the Town's Special Flood Hazard Area (SFHA). Using parcels that are located wholly or partially within the Town's SFHA means that the data considers all values of buildings, even those that may not be impacted by a flooding event. The parcel information, using the best available data, provides the number of parcels in the SFHA, and values of the buildings on each property. Land value was not considered for this exercise.

The value of the existing building stock within the SFHA is approximately $70 million.[59] The most expensive property in the SFHA belongs to the Richmond Elementary School whose building is valued at $6.7 million. (Note: the school building itself is not in the SFHA). The most valued private structure in the SFHA is a residential structure in the East Wyoming area valued at around $1 million. There are several private structures in the neighborhood with similar values, some of which are in or near the SFHA, putting them at risk or close to being at risk. A destructive flood could impact the entire building stock within the SFHA, though damages would likely be a percentage of total assessed value.

Table 19 Assessment of Building Values within Floodplains[1]

Zoning	Number of Parcels	Parcels in SFHA	% in SFHA	Assessed Bulding Value of Parcels in SFHA
Residential	2550	463	18.1%	$55,623,100
Commercial	652	51	7.8%	$9,555,100
Industrial	49	21	42.8%	$2,646,800
				$67,825,000

Source: Town GIS Data Analysis

To account for climate change, this analysis also considers FEMA's 0.2% annual chance floodplain (500-year flood) data. This area is inclusive of the 1% annual chance floodplain (100-year flood), and therefore encapsulates parcels that are already captured within the SFHA alone. Sixty-nine parcels containing buildings fall within this zone, with a total building value at more than $11 million. Though buildings in the 500-year flood zone that are outside of the 100-year zone do not require flood insurance, the area of impact can be used as a proxy for future flooding under climate change since the chance for extreme precipitation events is predicted to increase.

Hazards that impact building value and cause significant damage will also notably have an impact on the normal economic schedule of Richmond, resulting in Town-wide fiscal losses to businesses and individuals. Beyond building values as a measure of loss for a potential flood, more qualitative data such as the potential for loss of life, loss of utilities and services, or loss of tax base for future town operations become important factors in assessing risk. Should any of the properties forming the tax base be destroyed by a hazardous event, a causal effect would be those property owners whose parcels remain intact would carry and increased financial burden with regards to property taxes. It is an important course of action for the Town to protect both lives and property from natural disasters. However, as Richmond's population grows, the burden of protecting lives and property grows.

The loss of Town utilities and services also presents a potential causal effect of damage. The loss of critical facilities including long-term care, health, and group home facilities, as well as schools, water and energy facilities would negatively impact the Town's normal economic and social processes and cause further need of emergency shelters and resource distribution.

[59] This number comes from the assessed building value of all parcels within the SFHA.

4.4 BUILT ENVIRONMENT

According to GIS analysis and 2021 Assessor's data, Richmond has 2,924 buildings with a total value of $579 million. Approximately 95% (2,770) of the existing building stock is associated is residential, not accounting for future development. Of the residential buildings, 50.5% of housing units were built in or before 1970. Older units may not be as durable or up to safety standards and are therefore more susceptible to damage in a hazard event.[60]

The RHMC identified the critical infrastructure in the section below, and in Table 20 Critical Infrastructure and Community Assets. The list includes Dams (20), Care Facilities (10), Critical Municipal Facilities (20), Schools (8), and Historic Resources (7). All these important community resources have the potential to be affected by a natural hazard. The magnitude of the losses would be dependent upon the type, location, and extent of the hazard.

The Town's zoning laws help dictate future development while maintaining Richmond's rural character. Strict enforcement of building codes and new regulations as required will lessen potential damage caused by a natural hazard event. The codes range from building codes and design standards to zoning regulations. The Town's zoning ordinances account for a review of developments proposed in FEMA floodplain areas and stormwater management regulations. The Town uses the Rhode Island State building code to determine related hazard measures such as snow load and wind speed variables in building structures.[61] For the purpose of this plan, it is difficult to ascertain the amount of damage caused by a natural hazard because the damage will depend on the hazard's extent, location, and severity, making each hazard event unique; knowing that the Town has preventative actions written into its codes and ordinances means Richmond is taking an active stance on preparing for hazard scenarios.

As described in the Hazard Profiles above, buildings have a high potential to be impacted by floods in Richmond. The base flood is an event that has a one percent probability of happening in any given year and is the storm event used to identify the flood zones which impact zoning and building requirements throughout the Town. Using the Town's GIS data, it was determined that there are total of 69 structures within Town's SFHA (3 of which located in the 500-year flood-zones). The impact on buildings in the flood zone (both 100-year and 500-year) was discussed in the fiscal impacts section (4.3). Buildings also have the potential to be impacted by less frequent hazards such as earthquakes, tornadoes, and wildfires, as well as suffer the impacts of more common occurrences such as hurricanes, Nor'easters and winter storms.

Hazard mitigation is a look into the future, and an analysis of the built environment would be remiss if not to include the possibility of future development in the area. The zoning and subdivision ordinances enacted by the Town help to ensure all proposed development is in line with mitigation standards, but it is of note that infill development currently planned by the Town could have an impact on an area's vulnerability to flooding, even if unintentional. New development will be discussed further in Section 4.7.

In the case of wildfire, the percent of structures located in higher risk flame areas have the potential to suffer the most damage. The integrity of these buildings is dependent on building construction and implementation of Firewise Principles, so enforcement of State building codes is key to protecting structures from major damage in a brushfire or wildfire event.

[60] 2019 American Community Survey Selected Housing Characteristics.

[61] RISBC-1 Rhode Island Building Code, 2022.

4.5 POPULATION IMPACT ANALYSIS

Natural hazards pose a risk to the population of Richmond: the economy, government functions, and recreation.

According to the 2020 US Census, there are 3,090 housing units in Richmond supporting a population estimate of 8,020. Of note, around 89.6% of the housing units are owner-occupied, leaving 10.4% of units as renter-occupied, and more susceptible to hazard damage and consequences because of ownership status reflected in insurance policies. The American Community Survey notes several houses in 2019 with no cellular service available. While the number is small (18 total), it reflects the mostly rural nature of Richmond that could be severely impacted if cellular service or power services are interrupted due to a hazard event such as a hurricane, thunderstorm, winter storm, etc., all of which are likely to occur in Richmond. Several members of the public noted concerns about emergency-warning systems coupled with responses regarding a better-equipped power grid.[62] Ensuring that emergency hazard information can get to residents in time for preparation or response to an event is a crucial concern within the Town. Without a resilient or back up communication system, members of the public could be left stranded in hazard events without resources or knowledge.

Of the total population, another vulnerable group is residents 65 years or older, who make up 14.9% of Richmond.[63] Along with the younger population of Richmond (19% are 18 years or under), senior residents are more vulnerable in hazard events for a multitude of reasons, including lower levels of mobility. Ensuring clear communication and emergency response system is key to protecting senior residents in the long-term, and ensuring the town is aware of where senior residents are located could aid in the response to a hazard scenario.

In addition to private wells which serve most of the population, there is limited water service in the Town. The Richmond Water Department supplies drinking water to residential customers, commercial customers, industrial customers, and schools. The privately run Shannock Water District in Richmond and Charlestown provides water to an estimated 90 households including several low to moderate income housing units, and Kenyon Industries.[64] The Town established minimum house lot areas and setbacks which helps to reduce the impact of drought on the water supply that serves residents, services, and businesses. Several residents voiced concerns about towns support of safe drinking water, especially in the case of private wells.

The group homes in Richmond provide residential services and host around 24 beds. Additionally, there are less than 20 people in residential noninstitutional treatment centers.[65] See Appendix C: Critical Facilities for a list of these care facilities. These services have established their own emergency plans but knowing where the population is located helps improve first responder actions, similar to the response protocols for senior residents.

Chariho Middle School located on Switch Road is the primary emergency shelter for the Town. Richmond Elementary School on Kingstown Road can be used as a backup shelter. Maintaining access to both facilities during a hazard event is crucial. Neither of these buildings is located in a SFHA but roads leading to the shelters are crossed by streams that may cut off access. Robust response and communication

[62] Town of Richmond Natural Hazard Mitigation and Climate Adaptation Survey, 2021

[63] U.S. Census Data, 2020.

[64] Richmond Comprehensive Community Plan, 2021; and Richmond Water Department

[65] US Census Bureau, 2020

systems will allow for better communication with residents who may rely on access to these shelters in a hazard situation.

In case of wildfire or brushfire, both structures and people are at risk. Depending on the strength and speed of the fire, firefighters are an extremely vital but vulnerable population, which is why tracking the layout of Richmond's fuels and possible fire areas is important. Areas with the potential for higher flame lengths due to the abundance of fuels will also have potential fires that are more difficult to suppress, causing more risk for the firefighters responding to the event.

4.6 Natural Environment

Richmond plays a much larger role than most communities in providing recreation and open space facilities to Rhode Islanders and people from other states. Situated near the ocean and I-95, with small villages and thousands of still rural upland acres, the southwest corner of the state has long been a vacation and recreation spot. Richmond's rivers and ponds provide excellent areas for canoeing and fishing. Forested areas offer great hunting, walking, and hiking trails to observe wildlife and rural scenery. The many farms throughout town also offer rural views and vistas. Farming activities and accessory uses also support economic development in Town through agritourism.[66] To protect these natural resources, the Town and The Wood-Pawcatuck Watershed Association abide by DEM guidelines regarding open space buffer on riparian lands adjacent to the Wood River to protect water quality.

Preservation of the forested areas in Richmond is important not only for maintaining community character and providing habitat for wildlife, but also for protecting water quality. Undeveloped land absorbs water and traps sediments and pollutants from runoff. This is especially important in a town where most of the residents rely on well water for drinking as discussed previously.

Although nearly 47% of Richmond's land has some official recreation, open space, or conservation status, most of this land is not restricted to those uses. Land under the jurisdiction of RIDEM, the Audubon Society, The Nature Conservancy, the Town, and open space in cluster or conservation development subdivisions and residential compounds may reasonably be considered permanently protected land. However, large private landholdings, whether owned by non-profit organizations, commercial enterprises, or participants in the State's Farm Forest and Open Space Program, cannot be assumed to remain permanently as recreation or open space land. In addition to the Town's protected 8,280 acres (6,835 of which is under the Rhode Island Farm, Forest and Open Space (FFOS) Program) of land), there are approximately 800 acres of private properties with a recreational business, including golf courses, campgrounds and fair grounds.[67]

Protecting the natural environment spans beyond just conservation for conservation's sake, especially as climate change has the potential to alter habitats and change the agricultural capacity of land. The natural environment plays a critical role in natural hazard mitigation by absorbing floodwaters, reducing extreme heat, and filtering pollutants. Undeveloped lands and the beneficial ecosystem services they provide can be highly vulnerable to drought, extreme wind, wildfire, and other aspects of hazards. Damage to local ecosystems or water may have direct or indirect impacts on the wellbeing of the water supply or on the economic benefit that the open space and agricultural lands in Richmond bring to the community. Furthermore, as climate change influences wetter and warmer spring seasons, many communities have seen an increase in tick and tick-borne diseases. In order to mitigate this secondary or indirect impact of

[66] Richmond Comprehensive Community Plan, 2021

[67] Richmond Comprehensive Community Plan, 2021

climate change, Richmond officials should increase public education about how to minimize exposure, conduct routine tick checks, and send a tick for analysis after receiving a bite.

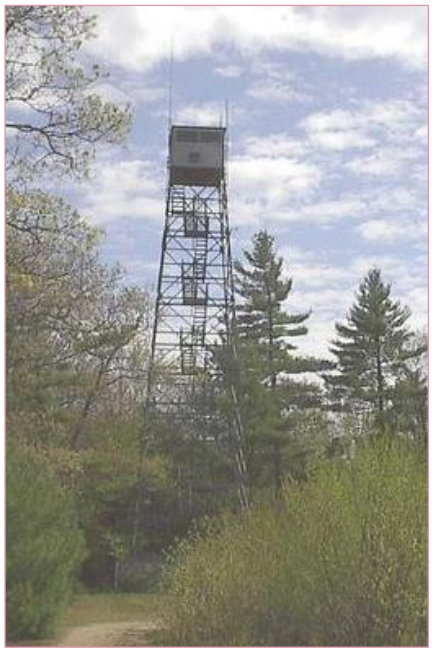
Joining in on a wildfire protection plan in partnership with the State, pursuing key land protection initiatives, keeping up with drainage infrastructure maintenance and cleaning, and enforcing environmental and natural resource-based development regulations remain key actions for the residents and visitors to maintain the positive impact of the natural areas in Richmond.

4.7 Vulnerability of Future Structures

Enough land is available to meet Richmond's near-future development needs for both residential and non-residential structures. Close to 90% of the town is zoned for residential uses, nearly 11,000 acres of which could potentially support additional residential development.[68] Concentrating new development in existing villages, encouraging non-residential development, and establishing "Growth Centers" will help the Town handle new growth. Future growth will likely be centered near water lines or a town center.

Wyoming is the area of town where infill and redevelopment are actively being encouraged as of 2022. Other villages such as Shannock, Kenyon and Alton are areas that could also support infill development, but as of right now are not formally identified as Growth Centers. Any possible future development will need to go through the rigorous zoning, building, and subdivision code processes that exist to ensure legality and safety of new development, but even with the codes in place new development is still at risk for incurring unexpected issues in the face of hazard events.

New development will especially need to be resilient in the face of climate change. As the possibility of heavier precipitation, extreme cold and heat, and more severe or unpredictable storms occur, so will the necessity for increased building standards and the further consideration of development locations. Beyond considering the location of new developments in the SFHA, developers will need to grapple with wind-related hazards, the possibility of wildfires in undeveloped land, and the access of emergency response teams in case of a hazard event to the new development site. The Town has codes and ordinances in place to promote safe development, though the impact of climate change exacerbates the need for careful consideration.



Shannock Hill Communications Tower

4.8 Critical Facilities and Risk Matrix

The matrix below (Table 20 Critical Infrastructure and Community Assets) represents the culmination of the critical facilities inventory and risk assessment process. Its purpose is to gather all the pertinent results in one place for ease of presentation and to serve as a starting point for discussion of specific mitigation actions. It not only lists the specific areas of concern but provides location information, summarizes the applicable hazard, problem, and mitigation benefits. A more detailed description of critical facilities and their location is listed in Appendix C: Critical Facilities and shown on the map in Appendix A: Maps.

[68] Richmond Buildout Analysis, 2018

Table 20 Critical Infrastructure and Community Assets

AT RISK	LOCATION	HAZARD	PROBLEM
I. Dams	A. White's Pond B. Tug Hollow Road Pond C. Bailey D. De Coppet Pond E. Tanner Pond F. Tug Hollow Pond G. Carolina Trout Pond H. Wells Pond I. Lillibridge Pond J. Haberek Farm Pond K. Duck Pond L. Wood River Junction M. Woodville Pond N. Barberville Pond O. Alton Pond P. Hope Valley Mill Pond Q. Wyoming Upper R. Horseshoe Falls S. Kenyon Mill Pond T. Carolina Pond	Flooding Structural damage due to earthquake.	Dam failure could lead to damaged roads, flooded houses, and economic loss. Browning Mill Pond in Exeter (not noted here) is in good shape but would cause the most damage to Richmond if it failed.
II. Care Facilities	A. State of RI – Group Home B. Hillsdale Park–Concentrated Elderly population C. Bridges, Inc. private, non-profit organization, certified provider of residential services to people who have developmental disabilities. D. Bridges, Inc. Group home, Developmental disabilities E. State of RI – Group Home Elderly residents F. State of RI – Group Home Cognitive delays G. Perspectives Corporation Cognitive delays H. State of RI – Group Home Cognitive delays – Adult I. Privately run – Group Home Cognitive delays – Adult J. State of RI –The Providence Center for Women	All hazards	Special needs populations that may need assistance during hazard events. Ambulatory needs for remote areas Poor housing construction Need to anticipate needs of clustered group homes

AT RISK	LOCATION	HAZARD	PROBLEM
III. Critical Municipal Facilities	A. Shannock Hill Radio Communication Tower B. EOC/Public Works Radio Communication Tower C. Town Hall D. Town EOC/Public Works E. H.L. Arnold Fire & Safety Complex F. Hope Valley – Wyoming Fire District Station 1 (main building in Hopkinton) G. Hope Valley- Wyoming Fire District Station 2- Alton H. Richmond-Carolina Fire District Station 2 I. Richmond-Carolina Fire District Station 3 J. Hope Valley Ambulance K. Police Station on Main Street (1st floor of Community Center) L. State Police Barracks M. Chariho Middle School (Primary Emergency Shelter) N. Community Center (Cooling and Heating Center) O. Richmond Elementary School P. Washington County Fairgrounds (Emergency animal shelter area) Q. Various Cell Towers R. Water Tower 1 @ Old Kenyon Road – Primary Tank S. Water Tower 2 – Secondary Tank T. Municipal wells (2) and pump station	All hazards	Depended upon for responding to all natural hazard events. Some aspects critical for emergency response. Potential loss of physical access, power supply and critical systems, thus hindering the governmental and emergency response to natural hazard events. Also may cause a long-term halt to normal Town processes.
IV. School Inventory	A. Meadowbrook Waldorf School B. Richmond Elementary School (Backup Shelter) C. Chariho Regional High School D. Chariho Regional Middle School (Primary Emergency Shelter) E. Chariho Area Career & Technical Center F. Chariho Alternative Learning (CAL) Academy G. Chariho Administration Building H. New Hope Preschool (no longer active)	Winter Storm Thunder/Lightning Storm Hurricane/Nor'easter Tornado Geomagnetic Storms	The Chariho buildings that act as shelters are critical during hazard events, and most schools can act as gathering places. Impact on school buildings causes difficulties for parents, students, and employees.

AT RISK	LOCATION	HAZARD	PROBLEM
V. Historic District (year added to National Historic Register)	A. Beaver River Road Historic District (10/25/21) B. Carolina Village Historic District (5/2/74) C. Hillsdale Historic and Archaeological District (11/24/80) D. Shannock Village Historic District (8/4/83) E. Wyoming Village Historic District (Hopkinton and Richmond) (5/2/74) F. John Hoxsie House / Old Kenyon Farm (5/5/78) G. Samuel Clark Farm (2/4/19)	Flooding Winter Storm Lightning Storm Hurricane/Nor'easter	These historic resources, susceptible to property damage, contribute to Richmond's culture, heritage, and general character.

CHAPTER 5: PROGRAMMATIC CAPABILITY ASSESSMENT

5.1 PURPOSE

This capability assessment examines the existing studies, plans, programs, and policies that have incorporated hazard mitigation and other pro-active tools into the Town system. The purpose of the capability assessment is to highlight successes, identify shortcomings, and to lay the groundwork for possible improvement. Richmond recognizes that the inclusion of mitigation initiatives not only benefits the community by reducing human suffering, damages and the costs of recovery, but also helps build and maintain the sustainability and economic health of the Town. Section 5.2 details the Town's existing relevant plans, programs, and policies that were reviewed during the drafting of this plan.

5.2 PRIMARY PLANS AND REGULATIONS

5.2.1 RICHMOND COMPREHENSIVE COMMUNITY PLAN

In 2021, the Town of Richmond updated its Comprehensive Community Plan (CCP). The updated plan was adopted by Town Council in March, 2021, amended later that year, and the amended version was adopted by the Town Council in February, 2022. An update to the Town's 2016 Amended Comprehensive Plan, the 2021 Plan aims to relate future land use to the environmental capacity of the land, safeguard natural and cultural assets, promote the production of affordable housing, and encourage economic development. It addresses land use, housing, economic development, natural resources, services and facilities, open space and recreation, and circulation, with references to the hazard mitigation plan. The Town recognizes the importance of hazard mitigation, its interaction with municipal land use and infrastructure planning, and the need for a comprehensive planning approach which accommodates these interdependencies. The 2021 CCP includes two proposed actions in support of natural hazard mitigation planning and emergency operations planning, including an action to pursue available funding to implement the strategies developed in subsequent iterations of the Richmond HMP.

According to the 2021 CCP, unimproved residential land covers nearly 43 percent of the Town's net land area. Close to 90 percent of the Town is zoned for residential uses. According to the 2018 Buildout Analysis, of this amount, 10,275 acres could potentially accommodate additional residential development. The Future Land Use Map encourages growth centers, such as the Wyoming/I-95 area, to concentrate development and reduce sprawl. Designated growth centers are, for the most part, located outside of flood hazard areas and away from steep slopes, within areas of public water service and fire protection. Therefore, disaster resilience is expected to remain high for new projects. However, parts of the Wyoming/I-95 infill and growth area designated on maps in Appendix A: Maps do intersect with the FEMA 100-year floodplain. New development around Buttonwoods Road and on parcels near Meadow Brook should consider abiding by an increased buffer from the SFHA to reduce risk of future flooding.

5.2.2 LAND DEVELOPMENT AND SUBDIVISION REGULATIONS

The subdivision and land development regulations are one of the Town's primary tools for regulating development in the Town. The purpose of the regulations is to protect the public health, safety, and welfare of the community by ensuring that development respects the natural limitations of specific locals including those presented by natural hazards. The Land Development and Subdivision Regulations have been amended to include references and details to the RI Stormwater Design Manual, reference Low-impact design strategies, and replace "cluster development" with "conservation development". The Town has also adopted a Soil Erosion and Sediment Control Ordinance to limit the negative impacts of development on nearby waterbodies. In future updates to its stormwater regulations and policies, the

Town should consider updating design storm precipitation amounts specified in the local subdivision ordinance and site plan review policy to promote more resilient development and road crossing design.

Article 13 of the Land Development and Subdivision Regulations requires applicants to submit a site context plan, existing conditions and resources plan, and a development overlay plan to help the Planning Board evaluate how the proposed development relates to existing natural and infrastructural features, and how the proposed design serves to protect or enhance existing features.

The Land Development and Subdivision process is overseen by the Town's Planning Board. It is through these regulations that the majority of the coordination between various regulatory siting and design programs actually occurs.

ZONING ORDINANCE

Richmond's Zoning Ordinance, Title 18 of the Town Code, is updated periodically and is enforced by the Zoning Official. The Zoning Ordinance manages growth and land use, directs growth away from known hazard areas, and outlines conservation priorities to maintain and restore protective ecosystems. Many elements of the Town's Zoning Ordinance support the hazard mitigation goals presented in this plan. Ch 8.10 of the Town Ordinance requires permits for all open-air fires and prohibits burning of any type of refuse for the purpose of preventing damage to property and injury to persons and animals and harmful emissions, helping to mitigate the risk of brush fires in Town. Chapter 18.44 is Richmond's Flood Hazard Overlay District, created to minimize property damage, protect watercourses from encroachment, and preserve the ability of floodplains to retain and carry off floodwaters. The flood hazard overlay district includes all areas designated as Zones A, AE, AH, AO, or A99 within the Town of Richmond as identified in the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) dated April 3, 2020, and described in the Washington County Flood Insurance Study dated April 3, 2020.

Chapter 18.37 creates an Aquifer Protection Overlay District to control uses in sensitive groundwater recharge areas. Outside of Wyoming, the Town is largely zoned R-2 and R-3 in order to control residential density while leaving larger areas open for open space. These zones were developed based on science to protect the underlying Wood Pawcatuck Aquifer by increasing pervious areas for groundwater recharge and reducing the potential for use conflicts that might lead to groundwater contamination. This type of zoning, along with the Aquifer Overlay District, protects water quantity and quality by balancing the need for clean drinking water with the demands for new development. By focusing growth into areas of increased density, this zoning pattern protects the important pervious surfaces that reduce stormwater flooding. Chapter 18.41 further incentivizes conservation through land development by allowing the Planning Board to increase the residential density of a "conservation development" where the developer has provided at least 20% more open space than the minimum required, and where the additional open space would benefit the conservation goals of the town.

To be effective, a local zoning ordinance must reflect the Town's goals for the future of the community, including conservation for long term mitigation of natural hazards and the impacts of climate change. Lands that are a high priority for conservation may be designated as open space for environmental protection and/or passive recreation rather than residential or other types of development to ensure protection of the open lands and the Town's rural character that is so important to its residents.

The Richmond zoning ordinance was amended in 2022 to be consistent with the 2021 Comprehensive Community Plan, but will need to be revisited periodically to make efficient use of developable space and ensure permanent protection of critical natural and environmental resources.

PLANNING BOARD

The Town's Planning Board oversees the subdivision and land development regulations which protect the public health, safety, and welfare of the community by ensuring that development respects the natural limitations of specific locals including those presented by natural hazards.

ZONING BOARD OF REVIEW

The Zoning Board of Review grants relief from the terms of the Zoning Ordinance, in the form of special use permits and variances (including use variances and dimensional variances). The Zoning Board of Review also hears appeals of violation notices and other determinations by the zoning enforcement officer.

5.2.3 EMERGENCY MANAGEMENT

Chapter 8.08 of the Town Code establishes the Richmond Emergency Management Agency to plan and coordinate the town's response to any occurrence or imminent threat of widespread or severe damage, injury, loss of property, or loss of life, whether caused by persons or resulting from acts of nature, including but not limited to fire, flood, earthquake, wind, storm, wave action, oil spill or other water contamination requiring emergency action to avert danger or damage, volcanic activity, epidemic, air contamination, blight, drought, infestation, explosion, riot, hostile military or paramilitary action, or an act of bioterrorism. In addition to other tools, the Town utilizes CodeRED Alerts to share information with residents during emergencies. In order to receive notifications, residents have to sign up via the town website and select whether they want alerts to come through as text, email, or phone. The Town currently uses the free version of the program provided by RIEMA, and therefor cannot target the announcements to specific geographic areas or demographic groups. certain groups. However, the program was successfully used to disseminate information during the COVID 19 pandemic.

EMERGENCY OPERATIONS PLAN (EOP)

The Richmond EOP was last updated by the Emergency Management department and approved by RIEMA and FEMA in 2012. Its primary purpose is to plan for the coordination and execution of specific roles, duties and responsibilities of individual municipal emergency response personnel in the event of a disaster or general emergency. Richmond's plan combines mitigation, preparedness, response, and recovery. large portion of the hazard identification, vulnerability, risk, and capability assessments from this HMP update will be used to strengthen the EOP.

Previous versions of the Town's EOP included a framework for handling emergency debris management developed by the Richmond Department of Public Works. After a recent storm, the town set up a debris drop off and collection site at the Town dog park on Buttonwoods Road, and a secondary site at the foot of water tower off of Country Acres Road in the Heritage Trail area. However, there is no formal debris management plan in place.

The next update of the Richmond Emergency Operations Plan and Community Emergency Management Plan (CEMP) should cover short-term response and long-term recovery to address communications, evacuation, and housing necessary for natural hazard identified in this HMP. It should also clearly specify protocols for emergency water delivery and disaster debris management.

5.2.4 CAPITAL IMPROVEMENTS PROGRAM

The Richmond Capital Improvements Program is a five-year plan outlining the Town's expenditures for permanent physical improvements. Proposed investments may include the Town's infrastructure and

facilities such as streets, police and fire stations, and recreation facilities. Integrating specific hazard mitigation activities into the Capital Improvements Program helps with activity implementation.

5.2.5 Stormwater Management Program

The Town of Richmond's Stormwater System Protection ordinance intends to control runoff volumes collected through their drainage swales, culverts, and detention ponds in order to prevent town road flooding and reduce pollution in local waterbodies. This ordinance directs DPW to complete the maintenance.

The Department of Public Works annually maintains the catch-basins and roadside conveyance systems (such as grassy swales, natural channels, ditches, and retention basins). Keeping these areas free of debris maximizes the efficiency of the conveyance system, reducing the potential for street flooding.

Other stormwater management retrofit concepts should be considered for areas with documented drainage-related flooding, such as the routine flooding that occurs in the Valley Lodge neighborhood. RIDOT and the Town of Richmond should work collaboratively to implement stormwater management improvements that would address runoff from I-95 and Route 3, which contributes to flooding in the Valley Lodge area.

5.2.6 Beaver River Watershed Assessment Report

In 2019, the Town of Richmond pursued a restoration and land protection planning assessment of the Beaver River watershed, an around 20-square mile area situated almost entirely within the limits of the Town of Richmond. The report analyzed existing and potential future watershed land-use conditions and impacts and developed prioritizations of both potential restoration projects, actions, and land protection measures to help sustain or improve both watershed water quality and quantity.

Land protection actions can be as important or even more important that restoration projects, particularly in a high-quality watershed such as the Beaver River. The report identified opportunities for land purchase of undeveloped land, conservation restrictions or similar protections, promotion of agricultural best management practices, and updates to Town ordinances and regulations. The prioritization analysis gave preference to parcels with the following natural flood mitigation characteristics: forested land, wetlands, parcels that encompass a portion of the stream or stream buffer, and parcels with important groundwater recharge capacity (HSG A soils). Larger parcels were ranked higher. Restoration opportunities were identified to improve water quality and habitat in the watershed include dam removal, culvert replacement, stream buffer restoration, reforestation, wetland restoration, and streambank/stream corridor restoration. The report's recommendations related to natural hazard mitigation are summarized below:

- Address high priority culverts. RIDOT should be contacted for coordination on upgrading culverts and stormwater runoff on Route 138 – Kingstown Road.
- Reforestation of cleared lands is an effective way to improve habitat, reduce runoff and increase groundwater recharge, and cool streams. There are 17 areas ranked as high priority for reforestation, for a total of almost 108 acres in the watershed.
- Wetlands provide important habitat in the watershed, as well as other ecosystem functions such as flood control, filtering nutrients, and for forested wetlands, cooling surface waters. There are 3 areas (map block lots 07E/020-009, 07E/020-010, and 07E/020-000) currently ranked as high priority for reforestation and wetland restoration. These small parcels are all in close proximity southeast of the Beaver River Golf Club, for a total of almost 2.5 acres in the watershed.

- Land protection - This analysis identified 4 high priority parcels in Richmond for land acquisition – two on Hillsdale Rd, one on Kingstown Rd., and one on 123 New London Turnpike. An additional 2 priority parcels on Shannock Village Rd and 343 Kingstown Rd. were identified to protect with a conservation restriction. Development restriction on any of these parcels would provide a benefit for flood mitigation.

The report also recommends ordinance and regulation updates including green stormwater infrastructure and low impact development requirements (as outlined in the Riparian Buffer Standards from the Rhode Island Low Impact Development Site Planning and Design Guidance Manual [RIDEM & RICRMC, 2011]), and revisions to Chapter 12.18 Protection of Trees on Town Property to include protection for larger trees. Both measures would mitigate flood risk in Richmond, and the latter would also mitigate future impacts of extreme heat.

5.2.7 National Flood Insurance Program (NFIP)

The Town of Richmond is an active and compliant member of the National Flood Insurance Program since 1980.[69] As such, Richmond residents are able to purchase flood insurance to protect their property against flood losses. There are currently 30 NFIP policies in effect covering $10,960,500 in property value. There have been 32 successful claims made since 1978, which paid out $1,689,263 to policyholders. Only four of the 30 policies are located in a FEMA designated floodplain (A zone). As of 2021, there are two residential Repetitive Loss (RL) properties in Richmond, up from one RL property in 2018[70]. A Repetitive Loss property is defined as an insurable building for which two or more claims of more than $1,000 were paid out by the NFIP within a 10-year period.[71] The Town of Richmond has adopted the most recent (April 2020) Flood Insurance Rate Maps (FIRM) and Washington County Flood Insurance Study (FIS).

All jurisdictions participating in the NFIP must designate a Local Floodplain Administrator who is responsible for ensuring continued compliance with the federal regulations. Historically, Richmond's Building Official fills the role. However, the Town Planner is considering credentialling as a Certified Floodplain Manager through the National Association of State Floodplain Managers to improve internal capacity to implement best floodplain management practices in town.

The Town continues to actively participate in the NFIP by adoption updates to the FIRMs as federal studies are completed, participation in Community Assistance Visits with the State and/or federal representatives, availability to answer or advise on floodplain management inquires form the public and promoting sound floodplain management decisions.

5.2.8 Richmond Rural Preservation Land Trust

The Trust works to identify, preserve, and protect open space, including forests, wildlife habitat, wetlands, and farmland, within the Town of Richmond, in perpetuity, to maintain the Town's rural character and ecological assets for the benefit of the public. The Trust is a key partner for the Town in conserving land in open space, habitat improvement, and public education.

5.2.9 Wood-Pawcatuck Wild and Scenic Rivers Stewardship Council

The Wood Pawcatuck Watershed was awarded the Wild and Scenic River designation by the federal Wild and Scenic Rivers Act in 2019. The goal of this designation is to protect and preserve the scenic rivers for the next generation and spans the Watershed's location in Rhode Island and Connecticut. A council was

[69] FEMA Flood Insurance Study, Washington County, Rhode Island, April 3, 2020

[70] As per communication with the Emergency Management Specialist FEMA Region 1 FM&I Branch, January 25, 2022

[71] As per communication with the Rhode Island State Hazard Mitigation Officer – July 2016

also founded in 2019, comprised of town representatives, non-governmental organizations, and state agencies with the goal to help preserve, protect, and enhance the special environmental, cultural, and recreational values of the watershed.72 The council manages the funding used by the Wood-Pawcatuck Watershed Association and has access to the federal tools and resources for designated areas that may help in watershed mitigation strategies.

5.2.10 Wood-Pawcatuck Watershed Association (WPWA)

WPWA is a non-profit organization which protects the integrity of the lands and waters of the Pawcatuck Watershed. WPWA works in partnership with local, state, and federal agencies, to encourage the watershed approach to environmental management, and works on the local level with regard to specific aspects of watershed protection. WPWA is instrumental in orchestrating restoration and conservation projects, studies, and partnerships. WPWA professional staff and subcontractors conduct annual river cleanups to remove major safety obstructions from the river, while allowing non-hazardous debris to remain in place for the critical habitat and ecological functions they provide.

WPWA volunteers can help implement mitigation actions that relate to riverine debris monitoring. WPWA maintains a River Conditions Map on their website to provide real-time information that may be useful to paddlers and other users of the river. The interactive map allows users to report on conditions such as downed trees and other blockages or streambank erosion. The data presented may be useful to Richmond DPW to provide timely notification of debris that could pose a risk to nearby infrastructure during a high flow event.

Wood-Pawcatuck Watershed Flood Resiliency Management Plan

In 2014 WPWA was awarded a $720,000 grant to develop a watershed wide management plan for flood resiliency. This project addresses the problems faced by cities and towns in the Wood-Pawcatuck Watershed caused by extreme weather events. Among other things, the plan ranked culverts throughout the watershed for replacement based on the project's ability to improve aquatic passage, remove impoundments that warm stream temperature, and provide hydraulic capacity to pass large storms (100-year events) considering climate change and associated predictions in increased rainfall.

As a result of this plan, National Oceanographic Atmospheric Agency (NOAA), The US Fish & Wildlife Service (USFWS), and the Natural Resources Conservation Service (NRCS) have invested significant funds toward the removal of multiple dams on the Pawcatuck River and the restoration of fish passage at several other dams along the Pawcatuck River.

5.3 Additional Town Departments

5.3.1 Planning Department

The Department of Planning carries out all the planning functions related to land use, environmental protection, and economic development required by the Town Charter, the Town ordinances, and the laws of the State of Rhode Island, and provides administrative assistance to the Planning Board and the Zoning Board of Review. Actions outlined in this hazard mitigation plan will help prioritize the growth and resiliency goals of the community. The Planning Department manages the GIS data and mapping requirements, as well as economic development planning in town. It also holds annual meetings with state agencies including RIDOT which provides a venue to discuss natural hazard-related risks and vulnerabilities associated with state-owned assets within the Town.

[72] Wood-Pawcatuck Wild and Scenic Rivers Stewardship Council, https://wpwildrivers.org/

The Panning Department has shown great initiative for improving resilience to natural hazards and the impacts of climate change in Richmond. The department is currently (2022) pursuing a Low Impact Development self-assessment which will lead to some recommendations about how to improve local land development subdivision recommendations. The results of the assessment will be presented to the planning board by the summer of 2022.

5.3.2 Building and Zoning Department

The Building and Zoning Department is responsible for administration and enforcement of the state building code, the zoning ordinance, and the Housing Maintenance and Occupancy Code, and any other function required by the ordinances of the Town or the laws of the State of Rhode Island. These regulations promote orderly growth and development, particularly in hazard prone areas, while maintaining the balance of unique and valuable natural resources in Richmond.

5.3.3 Emergency Management

Chapter 8.08 of the Town Code establishes the Richmond Emergency Management Agency to plan and coordinate the town's response to any occurrence or imminent threat of widespread or severe damage, injury, loss of property, or loss of life, whether caused by persons or resulting from acts of nature, including but not limited to fire, flood, earthquake, wind, storm, wave action, oil spill or other water contamination requiring emergency action to avert danger or damage, volcanic activity, epidemic, air contamination, blight, drought, infestation, explosion, riot, hostile military or paramilitary action, or an act of bioterrorism. In addition to managing the EOP, the Emergency Management department engages in disaster preparedness and response activities to better safeguard the Town from natural and manmade disasters. The department webpage has information on Natural Disasters and Making a Family Emergency Plan, and a link to the Beacon Mutual Hurricane Planning Guide.

In 2017, Richmond Emergency Management spearheaded joining the National Weather Service's StormReady program which helps arm America's communities with the communication and safety skills needed to save lives and property--before, during and after the event. The program encourages communities to take a new, proactive approach to all types of extreme weather—from tornadoes to winter storms – by providing emergency managers with clear-cut guidelines on how to improve their hazardous weather operations.[73]

The Town utilizes CodeRED Alerts to share information with residents during emergencies. To receive notifications, residents have to sign up via the town website and select whether they want alerts to come through as text, email, or phone. The Town currently uses the free version of the program provided by RIEMA, and therefor can't target the announcements to specific geographic areas or demographic groups. certain groups. However, the program was successfully used to disseminate information during the COVID 19 pandemic.

Additional duties include applying for mitigation grants, educating the public about disaster preparedness, and being the point of contact for disaster response and recovery.

5.3.4 Public Works

Richmond Public Works (DPW) manages public infrastructure projects including the town's public streets, bridges, buildings, sewer system, and the municipal tree services. Elements of this hazard mitigation plan will help the Public Works department prioritize projects and facilitate grant applications for funding. This

[73] The National Weather Service Storm Ready website at https://www.weather.gov/stormready/communities

department is out in the Town every day and offers firsthand experience on vulnerable systems, and infrastructure needs.

Since the 2018 HMP, DPW has made significant progress to mitigate hazards presented be dead and damaged trees throughout town. An initiative to create a dead tree limb removal and tree trimming mitigation program is underway, and the department has been doing aggressive tree trimming for the past four years. The Town also secured a contract with an outside company to provide a bucket truck on an as-needed basis to expand internal capacity for tree trimming and maintenance. These efforts are helping to reduce the probability of downed utility lines, reduce transportation hazards from high wind and ice events, and reduce storm debris.

The Richmond Water Department currently maintains a potable water agreement with Town of Westerly Water Division (in place through 2030) to provide emergency water service in case of a failure.

5.3.5 Police and Fire

Police and Fire Departments in Richmond ensure the safety and wellbeing of town citizens.

Firefighting in Richmond is provided by two fire districts; the Hope Valley-Wyoming Fire District and the Richmond-Carolina Fire District. Each fire district is a quasi-municipal organization chartered by the State of Rhode Island General Assembly. Each district has its own taxing authority and is staffed primarily through volunteer firefighters. Like other municipal fire departments, the districts provide fire prevention and suppression services and State Fire Code administration and enforcement. The Department also conducts an annual training for wildland firefighting. The western third of the Town is covered by the Hope Valley-Wyoming Fire District and the remainder of the Town is covered by the Richmond-Carolina Fire District with three facilities in town (see Critical Facilities section). Richmond-Carolina Fire District is rated a Class 9 by the ISO Fire Protection system. Because of its lack of direct connection to municipal water sources, the Hope Valley-Wyoming FD carries an ISO Fire Protection Class between 4-5[74].

Emergency medical services are provided by the Hope Valley Ambulance Squad, a separate organization.

Both the Fire and Police departments have active emergency plans in place with the local school system which could mitigate risk during a natural hazard event. The Chief of Police sits on the school's safety planning team which updates its Emergency Operations Plan every year, including schedules for fire drills, evacuations, etc. The Fire Department has considered developing a Community Wildfire Protection Plan, but at this time it does not intend to do so independently. Instead, the department will participate in the DEM wildfire planning process as stakeholders and use the results of the state plans as resources.

Both the Police and Fire Departments maintain mutual aid agreements with neighboring communities to support operations. The Police Department has non-emergency mutual aid agreements with PDs in Kingston, Charlestown, and other adjoining towns. The Fire Department is part of a regional group through Rhode Island Southern Firefighters League and both Fire Districts share their equipment with all Washington County companies through mutual aid agreements.

As part of the hazard mitigation planning committee, members of the police and fire department can suggest actions that can improve disaster response. They can also use this plan as guidance when applying for grant funding.

[74] The ISO Mitigation online ISO's Public Protection website at https://www.isomitigation.com/ppc/

5.3.6 Conservation Commission

The Richmond Conservation Commission is a seven-member volunteer group appointed by the Town Council that meets monthly to address environmental conservation issues in town. RCC efforts help to address critical issues potentially affecting important land and water resources and help determine whether or how a development should be approved for construction. RCC also sponsors education programs about important topics including habitat conservation and planning for climate change.

5.3.7 Town Council

The Richmond Town Council is comprised of five members, elected from the town at-large to serve for a term of two years. These elected officials develop town policy and enact town ordinances. They take a holistic view of the Town's operations when formulating policies and exercising town powers. Educating the Town Council members about the importance of hazard mitigation is not only beneficial for the Town's resiliency but also facilitates plan adoption.

5.4 State Programs

5.4.1 Rhode Island State Building Code (RISBC)

All municipalities within the State of Rhode Island share a single building code (RIGL 23-27.3-100 et. Al.). The Code itself (which incorporates the International Building Code) was last amended in 2012 and provides comprehensive construction requirements designed to mitigate the impacts from natural hazards, such as high wind events. The 2012 RISBC requires one foot of freeboard for all new and substantially improved construction in the floodplain. The Code is enforced by the Richmond Building Department and provides an additional layer of regulatory control to those discussed above.

5.4.2 Rhode Island State Dam Safety Program

The Town of Richmond participates in the State Dam Safety Program because the Wyoming Upper and White's Pond dams are classified as two of 28 high hazard dams within the State. The State Dam Safety Program was created to facilitate the enforcement of the primary dam inspection law. Rhode Island General Law 46-19 states that dam owners are responsible for the safe operation, maintenance, repair, and rehabilitation of a dam, which are the essential elements in preventing dam failure; furthermore, dam owners are liable for the consequences of accidents or failures of their dams. According to the State of Rhode Island 2016 Dam Safety Program Report, the following have been identified as program limitations: unclear ownership of numerous high hazard dams, construction of buildings within inundation areas below dams, lack of funding to repair of remove privately owned dams, inadequate spillway capacities and engineering analyses, lack of Emergency Action Plans across the state, inadequate staffing, increase in rainstorm intensities.

The 2020 Annual Report to the Governor on the Activities of the Dam Safety Program, issued by the State of Rhode Island Department of Environmental Management Bureau of Environmental Protection Office of Compliance and Inspection, indicates that the Barberville, Wyoming Upper, Alton Pond, and White's Pond dams have Emergency Action Plans (EAP) on file with the State. The Alton Pond EAP was completed in the years since the 2018 Richmond HMP. Horseshoe Falls, and Wood River Junction dams require completed EAPs.

5.4.3 Rhode Island Department of Environmental Management (DEM)

Wetland Regulations

The Rhode Island DEM is responsible for regulating alterations of the freshwater wetlands throughout the State. Since many floodplains are also wetlands, appropriately managing these resources help maintain proper floodplain function. These regulations ensure that actions in this plan which will alter the physical landscape will not do so at the expense of wetlands.

Division of Forest Management (DFM)

The Rhode Island Department of Environmental Management's Division of Forest Management updated the State's Forest Fire Program in 2020, giving local towns the most-up-to-date information on how to prepare, respond, and fund fire-related protection programs. The plan provides educational and training programming, equipment and work assistance, and community adaptation methods in case of wildfire events.

RI DEM is in the process of working on a Statewide Hazard Assessment Map and developing the NE Area Wildfire Risk Portal. New computer modeling is providing the state and local communities with estimates for the expected rate of spread of a wildland fire, the expected flame lengths of a fire, and the potential for a wildland fire to spread into tree canopies. DFM is encouraging and actively recruiting communities to embark on the Community Wildfire Protection Planning and Firewise Communities planning processes to create a more robust understanding of the risk of wildland fire and develop site-specific wildland fire mitigation strategies. For more information, contact DEM Forest Fire Program Coordinator Olney Knight or fire prevention officer Al Waterman.

Chapter 6: Identification of Mitigation Actions

Whereas the two preceding Chapters identify risks from natural hazards and programmatic capabilities, this chapter defines a broad mission for the Town in mitigating these risks and establishes a series of hazard mitigation goals and specific implementation actions.

6.1 Mission Statement

The purpose of this plan is to protect property, safety, and natural resources, and enhance quality of life in Richmond.

6.2 Mitigation Goals and Objectives

To achieve its mission the Town developed this Richmond Hazard Mitigation Plan update to establish a series of goals that support the mission. These goals were modified slightly from the 2018 HMP, and two new goals and one new objective were added. The 2022 HMP goals include:

- Protect life and safety from the impacts of natural hazards.
- Protect property and reduce damages to present and future structures or property from the impacts of natural hazards.
- Protect critical infrastructure including dams, roads, utilities, and essential services.
- Design future local infrastructure improvements to mitigate the impacts of natural hazards and build local resilience.
- Safeguard Richmond's natural resources, environmental features, and natural ecosystem services to improve resilience to the impacts of natural hazards.

Objectives That Support the Mission:

- Upgrading infrastructure
- Protecting property
- Integrating current planning and management approaches
- Improving response effectiveness
- Maintaining open space
- Increasing education and awareness of natural hazards

6.3 Review of 2018 Actions

The RHMC and project consultant reviewed the 2018 Mitigation Actions to determine which actions were completed, ongoing, or no longer relevant. The action review included questions regarding what was accomplished for this project during the reporting period; what obstacles, problems, or delays did the project encounter; and if uncompleted, is the project still relevant and should it be changed or revised? Actions were then categorized as either completed, ongoing (initially addressed but requiring ongoing maintenance or attention and carried forward from the 2018 plan), or not started/partially addressed (revised from the 2018 plan or removed because were no longer relevant). The results of this review are included in Appendix D: Review of 2018 Mitigation Actions.

Homeowner elevating structure to reduce future flood damages

Many of the 2018 proposed actions remain in progress or were never initiated. Due to staff turnover over the 5-year planning cycle, it is often impossible to fully understand why some actions were not completed, though common causes include lack of funding, insufficient staff capacity, and lack of a project champion. Some actions, however, were implemented, and these can serve as a template for how the town, in the next five-year planning cycle, can work towards implementation of the proposed 2022 actions.

One such example is the overarching 2018 action to alleviate flooding risk on the east side of KG Ranch Road close to Route 95 and Route 3. Even before the 2018 HMP, the Town had been working for many years to mitigate ongoing flooding in this area. Biggest challenges were cost and the fact that stormwater contributing to the flooding appeared to be originating from RIDOT and RIDEM properties. 1a - 1e all deal with mitigation of routine flooding, and all have a high price associated with implementation. Recognizing the need to coordinate and partner with the relevant state agencies, especially DEM, to make meaningful progress, the Town sought out opportunities for collaboration. The Town also submitted two notices of intent with RIEMA over several years and eventually put together a grant application for technical assistance to further explore flooding in this area. As of 2021, the Town is now in the early stages of a partnership with Southern RI Conservation District (SRICD) with funds from the USDA Natural Resources Conservation Service (NRCS), to do all planning, engineering, and design to alleviate flooding of the problem area at no cost to the town beyond staff support. Given this progress, Richmond carried the project forward into the 2022 Mitigation Strategy using more focused, measurable language: Implement the mitigation strategies identified in the SRICD NRCS study to reduce flood vulnerability and routine damages in the Valley Lodge neighborhood. Future iterations of this HMP may once again expand this action to include multiple discreet initiatives to reduce flooding here, based on the results of the NRCS study.

Flooding at Tall Timbers Drive

Private home elevation near Wood River

6.4 2022 IDENTIFIED ACTIONS

Removing and precluding development from hazardous areas is the best method of mitigation. However, for areas where development has already occurred, or for vulnerabilities that are less geographically specific, additional mitigation measures must be pursued. After reviewing the Town's identified risks and vulnerabilities to natural hazards, the input and feedback from the public workshop and survey, recommendations from the Town, and the local Capability Assessment, the RHMC selected mitigation actions to incorporate into the 2022 Update.

The Committee has identified a comprehensive range of actions that would reduce Richmond's vulnerability to the identified hazards. The 2022 actions align with one or more of the following mitigation categories:

- Public Education and Awareness
- Property Protection
- Natural Resource Protection
- Structural Projects
- Emergency Services
- Planning and Prevention

The HMC reviewed and re-prioritized the 2018 Risk Assessment Table and the associated actions based on historical damage, safety of the population, property protection and consistency with town-wide goals and objectives. The RHMC has worked to set goals and objectives that are bounded by a time frame and are compatible and consistent with state hazard mitigation goals outlined in the 2018 RI State Hazard Mitigation Plan.

Table 21 2022 Richmond Hazard Mitigation Strategy below outlines the 2022 Richmond Hazard Mitigation Strategy. The strategy consists of a series of pre-disaster mitigation actions. Each action presented below includes a summary of the specific problem and proposed possible solution, details of the primary tasks to be undertaken, an appropriate lead for action implementation, and anticipated costs and financing options. Each of the prospective project leads identified in the following mitigation action descriptions were given an opportunity to review and provide input on the draft plan. Other relevant departments or agencies that can offer support to the project are also listed.

The time frames used for this strategy are as follows:

Short Term: within 1-3 years
Medium Term: within 3-5 years
Long Term: greater than 5 years

If known, the actions include cost estimations and assign responsible parties to lead the efforts to complete the action. The cost ranges used for this strategy are as follows:

- Staff Time – municipal personnel time
- Minimal – less than $5,000
- Moderate – more than $5,000, but less than $25,000
- Significant – over $25,000

Table 21 2022 Richmond Hazard Mitigation Strategy

	Description	Action Type	Lead	Support	Estimated Costs	Financing Options	Time Frame	Benefit
	FLOOD PRONE DRAINAGE SYSTEMS AND STREETS							
1	Implement the mitigation strategies identified to reduce flood vulnerability and routine damages in the Valley Lodge neighborhood	PP	RIDOT, RIDEM, Town Planning, Town Administrator	DPWs, Consulting Engineer	TBD**;** $75,000 pine shadows/KG Ranch; $25,000 Pine Shadows/Leroy Drive	FEMA FMA or HMGP, Town EM or Planning annual budget	3-5 yrs	Increased public safety and decreased damage to structures and infrastructure. Improve watershed health.
The ongoing Southern Rhode Island Conservation District (SRICD) Natural Resources Conservation District (NRCS) study will identify specific projects to reduce risk in the flood-prone Valley Lodge neighborhood on the east side of KG Ranch Road close to Route 95 and Route 3. When the pond on the west side of KG Ranch Road overflows, the uneven topography causes the water to flood the Valley Lodge neighborhood. Other water runs off nearby RIDEM conservation land and RODOT roadways. The Town and its partners have secured a NRCS grant to evaluate the causes of the flooding and identify solutions. Potential solutions previously identified by the hazard mitigation committee as ways to reduce flooding in the Valley Lodge neighborhood include increasing the retention basin at Pine Shadows/KG Ranch Road and enlarging the retention basin at Pine Shadows/Leroy Drive. These and other alternative solutions may be evaluated in the current study.								
2	Straighten and widen box culvert at Carolina Nooseneck Rd to alleviate flooding at the east end of Buttonwoods Rd.	SP, ES	RIDEM	DPW	$150,000 to $200,000	RIDEM, RIDOT, Town EM or DPW annual budget	3-5 yrs	Increased public safety and decreased damage to structures and infrastructure. Improve watershed health.
Project will alleviate flooding at the east end of Buttonwoods Rd. The Richmond DPW building and Emergency Operations Center are located between two stream crossings on Buttonwoods Rd, and high flood waters could isolate these critical facilities.								

	Description	Action Type	Lead	Support	Estimated Costs	Financing Options	Time Frame	Benefit
3	Elevate the roadbeds at Mechanic Street/ Switch Road at Diamond Brook, Pine Hill at Meadow Brook, and Pine Hill at White Brook	ES	DPW		$250,000	FEMA FMA, Town EM or DPW annual budget	3-5 yrs	Increased public safety and decreased damage to structures and infrastructure. Improve watershed health.
Elevate the roadbeds at these locations at least one foot above base flood elevation. Mechanic Street/Switch Road leads to the Chariho Middle School Emergency Shelter on 455 Switch Road.								
4	Identify Repetitive Loss homes throughout the Town for Voluntary Acquisition	PL	Building Official, Town Planner	Town Administrator	Staff time	Town annual budget (Planning Department)	1-3 yrs	Reduce number of flood claims and building damage, improve floodplain function
5	Research and secure funding from various state and federal grants for Voluntary Acquisition of highly flood-prone properties.	PL	Building Official, Town Planner	Town Administrator	Staff time	Town annual budget (Planning Department)	1-3 yrs	Reduce number of flood claims and building damage, improve floodplain function
6	Engage in Voluntary Acquisition Program for 2-3 highly flood-prone properties	PL	Building Official, Town Planner	Town Administrator	$500,000 (based on 2020 assessment for two at-risk properties with flood history)	Town annual budget (Planning Department) HMGP, FMA, BRIC, and CDBG	3-5 yrs	Reduce number of flood claims and building damage, improve floodplain function

	Description	Action Type	Lead	Support	Estimated Costs	Financing Options	Time Frame	Benefit
7	Stormwater management improvements that would address runoff from I-95 and Route 3	PP	Town Administrator, Town Planner	DPW	Staff Time	Town annual budget (Planning Department)	1-3 yrs	Reduce number of flood claims and building damage, improve floodplain function
Coordinate with RIDOT to discuss cost-sharing options to implement stormwater management improvements that would address runoff from I-95 and Route 3, which contributes to flooding in the Valley Lodge area.								
8	Upgrade culverts and stormwater runoff on Route 138 – Kingstown Road	PP	Town Administrator, Town Planner	DPW	Staff Time	Town annual budget (Planning Department)	1-3 yrs	Reduce number of flood claims and building damage, improve floodplain function
Coordinate with RIDOT to discuss cost-sharing options for upgrading culverts and stormwater runoff on Route 138 – Kingstown Road as recommended in the 2021 Beaver River Watershed Assessment Report.								
9	Update design storm precipitation amounts for subdivision design	PL	Planning Department	None	Staff time and volunteer time	Town annual budget (Planning Department)	1-3 yrs	Increased public safety. Decreased damage to structures and infrastructure. Improve watershed health.
Update design storm precipitation amounts for subdivision design to promote more resilient development and road crossing design. This action should be considered and implemented alongside other recommendations of the 2022 Low Impact Development self-assessment currently underway by the Town Planning Department.								

	Description	Action Type	Lead	Support	Estimated Costs	Financing Options	Time Frame	Benefit
10	Hire a grant administrator to be tracking, pursuing, and managing HMP-related grants	PL	Town Administrator, Planning Department	Town EM, DPW	$10,000/yr – 2022 Town budget includes an extra $10,000 for this.	Town annual budget	1-3 yrs	All hazard mitigation

STREAM AND RIVER FLOODING

11	Coordinate with the WPWA for shared use of the web-based debris inventory tool	PL	WP WSRSC, Town Planner, Town Administrator	WPWA, Trout Unlimited, DPW, RIDEM DFW & DFE	Staff time or volunteer time	Town annual budget (Planning Department), WPWSRSC, USFWS grants	1-3 yrs	Improve floodplain function, reduce flooding
Coordinate with the Wood-Pawcatuck Watershed Association (WPWA) for shared use of the interactive web-based debris inventory to allow DPW to benefit from volunteer reports about in-stream obstructions and blockages at culverts and bridges. The purpose of this action is to improve the carrying capacity of the local rivers and streams by removing debris (i.e. tree limbs, excess sedimentation) that is clogging the waterway, thereby causing more flooding.								
12	Continue to remove debris from the stream channels to reduce the risk of culvert or bridge obstruction and damage	NR	Town Planner, Town Administrator, DPW	WPWA (Director)	Staff time and volunteer time	Town annual budget (Planning Department)	1-3 yrs	Improve floodplain function, reduce flooding.
13	Identify the need for new or additional stream access points	PL	Town Planner, Town Administrator, DPW	WPWA (Director)	Staff time and volunteer time	Town annual budget (Planning Department)	1-3 yrs	Improve floodplain function, reduce flooding
Develop an ongoing dialogue between local land trust, town, and private owners to identify the need for new or additional stream access points on private lands for the purpose of routine or emergency debris removal. The partnership will improve the ability of the Town and WPWA to access the river for debris removal for health and safety, where a known obstruction exists that poses a risk of obstruction.								

	Description	Action Type	Lead	Support	Estimated Costs	Financing Options	Time Frame	Benefit
14	Pursue wetland restoration of 2.5 acres (3 parcels) in Beaver River Watershed ranked as priority in the 2021 Beaver River Watershed Assessment.	NR	Planning Department, RRPLT, Con Com	None	Staff time or volunteer time	NEIWPCC, SNEP SWIG, and NBEP	3-5 yrs	Improve floodplain function, reduce flooding, protect critical resources
15	Pursue permanent land protection for 4 parcels in Beaver River Watershed through land acquisition or partnership	PL	Planning Department, RRPLT, Con Com	None	Staff time or volunteer time	Grant funding and/or the Town, a non-profit such as TNC, or RIDEM	3-5 yrs	Improve floodplain function, reduce flooding, protect critical resources
Two parcels on Hillsdale Rd, one on Kingstown Rd., and one on 123 New London Turnpike were identified as high priorities for protection through land acquisition or partnership in the 2021 Beaver River Watershed Assessment.								
16	Pursue permanent land protection for 2 parcels in Beaver River Watershed through conservation restriction	PL	Planning Department, RRPLT, Con Com	None	Staff time or volunteer time	Grant funding and/or the Town, a non-profit such as TNC, or RIDEM	3-5 yrs	Improve floodplain function, reduce flooding, protect critical resources
One parcel on Shannock Village Rd and one on 343 Kingstown Rd were identified as high priorities for protection through conservation restriction in the 2021 Beaver River Watershed Assessment.								
17	Implement recommendations of the upcoming NRCS PL566 program	NR, PL	Town Planner, Town Administrator	WPWA (Director)	Staff time or volunteer time	Town annual budget (Planning Department)	1-3 yrs	Improve floodplain function, reduce flooding
Partner with Wood-Pawcatuck Watershed Association to pursue mitigation actions identified in the Wood-Pawcatuck Watershed Resiliency Management Plan and the upcoming PL566 program, funded through NRCS.								

	Description	Action Type	Lead	Support	Estimated Costs	Financing Options	Time Frame	Benefit
MUNICIPAL WELLS/PUMPING STATIONS								
18	Raise retaining wall around the pump station at Woodriver Drive	SP	DPW and Water Department Manager (LaFramboise Water)	None	$25,000	Town annual budget (DPW) and FEMA HMGP or FMA	1-3 yrs	Increased public safety and decreased damage to structures and infrastructure. Protect human health.
The Pump Station at Woodriver Drive in the Valley Lodge Neighborhood is vulnerable to flooding. This project proposes to raise the retaining wall around the secondary well bunker to one foot above base flood elevation to prevent flooding of wellhead.								
DAMS								
19	Encourage private owners to create Emergency Action Plans	PL	Planning Department and Building Inspector	RIDEM	Staff time or volunteer time	Town annual budget (Planning Department) and FEMA National Dam Safety Program	3-5 yrs	Increased public safety and decreased damage to structures and infrastructure.
Identify private dam owners and encourage them to create Dam Emergency Action Plans (State template available on RIEMA website) to ensure proper maintenance and structural integrity of the structures. As of 2021, the Horseshoe Falls and Wood River Junction dams (both classified as significant hazard dams) do not have Emergency Action Plans filed with the State of Rhode Island.								

	Description	Action Type	Lead	Support	Estimated Costs	Financing Options	Time Frame	Benefit
			CRITICAL MUNICIPAL HAZARD RESPONSE FACILITIES					
20	Assess opportunities for dry flood-proofing of the Town Hall	PP	Town EM, DPW	Town Administrator	Assessment phase: $10,000	Town annual budget (DPW), FEMA BRIC, EMPG, HMGP	1-3 yrs	Protect Town property and reduce damages.
Assess opportunities for dry flood-proofing of the Town Hall to reduce potential damage to records in Town Hall basement. Assessment phase would include engineering field visit and analysis, plus input from an architect or building specialist about dry-floodproofing measures.								
21	Implement dry floodproofing at Town Hall	PP	Town EM, DPW	Town Administrator	$50,000	Town annual budget (DPW), FEMA BRIC, EMPG, HMGP	1-3 yrs	Protect Town property and reduce damages.
Install additional sump pumps for Town Hall basement with french drains and other dry-floodproofing solutions identified during the assessment phase. Cost estimate assumes one sump, French drain, and sealing of openings or cracks in the foundation wall.								
22	Repair perimeter fencing to secure the Shannock Hill radio communication tower.	ES	Police Department and Town EM	None	$10,000	Town annual budget (Police Department) and FEMA HMGP, PA, EMPG	1-3 yrs	Increased public emergency response communication function
The tower supports numerous public safety radio repeaters; however the RI Emergency Management Agency is currently planning to construct a new tower at this location that the Town would be able to use in place of the existing tower. Given this upcoming investment, the Town's approach to addressing deficiencies at the existing tower minimizes any capital investment that would be superseded by the implementation of the state's planned project.								

	Description	Action Type	Lead	Support	Estimated Costs	Financing Options	Time Frame	Benefit
23	Research and install a back-up generator to power all emergency operations at Town Hall	ES	Town Administrator, Town EM, DPW	None	Assessment: Staff time; Purchase and install generator: $50,000	Town annual budget (EM), FEMA HMGP and BRIC	1-3 yrs	Protect critical resources and improve disaster response and recovery.
Evaluate emergency operations electrical load needs for a back-up generator to power all emergency operations at Town Hall. With the results of the evaluation, secure funding and install the new generator. Because the building serves as Richmond's an alternate Emergency Operations Center, the generator should be capable of providing power for air conditioning, lighting, and the computer servers, at a minimum.								
24	Develop a Richmond debris management plan	PL	DPW	Town EM, RIEMA, RIDEM	Staff time	Town annual budget (EM)	3-5 yrs	Increased public safety and decreased damage to structures and infrastructure
The debris management plan will establish procedures and guidelines for managing disaster debris in a coordinated, environmentally responsible, and cost-effective manner. The debris management plan will describe the coordination process with all entities responsible for managing debris, outline the methods used to collect debris (curbside collection, community drop-offs, DPW crew response) and identify temporary debris management sites and disposal locations in town.								
25	Update the Richmond Emergency Operations Plan (EOP)/Community Emergency Management Plan (CEMP)	PL	RIDEM, Town EM	DPW	Staff time	Town annual budget (EM)	1-3 yrs	Increased public safety and improve emergency response.
Richmond EOP/CEMP update should cover short-term response and long-term recovery to address communications, evacuation, and housing necessary for natural hazards identified in this HMP. It should also clearly specify protocols for emergency water delivery and disaster debris management.								

	Description	Action Type	Lead	Support	Estimated Costs	Financing Options	Time Frame	Benefit
				CARE FACILITIES				
26	Purchase a suitable building or property for the new Richmond Community/Senior Center	ES	Planning Department, Wellness Committee, Finance, Town Council	Town EM	To be determined based on selected property	Town annual budget (existing funds set aside in Capital Budget), ARPA, FEMA HMGP	3-5 yrs	Increased public safety and decreased damage to structures and infrastructure.
The selected site should be easily accessible and outside any known natural hazard areas, and the facility should be designed to be resilient to hurricanes and snowstorms using construction best management techniques. Examples include wood framing tie downs, better roof design to withstand snow loads and prevent shingles from blowing off, generator, wind-resistant glass windows, etc.								
				RECREATION FACILITIES				
27	Develop a Wildland Urban Interface Fire Plan or Community Wildfire Protection Plan	PL	Richmond Carolina and Hope Valley Wyoming Fire Departments	RIDEM and professional consultants	$12,000	BLM Grants, FEMA FPSG	3-5 yrs	Increased public safety and decreased damage to structures and infrastructure.
Plan will address the community's ability to maintain a high level of fire protection, prepare for large-scale wildfire/brushfire disasters, and provide training to fire personnel.								
28	Improve emergency access to fire gates	ES	RIDEM DFE, Richmond Carolina and Hope Valley Wyoming Fire Departments	None	$40,000	FEMA FPSG	3-5 yrs	Increased public safety and improve emergency response
Coordinate with RIDEM to improve emergency access to fire gates by removing boulders and installing breakaway chains across the firebreak roads, and clearing downed trees and other storm debris from behind the gates.								

	Description	Action Type	Lead	Support	Estimated Costs	Financing Options	Time Frame	Benefit
29	Increase public education on tick-borne diseases	PE	Con Com	RIDOH	Staff time, volunteer time	Town annual budget	1-3 yrs	Protect human health
Increase public education to increase knowledge of tick-borne diseases and to promote behaviors that can prevent illness. Informational materials should discuss how to minimize exposure to tick bites, conduct routine tick checks, and send a tick for analysis after receiving a bite.								

Acronyms

Action Type

ES	Emergency Services and Protection	PE	Public Education and Awareness	PP	Property Protection
NR	Natural Resource Protection	PL	Planning and Prevention	SP	Structural Projects

Agency/Department/Organization/Funding Source

ARPA	American Rescue Plan Act of 2021	RIDOT	RI Department of Transportation
BLM	U.S. Bureau of Land Management	RIDEM	RI Department of Environmental Management
BRIC	FEMA Building Resilient Infrastructure and Communities Program	RIDEM DFW	RI DEM Division of Fish and Wildlife
CDBG	HUD Community Development Block Grant	RIDEM DFE	Division of Forest Environment
Con Com	Conservation Commission	RIDOH	RI Department of Health
DPW	Richmond Department of Public Works	RIEMA	RI Emergency Management Agency
EM	Richmond Emergency Management	RRPLT	Richmond Rural Preservation Land Trust
EMPG	FEMA Emergency Management Performance Grant	SNEP	Southeast New England Program (SNEP)
FEMA	Federal Emergency Management Agency	SWIG	SNEP Watershed Implementation Grants
FMA	FEMA Flood Mitigation Assistance Program	TNC	The Nature Conservancy
FPSG	FEMA Fire Prevention and Safety Grants	USDA	U.S. Department of Agriculture
HMGP	FEMA Hazard Mitigation Grant Program (Section 404)	USFWS	US. Fish and Wildlife Service
NBEP	Narragansett Bay Estuary Program	USFS	U.S. Forest Service
NEIWPCC	New England Interstate Water Pollution Control Commission	WP	Wood-Pawcatuck
NRCS	USDA Natural Resources Conservation Service	WP WSRSC	WP Wild and Scenic Rivers Stewardship Council
PA	FEMA Public Assistance Grant Program (Section 406)[75]	WPWA	Wood-Pawcatuck Watershed Association
RI	State of Rhode Island		

[75] Recipients must have a FEMA-approved Hazard Mitigation Plan before FEMA can provide PA funding for any Permanent Work

6.5 Process for Setting Priorities

The last step in developing the Town's mitigation strategy is to assign each mitigation measure a priority ranking of low, medium, or high to help direct limited resources towards those actions with the greatest potential benefit. The RHMC used a prioritization method modelled after FEMA's STAPLEE (Social, Technical, Administrative, Legal, Economic, and Environmental) framework, and focusing on the following four key categories:

Benefits: Determine whether the proposed mitigation measure will improve property protection, natural resource protection, technical capacity, public awareness, or emergency response.

Feasibility: Determine whether the proposed mitigation measure is feasible in terms of Town staffing, public support, and whether it is technically implementable.

Economic: Evaluate each mitigation measure in terms of estimated cost and availability of known funding sources.

Regulatory: Evaluate each mitigation measure for consistency with local, state, and federal permitting and regulatory requirements and goals.

The RHMC had limited access to detailed analyses of the cost and benefits of any given mitigation measure, so prioritization is based on the local team members' understanding of existing and potential hazard impacts and an approximate sense of the costs associated with pursuing any given mitigation measure as recorded in Table 21, above.

Table 22 below demonstrates the prioritization of the Town's proposed 2022 hazard mitigation measures.

Table 22. 2022 Mitigation Action Prioritization

	Action	Priority
1	Implement the mitigation strategies identified to reduce flood vulnerability and routine damages in the Valley Lodge neighborhood	High
2	Straighten and widen box culvert at Carolina Nooseneck Rd to alleviate flooding at the east end of Buttonwoods Rd.	Medium
3	Elevate the roadbeds at Mechanic Street/Switch Road at Diamond Brook, Pine Hill at Meadow Brook, and Pine Hill at White Brook	Medium
4	Identify Repetitive Loss homes throughout the Town for Voluntary Acquisition	High
5	Research and secure funding from various state and federal grants for Voluntary Acquisition of highly flood-prone properties.	High
6	Engage in Voluntary Acquisition Program for 2-3 highly flood-prone properties	High
7	Stormwater management improvements that would address runoff from I-95 and Route 3	Medium
8	Upgrade culverts and stormwater runoff on Route 138 – Kingstown Road	Medium
9	Update design storm precipitation amounts for subdivision design	High
10	Hire a grant administrator to be tracking, pursuing, and managing HMP-related grants	Medium
11	Coordinate with the WPWA for shared use of the interactive web-based debris inventory tool	Medium
12	Continue to remove debris from the stream channels to reduce the risk of culvert or bridge obstruction and damage	Low
13	Identify the need for new or additional stream access points	Low

	Action	Priority
14	Pursue wetland restoration of 2.5 acres (3 parcels) in Beaver River Watershed ranked as priority in the 2021 Beaver River Watershed Assessment.	Low
15	Pursue permanent land protection for 4 parcels in Beaver River Watershed through land acquisition or partnership	Low
16	Pursue permanent land protection for 2 parcels in Beaver River Watershed through conservation restriction	Low
17	Implement recommendations of the upcoming NRCS PL566 program	Medium
18	Raise retaining wall around the pump station at Woodriver Drive	Low
19	Encourage private owners to create Emergency Action Plans	Medium
20	Assess opportunities for dry flood-proofing of the Town Hall	Medium
21	Implement dry floodproofing at Town Hall	Low
22	Repair perimeter fencing to secure the Shannock Hill radio communication tower.	Low
23	Research and install a back-up generator to power all emergency operations at Town Hall	Medium
24	Develop a Richmond debris management plan	Low
25	Update the Richmond Emergency Operations Plan/Community Emergency Management Plan (CEMP)	Medium
26	Purchase a suitable building or property for the new Richmond Community/Senior Center	Low
27	Develop a Wildland Urban Interface Fire Plan or Community Wildfire Protection Plan	Medium
28	Improve emergency access to fire gates	Medium
29	Increase public education on tick-borne diseases	Medium

CHAPTER 7: PUBLIC ENGAGEMENT AND INPUT

Public engagement is an integral piece of the hazard mitigation planning process, and was a priority for the RHMC from the onset of the project. This HMP update was developed by the Richmond Hazard Mitigation Plan Committee (RHMC) that included community members of diverse backgrounds within Richmond, from Town administrative officials to emergency services and public works personnel as well as a representative from the Rhode Island Emergency Management Agency. The RHMC guided the planning process and gathering of information within the community to ensure an outcome that was most applicable to Richmond's unique identity and challenges. The Committee met formally for five virtual steering meetings, developed and administered a public survey, and hosted one virtual public meeting. The details of those meetings are presented in Appendix I: Public Engagement.

Preceding the HMP update, the 2021 CCP update process included a workshop, community survey, working sessions with the Richmond Planning Board, and two public hearings,[76] gathering a record of public sentiment about current conditions and a vision for the Town's future. The feedback gathered during the CCP public engagement process that related to natural hazards, vulnerable populations, environmental concerns and land conservation was incorporated into this HMP update.

The RHMC utilized its working meetings to develop a clear picture of the hazards of concern and mitigation strategies used in Richmond. The outcome of these meetings was a draft public survey, an inventory of critical facilities and Town capability assessment, an inventory of hazard-related problem areas for the Town, a review and amendment of previous mitigation actions, development of new mitigation actions, a review of historic hazard events and their impact on the town, and planning for the public meeting.

Public interaction beyond the RHMC began at the outset of the project, with social media (Facebook) posts introducing the project and with the creation of a sub-page on the Town's official website to provide background and contact information regarding the planning process. The HMP website and social media feed were updated at several intervals throughout the process, including invitation to attend the public meeting, to complete a public survey, and to review and provide comment on the Draft Plan.

The goal of the public survey was to better understand current community perception and concern about natural hazards in Richmond, to solicit feedback on the mitigation actions previously taken by the Town, and to begin developing a community vision for climate resilience within Richmond. The Town of Richmond Natural Hazard Mitigation and Climate Adaptation Survey contained fourteen questions including multiple choice, ranking, and short response questions to prioritize Richmond's climate vulnerabilities and strengths, and determine the public's concerns, methods of communication, and response efforts regarding hazard events. The public survey was officially sent to the public on December 7, 2021. The survey was distributed through the Town's Facebook and website and received a total of 146 responses within the period it was open, from December 7 through January 14, 2022. See Appendix I: Public Engagement for the full survey and a summary of responses.

The RHMC also hosted a virtual public meeting which was advertised on the same platforms as all other information relating to public input on the Hazard Mitigation Plan (Facebook and the Town's website). The virtual public meeting was held on February 16, 2022, with attendees from the RHMC and members of the public. Information gathered from attendees in this public meeting informed the development of mitigation actions for the plan, as attendees described personal experiences with natural hazards and reviewed the work done or proposed to complete mitigation actions from the previous plan. A recording of the public meeting was posted on the Town's website for the project. Despite low turnout to the

[76] Richmond Comprehensive Community Plan Update, 2021

meeting, the personal input from Town residents contributed valuable information to the mitigation action matrix and hazard profiles in this HMP update.

The Town released the draft plan for public review and comment in early April 2022, posting links over Facebook and on the Town website and directing people to the draft via Facebook and the News Flash section of the www.RichmondRI.com homepage to increase awareness. The Town Planner also sent direct email notification of the draft with a request for comments to the following stakeholders:

- Wood Pawcatuck Watershed Association Executive Director
- Wood Pawcatuck Wild & Scenic Rivers Stewardship Council
- South Kingstown Principal Town Planner
- Hopkinton EMA Director
- Exeter EMA Director
- Charlestown Town Planner
- RIEMA State Mitigation Officer

This period of public review period occurred prior to submitting the plan to the State of Rhode Island and prior to the review of the final plan by the Town Council. Public comments on the final draft plan were addressed prior to submittal to the Council for adoption.

CHAPTER 8: IMPLEMENTATION AND ADOPTION

After a rigorous hazard mitigation planning process, it is the responsibility of the Town to continue to pursue and monitor the hazard impacts and mitigation action implementation over the 5-year implementation period. Until the development of a future plan in 2027, this plan will serve as a guide for mitigating the impacts of natural hazards in Richmond. The Town of Richmond and the RHMC realize that successful hazard mitigation is an ongoing process that requires routine evaluation and revision to effectively reduce damage from natural hazards and have a positive impact on quality of life in the Town.

8.1 MONITORING

The Richmond Emergency Management Task Force (REMTF), which is led by the Town Emergency Manager and includes members of the RHMC, meets quarterly and takes responsibility over the HMP plan review and annual maintenance. REMTF meets quarterly, and has a standing annual agenda item to monitor, evaluate, and make updates to the HMP.

Prior to the monitoring discussion of the 2022 Plan, REMTF members will consult with all relevant town staff, boards and committee members to evaluate the progress made on the 2022 HMP mitigation strategies, and/or invite the lead implementing actors to participate in the REMTF meeting to ensure the engagement of all relevant parties. Participants of the meeting will, at a minimum, discuss mitigation strategy progress and next steps for implementing the listed mitigation actions. Depending on need, these annual meetings may also address required updates to the Town's critical facilities, capabilities, or hazard history.

Discussion of HMP-related topics at the REMTF meetings will be documented in the minutes for public record to keep a clear trail of mitigation action decisions to support the development of the subsequent 5-year HMP Update.

8.2 EVALUATION

The annual REMTF HMP discussion will review the progress made on the mitigation actions presented in the 2022 plan and ensure the 2022 strategy remains relevant and applicable given current needs and

conditions. The Task Force will base its evaluation of mitigation actions on whether or not the actions have met the following criteria: increased public awareness and education, reduction in hazard damage, actions being implemented in the designated time frames, and actions staying within the cost estimate. If changes to the HMP are proposed or a specific mitigation strategy implementation is reported as complete, the Task Force will report this progress to the Town Council. Town Council will notify the public of any plan revisions made during the annual meeting with announcements on the town website and social media feeds, and by posting such revisions on the town website for public review and comment. The Task Force will also notify the administration and/or emergency management teams of any HMP updates.

8.3 UPDATES

The Task Force will continue to update the 2022 plan as necessary, depending on mitigation actions taken, new actions developed, or other hazard events that may have an impact on the Town. All updates will be directed to the Town Council as well as advertised to the public for input and response.

A full revision of the plan will occur in five years, ideally beginning the year before the five-year mark to maintain an active and up-to-date plan. That process will include multiple opportunities for community engagement and public input, coordination with local officials and neighboring communities, and a full review and approval process through Town Council as well as RIEMA and FEMA.

8.4 ADOPTION

The 2022 HMP update received Approval Pending Adoption from FEMA in late July 2022, and was formally adopted by the Richmond Town Council on June 21, 2022.

RESOURCES

ARPA	American Rescue Plan Act of 2021
BLM	U.S. Bureau of Land Management, Wildlife Resource Management
BRIC	FEMA Building Resilient Infrastructure and Communities Program
CDBG	HUD Community Development Block Grant
EMPG	FEMA Emergency Management Performance Grant Emergency Management Performance Grant | FEMA.gov
FMA	FEMA Flood Mitigation Assistance Program
FPSG	FEMA Fire Prevention and Safety Grants Fire Prevention and Safety | FEMA.gov
HMGP	FEMA Hazard Mitigation Grant Program (Section 404) Hazard Mitigation Grant Program (HMGP) | FEMA.gov
NBEP	Narragansett Bay Estuary Program Projects We Fund — Narragansett Bay Estuary Program (nbep.org)
NEIWPCC	New England Interstate Water Pollution Control Commission
NRCS	USDA Natural Resources Conservation Service, Environmental Quality Incentives Program
PA	FEMA Public Assistance Grant Program (Section 406)[77]
SNEP SWIG	Southeast New England Program (SNEP) SNEP Watershed Implementation Grants
TNC	The Nature Conservancy
USDA	U.S. Department of Agriculture, Crop and Livestock Insurance
USFWS	US. Fish and Wildlife Service
USFS	U.S. Forest Service

[77] Recipients must have a FEMA-approved Hazard Mitigation Plan before FEMA can provide PA funding for any Permanent Work

APPENDICES

Appendix A: Maps

Appendix B: Dams in Richmond

Appendix C: Critical Facilities

Appendix D: Review of 2018 Mitigation Actions

Appendix E: Mitigation Action Prioritization

Appendix F: Technical and Financial Assistance for Mitigation

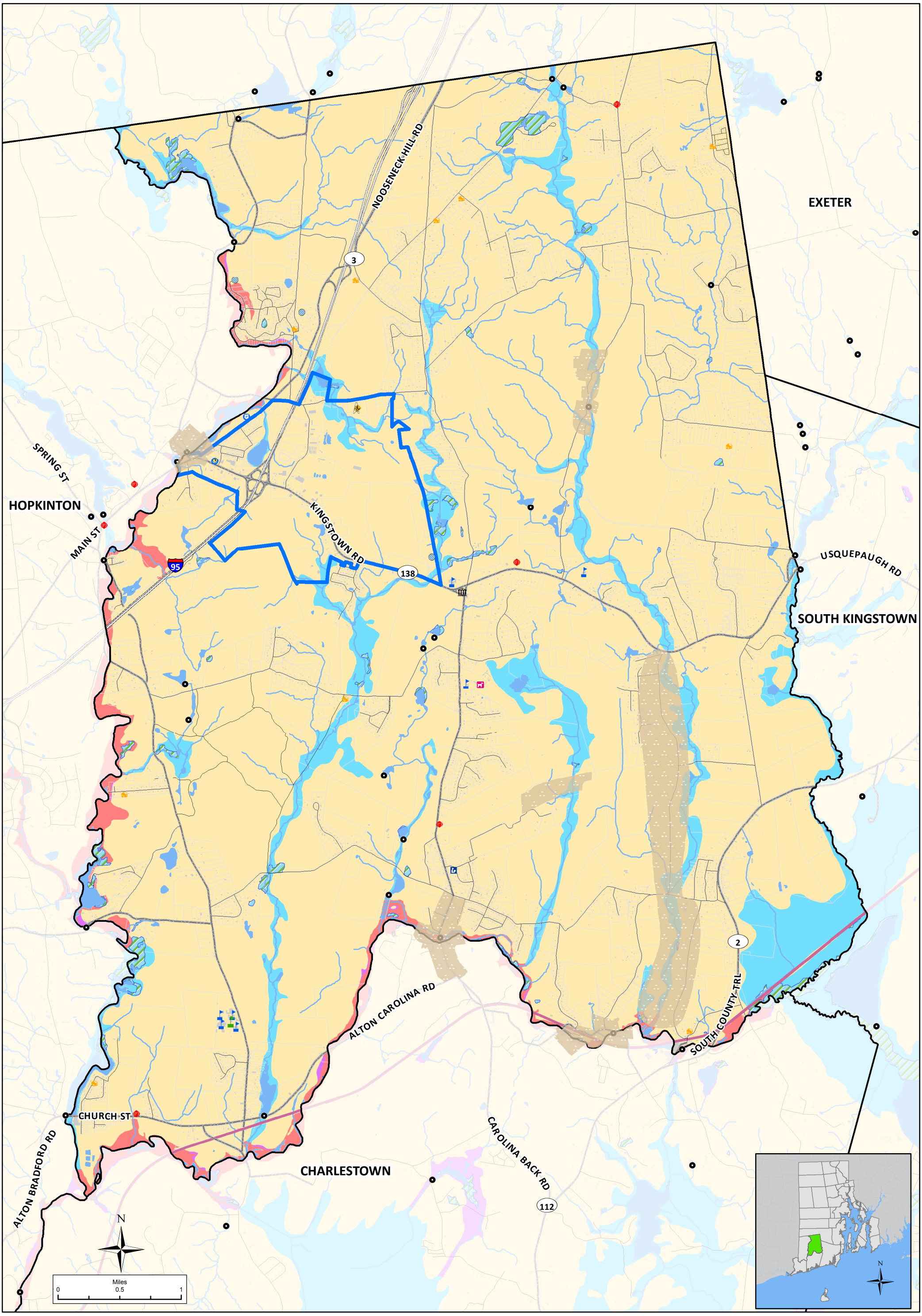
Appendix G: Existing Protection Systems

Appendix H: Financing Options

Appendix I: Public Engagement

Appendix J: Adoption Resolution

APPENDIX A: MAPS



RICHMOND, RI

Hazard Mitigation Plan

Critical Facilities w. FEMA Flood Zones

Source:
RIGIS, 2014. Dams, RI DEM
RIGIS, 2010. Lakes and Ponds (1:5000)
RIGIS, 2001. Freshwater Rivers and Streams (1:5000)
RIGIS, 2015. Statewide Digital Flood Insurance Rate Map (FIRM)
Town of Richmond, 2021. Infill/Growth Areas
BETA Group, Inc. 2021. Critical Facility Manual Input

This map is intended for planning purposes only
Date: 2/24/2022

Legend

- Town Hall
- Library
- Senior Center
- Fire/Ambulance
- Police
- DPW
- Water Station
- Dams
- Animal Shelter
- Chariho Reg. School District
- School
- Care
- Communication
- Historic District

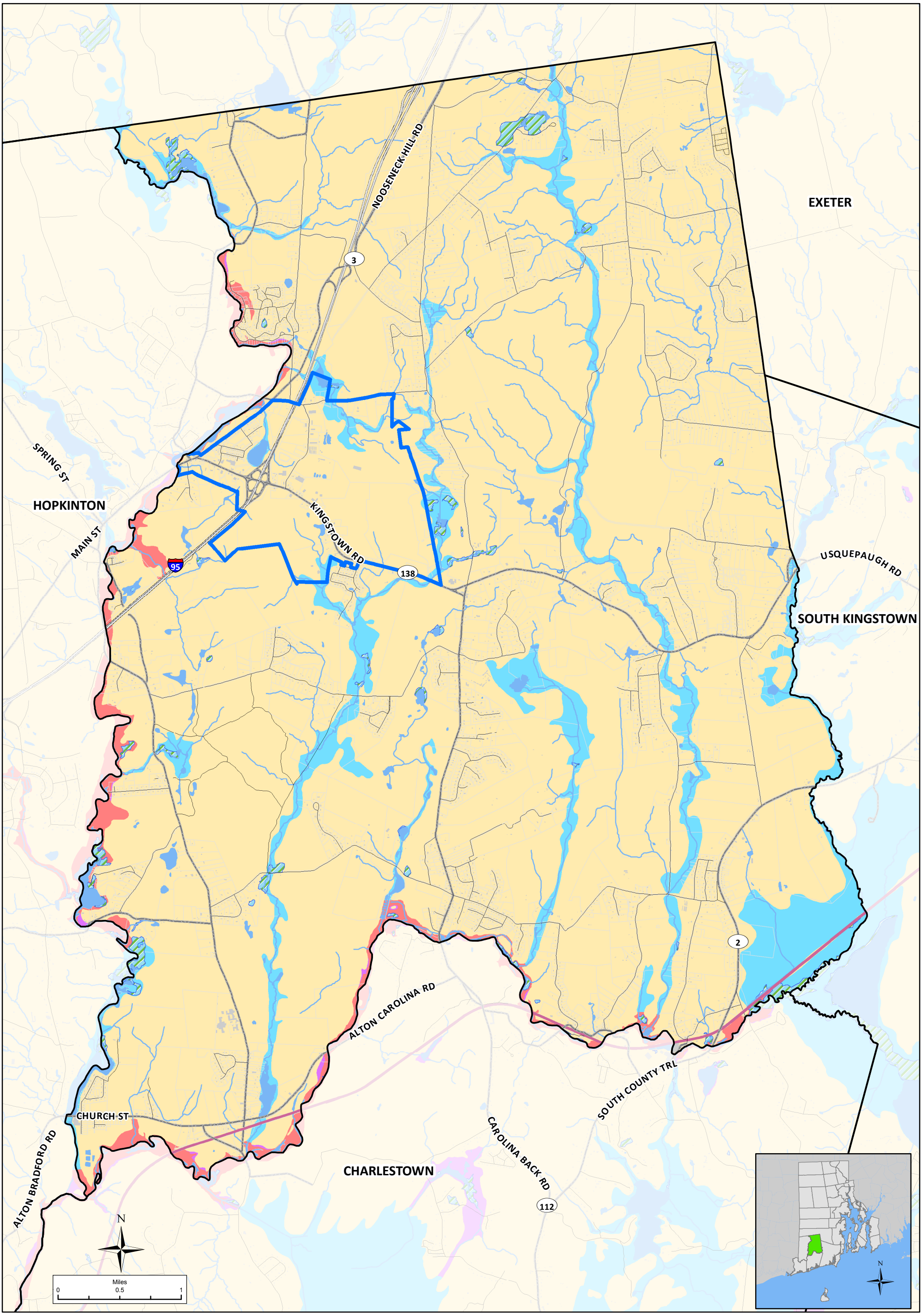
FEMA Flood Zones

- 0.2% Annual Chance
- A
- AE
- X

- Stream
- Water Bodies
- Wetland
- Open Space
- Infill/Growth Area

All Roads

- Interstate
- U.S. Highway
- State
- Street
- Railroad



RICHMOND, RI
Hazard Mitigation Plan
FEMA Flood Zones

Source:
RIGIS, 2010. Lakes and Ponds (1:5000)
RIGIS, 2001. Freshwater Rivers and Streams (1:5000)
RIGIS, 2015. Statewide Digital Flood Insurance Rate Map (FIRM)
Town of Richmond, 2021. Infill/Growth Areas

This map is intended for planning purposes only
Date: 2/24/2022

Legend

FEMA Flood Zones
- 0.2% Annual Chance
- A
- AE
- X

- Stream
- Water Bodies
- Wetland
- Open Space
- Infill/Growth Area

All Roads
- Interstate
- U.S. Highway
- State
- Street
- Railroad

NOOSENECK HILL RD
EXETER
SPRING ST
HOPKINTON
MAIN ST
KINGSTOWN RD
USQUEPAUGH RD
SOUTH KINGSTOWN
ALTON CAROLINA RD
SOUTH COUNTY TRL
CHURCH ST
ALTON BRADFORD RD
CAROLINA BACK RD
CHARLESTOWN
3
95
138
2
112
N
Miles
0
0.5
1

BETA
IMPROVING COMMUNITIES TOGETHER

RICHMOND, RI
Hazard Mitigation Plan
Water Bodies

Source:
RIGIS, 2015. Rhode Island Land Cover and Land Use 2011 (NEMO Consolidated)
RIGIS, 2010. Lakes and Ponds (1:5000)
RIGIS, 2001. Freshwater Rivers and Streams (1:5000)
Town of Richmond, 2021. Infill/Growth Areas

This map is intended for planning purposes only
Date: 2/24/2022

Legend

Water Bodies
- Stream
- Water Bodies
- Wetland
- Open Space
- Infill/Growth Area

All Roads
- Interstate
- U.S. Highway
- State
- Street
- Railroad

NOOSENECK HILL RD
EXETER
3
SPRING ST
HOPKINTON
MAIN ST
95
KINGSTOWN RD
138
USQUEPAUGH RD
SOUTH KINGSTOWN
2
SOUTH COUNTY TRL
ALTON CAROLINA RD
CHURCH ST
ALTON BRADFORD RD
CAROLINA BACK RD
CHARLESTOWN
112
N
Miles
0
0.5
1

BETA
IMPROVING COMMUNITIES TOGETHER

RICHMOND, RI
Hazard Mitigation Plan
Dams

Source:
RIGIS, 2014. Dams, RI DEM
RIGIS, 2010. Lakes and Ponds (1:5000)
RIGIS, 2001. Freshwater Rivers and Streams (1:5000)
Town of Richmond, 2021. Infill/Growth Areas

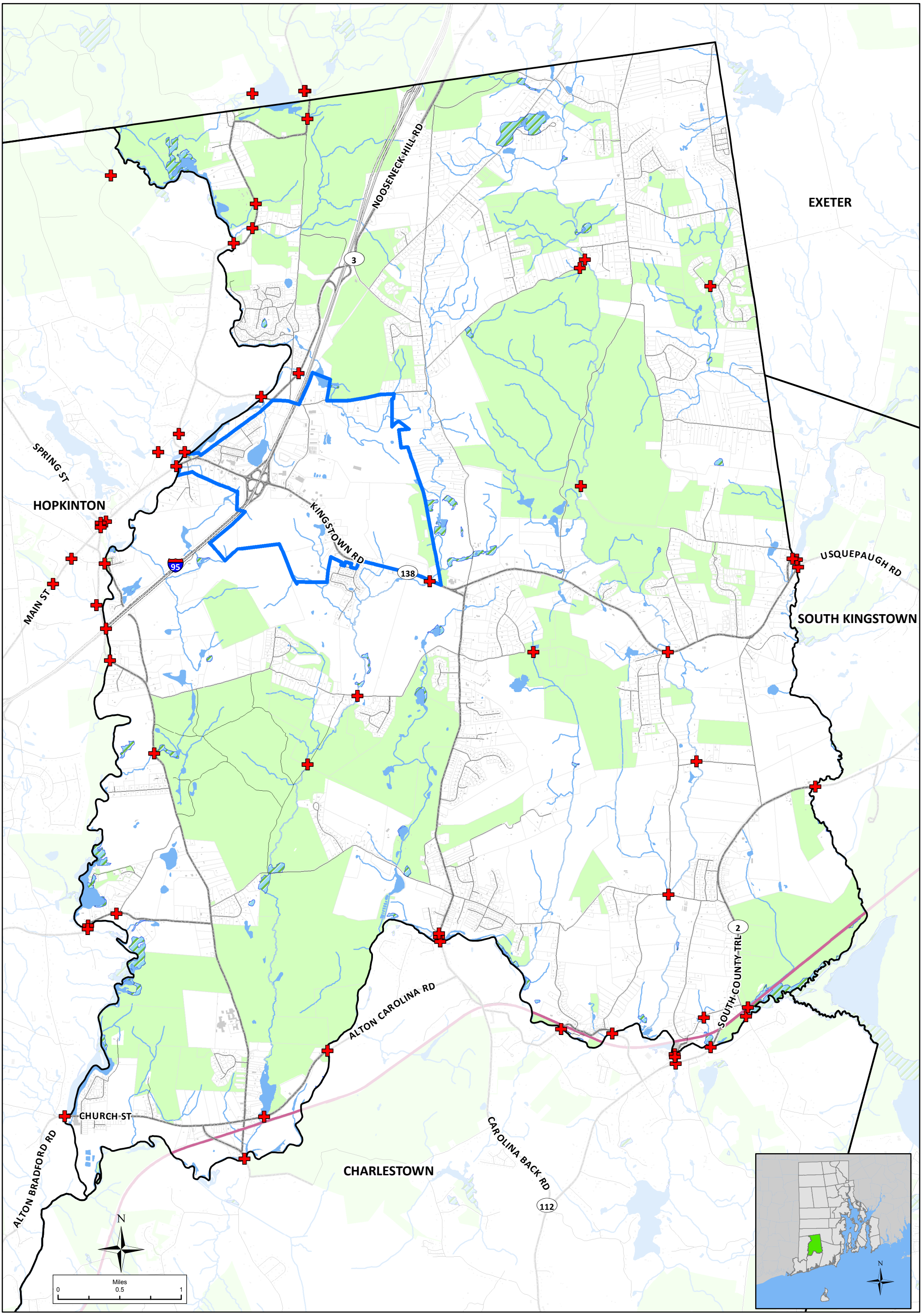
This map is intended for planning purposes only
Date: 2/24/2022

Legend

Dam Location
- Dams

- Stream
- Water Bodies
- Wetland
- Open Space
- Infill/Growth Area

All Roads
- Interstate
- U.S. Highway
- State
- Street
- Railroad



RICHMOND, RI
Hazard Mitigation Plan
Bridges

Source:
RIGIS, 2014. Dams, RI DEM
RIGIS, 2010. Lakes and Ponds (1:5000)
RIGIS, 2001. Freshwater Rivers and Streams (1:5000)
North Atlantic Aquatic Connectivity Collaborative 2005-2017. Stream Continuity Project
Town of Richmond, 2021. Infill/Growth Areas

This map is intended for planning purposes only
Date: 2/2/2022

Legend

Bridge Location
- Bridges

- Stream
- Water Bodies
- Wetland
- Open Space
- Infill/Growth Area

All Roads
- Interstate
- U.S. Highway
- State
- Street
- Railroad

NOOSENECK HILL RD
EXETER
3
SPRING ST
HOPKINTON
MAIN ST
KINGSTOWN RD
95
138
USQUEPAUGH RD
SOUTH KINGSTOWN
2
ALTON CAROLINA RD
CHURCH ST
SOUTH COUNTY TRL
ALTON BRADFORD RD
CAROLINA BACK RD
CHARLESTOWN
112
N
Miles
0
0.5
1

RICHMOND, RI
Hazard Mitigation Plan
Population Density

Source:
US Census, 2020. Census Block Population Totals (PL-171)
RIGIS, 2010. Lakes and Ponds (1:5000)
RIGIS, 2001. Freshwater Rivers and Streams (1:5000)
Town of Richmond, 2021. Infill/Growth Areas

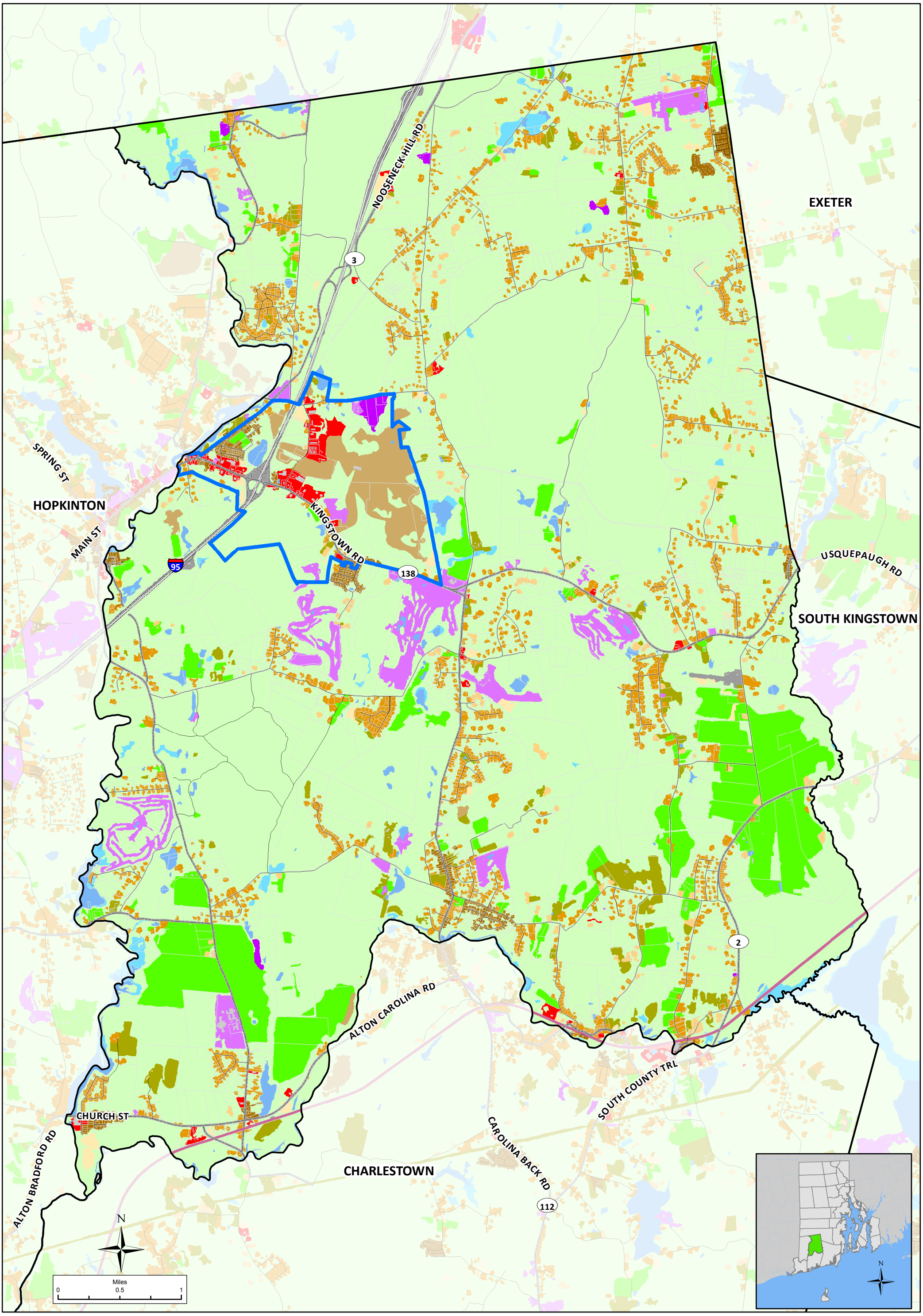
This map is intended for planning purposes only
Date: 2/24/2022

Legend

People Per Acre
- 0 or No Data
- 0.01 - 0.25
- 0.26 - 0.50
- 0.51 - 2.00
- 2.01 >

- Stream
- Water Bodies
- Wetland
- Open Space
- Infill/Growth Area

All Roads
- Interstate
- U.S. Highway
- State
- Street
- Railroad



RICHMOND, RI
Hazard Mitigation Plan
Land Use

Source:
RIGIS, 2015. Rhode Island Land Cover and Land Use 2011 (NEMO Consolidated)
Town of Richmond, 2021. Infill/Growth Areas

This map is intended for planning purposes only
Date: 2/24/2022

Legend

- Commerical or Industrial
- Cropland, Orchards, Nurseries
- Forested Wetlands, Forest and Brushland
- Institutional, Developed Recreation, Cemetery
- Low Density Residential
- Medium High Density Residential
- Medium Low Density Residential
- Pasture, Idle Agriculture or Power Lines
- Sandy/Beaches, Quarries, Outcrop
- Transportation
- Vacant Land (Urban) and Transitional Areas
- Waste Disposal
- Water
- Water and Sewage Treatment
- Wetland

Infill/Growth Area

All Roads

- Interstate
- U.S. Highway
- State
- Street
- Railroad

APPENDIX B: DAMS IN RICHMOND

2022 Richmond Dams – data collected from the RI Dam Safety Annual Report STATE OF RHODE ISLAND Department of Environmental Management, Office of Compliance and Inspection, Dam Safety Program (ri.gov)

River/Stream	Dam Name	Hazard	Emergency Action Plan (EAP) in Place?
White Brook	White's Pond	HIGH	Yes
Beaver River-trib	Tug Hollow Road Pond	LOW	No
Unnamed	Bailey	LOW	No
Beaver River	Decappett Pond	LOW	No
White Brook	Tanner Pond	LOW	No
Beaver River	Tug Hollow Pond	LOW	No
Diamond Brook	Carolina Trout Pond	LOW	No
White Brook-trib	Wells Pond	LOW	No
White Brook	Lillibridge Pond	LOW	No
Diamond Brook	Haberek Farm Pond	LOW	No
White Brook	Duck Pond	LOW	No
Meadow Brook	Wood River Junction	SIGNIFICANT	No
Wood River	Woodville Pond	LOW	No
Wood River	Barberville Pond	SIGNIFICANT	Yes
Wood River	Alton Pond	SIGNIFICANT	Yes
Wood River	Hope Valley Mill Pond	LOW	No
Wood River	Wyoming Upper	HIGH	Yes
Pawcatuck River	Horseshoe Falls	SIGNIFICANT	No
Pawcatuck River	Kenyon Mill Pond	LOW	No
Pawcatuck River	Carolina Pond	LOW	No

APPENDIX C: CRITICAL FACILITIES

Critical infrastructure and community assets (per 2018 RHMC): Flood Prone Drainage Systems, Dams, Care Facilities, Fire and Police Stations, Town Hall, Town EOC, Shelters, and Communication Infrastructure, Electrical Facilities, and Water Pump Stations.

Community assets: Recreational Facilities and Historic Resources

Critical Municipal Facilities Inventory

Name	Location
Shannock Hill Radio Communication Tower	Shannock Hill Road
EOC/Public Works Radio Communication Tower	51 Buttonwoods Road
Town Hall	5 Richmond Townhouse Road
Town EOC/Public Works	51 Buttonwoods Road
H.L. Arnold Fire & Safety Complex	208 Richmond Townhouse Road
Hope Valley - Wyoming Fire District Station 1 (main building in Hopkinton)	996 Main Street
Hope Valley- Wyoming Fire District Station 2- Alton	350 Church St (Wood River Junction)
Richmond-Carolina Fire District Station 2	252 Kingstown Road (Route 138)
Richmond-Carolina Fire District Station 3	3 Bell School House Road
Hope Valley Ambulance	Fairview Ave., Hopkinton
Police Station on Main Street (1st floor of Community Center)	1168 Main Street
State Police Barracks	54 Nooseneck Hill Road
Chariho Middle School (Primary Emergency Shelter)	455B Switch Road
Community Center (Cooling and Heating Center)	1168 Main st
Richmond Elementary School	190 Kingstown Road
Washington County Fairgrounds (Emergency animal shelter area)	78 Richmond Townhouse Rd.
Various Cell Towers	NA
Water Tower 1 @ Old Kenyon Road – Primary Tan	Old Kenyon Road
Water Tower 2 – Secondary Tank	Country Acres Road
Municipal wells (2) and pump station	94 Woodriver Drive

School Inventory

Type	Level	Grades	District	Name	Address
Private	Preschool-Middle	PK-08	NA	Meadowbrook Waldorf School	300 Kingstown Road
Public	Elementary	PK-04	Chariho	Richmond Elementary School	190 Kingstown Road
Public	Sr. High	09-12	Chariho	Chariho Regional High School	453 Switch Road
Public	Middle	05-08	Chariho	Chariho Regional Middle School	455B Switch Road
Public	Sr. High	09-12	Chariho	Chariho Area Career & Technical Center	459 Switch Road
Public	Middle and High	7-12	Chariho	Chariho Alternative Learning (CAL) Academy	455C Switch Road
Public	N/A	N/A	Chariho	Chariho Administration Building	455A Switch Road
Private	Preschool	PK	Chariho	New Hope Preschool (no longer active)	80 Richmond Townhouse Road

PPENDIX C

Richmond Sites on the National Historic Register

Historic District	Number of Contributing Properties
Beaver River Road Historic District (10/25/21)	N/A
Carolina Village Historic District (5/2/74)	28
Hillsdale Historic and Archaeological District (11/24/80)	N/A
Shannock Village Historic District (8/4/83)	44
Wyoming Village Historic District (Hopkinton and Richmond) (5/2/74)	35
John Hoxsie House / Old Kenyon Farm (5/5/78)	N/A
Samuel Clark Farm (2/4/19)	12

Note: Sites are accompanied by the date of listing on the National Register.
https://preservation.ri.gov/historic-places/national-register/listed-properties

Care Facilities Inventory

Facility Address	Type of Facility
40 Crestwood Drive	**State of RI – Group Home**
464/465 Gardiner Road – *Hillsdale Park*	Concentrated Elderly population
218 James Trail	**Bridges, Inc.** is a private, non-profit organization founded in 1986 and became a certified provider of residential services to people who have developmental disabilities.
3 White Oak Drive	**Bridges, Inc.** Group home, Developmental disabilities
61 KG Ranch Road	**State of RI – Group Home** Elderly residents
122 Kenyon Hill Road	**State of RI – Group Home** Cognitive delays
81 New London Turnpike	**Perspectives Corporation** Cognitive delays
8 Kenyon School Road	**State of RI – Group Home** Cognitive delays – Adult
25 Riverview Drive	**Privately run – Group Home** Cognitive delays - Adult
15 Baker Pines Road	**State of RI** –The Providence Center for Women

AT RISK	LOCATION	HAZARD/S	PROBLEM	MITIGATION BENEFITS
I. Flood Prone Drainage Systems	A. Valley Lodge Neighborhood B. Wood River C. Riverview Drive D. New London Turnpike @ Dawley Park Rd E. Usquepaug Road @ Glen Rock Road F. Richmond Town House Rd @ Wilbur, @Dover Lane, @ Pine Hill Rd G. Woodville Road @ dam H. Beaver River School House Road I.KG Ranch Road @ Cherry Lane J. Kingstown Rd. @ Meadowbrook, @ Beaver River Road K. Kenyon Hill Trail @Meadowbrook L. Pine Hill Rd. @ Meadowbrook Trail (Meadow Brook) M. Pine Hill Rd. @ Mill Lane (White Brook) N. Pinehurst Dr. @ Soneric Lane O. Shannock Hill Road P. Shannock Village Road Q. Carolina Nooseneck Rd. @ Buttonwoods Rd. (Meadow Brook) R. Carolina Nooseneck Rd. @ Baker Pines Rd. (Meadow Brook) S. Old Mountain Rd @ Beaver River T. Carolina-Alton Rd. @ Woodville Alton Rd. U. Woodville Rd. @ Wood River V. Switch Road @ Diamond Brook W. Mechanic Street/Pleasant St./N. Switch Rd. X. Hillsdale @ Beaver River Y. Biscuit City Road @ Bridge (Usquepaug River) Z. Kings Factory Road @ 91 Overpass (Meadow Brook) AA. Switch Road @ 91 Overpass (Meadow Brook)	Flooding	Flooding of local roads limit access and may strand residents and hinder rescue or evacuation efforts	Drainage, road access, reducing infrastructure loss.
II. Municipal Wells/ Pumping Station	All residents served by onsite wastewater treatment systems A. Pump Station at 94 Woodriver Drive (Valley Lodge Neighborhood) B. Water Tower 1 @ Old Kenyon Road – Primary Tank C. Water Tower 2 @ Country Acres Road – Secondary Tank D. Private wells (90% of town is on private wells) E. Shannock Water System in Charlestown (services 2% of Richmond residents)	Drought Flooding	Contamination of water in the water towers could leave (% pop) without potable water. Drought could cause low water levels in private wells. Destruction of water towers could cause widespread flooding	Safe and abundant drinking water.

AT RISK	LOCATION	HAZARD/S	PROBLEM	MITIGATION BENEFITS
III. Dams	A. Barberville Pond B. Wyoming Upper (high hazard) C. Hope Valley Mill Pond D. Alton Pond – on Rt 91, owned by RIDOT E. Horseshoe Falls (historic) F. White's Pond (private, high hazard) G. Lillibridge Pond H. Tanner Pond I. Wood River Junction (Meadowbrook Pond, Rt. 91, owned by RIDOT) J. Hillsdale Dam (on de Coppet Estate) (owned by DEM) K. Kenyon Mill dam (privately owned) L. Wells Pond M. Tug Hollow Pond N. de Coppet Estate Pond (owned by DEM) O. Bailey (on de Coppet Estate) (owned by DEM) P. Carolina Trout Pond Q. Duck Pond (73 Woodville Rd., South of Richmond Country Club)	Flooding Structural damage due to earthquake.	Dam failure could lead to damaged roads, flooded houses, and economic loss. Browning Mill Pont in Exeter is in good shape but would cause the most damage to Richmond if it failed.	Structural preservation preventing catastrophic flooding, reducing property loss and protecting public health, safety, and welfare.

APPENDIX D: REVIEW OF 2018 MITIGATION ACTIONS

Action	Mitigation Action	2018 Priority	Project Status	Status Description
1a	1a Build a retention pond in Valley Lodge Neighborhood	High	Project delayed/ ongoing	Town has been working for many years to mitigate ongoing flooding in this area. Biggest challenge is cost and that stormwater contributing to flooding appears to be originating from RIDOT and RIDEM properties. Town needs to continue to coordinate and partner with these state agencies to make meaningful progress, especially DEM. Town has put in two notices of intent with RIEMA to eventually put together a grant application for technical assistance. One of the greatest challenges facing the town is developing a project plan that covers the objectives for flood mitigation and other benefits for this area. 1a - 1e all deal with mitigation of routine flooding, and all have a high price associated with implementation. The Town is now in the early stages of a partnership with Southern RI Conservation District with funds from NRCS, to do all planning, engineering, and design functions on these actions at no cost to the town beyond staff support. This project should cover 1a through 1e. Revise action to: Implement the mitigation strategies identified in the SRICD NRCS study to reduce flood vulnerability and routine damages in the Valley Lodge neighborhood.
1b	Identify Repetitive Loss Properties in Valley Lodge Neighborhood	High	Project delayed/ ongoing	See above
1c	Create voluntary acquisition program for Valley Lodge Neighborhood	High	Project delayed/ ongoing	See above
1d	Increase retention basin at Pine Shadows/KG Ranch Road	Medium	Project delayed/ ongoing	See above

Action	Mitigation Action	2018 Priority	Project Status	Status Description
1e	Enlarge retention basin at Pine Shadows/Leroy Drive	Medium	Project delayed/ ongoing	See above
2a	Raise Buttonwoods roadbed to 1' above BFE	High	Complete	This project would alleviate flooding at the east and west ends of Buttonwoods Rd. The Richmond Public Works building, and Emergency Operations Center are located between the two stream crossings. High flood waters could isolate these critical facilities. The town did install new drainage in this location during road repaving in 2018, when they made surface repairs and elevated the road to 1" above BFE.
2b	Straighten and widen box culvert at Carolina Nooseneck Rd	High	Project delayed/ongoing	No progress. Continue action.
3	Raise roadbeds at Mechanic Street/ Switch Road at Diamond Brook, Pine Hill at Meadow Brook, and Pine Hill at White Brook which lead to emergency shelter (Chariho Middle School Emergency Shelter on 455 Switch Road)	High	Project delayed/ongoing	No progress. Continue action.
4a	Identify Repetitive Loss homes throughout the Town for Voluntary Acquisition	Medium	Project delayed/ ongoing	This action responds to the March 2010 catastrophic flooding. Claims mainly came from Valley Lodge Estates, and maybe parts of Alton along wood river. There are two RL properties in Town. RHMC requested FEMA data on the location of RL properties.
4b	Research and secure funding from various state and federal grants for Voluntary Acquisition.	Medium	Project delayed/ ongoing	See above.
4c	Engage in Voluntary Acquisition Program	Medium	Project delayed/ ongoing	See above.

Action	Mitigation Action	2018 Priority	Project Status	Status Description
5a	Inventory the debris, noting location, type, and size. Engage Wood-Pawcatuck Watershed Association in stream survey.	Medium	No progress	Still relevant, carry forward, revise action
5b	Remove the debris from the stream channels by engaging volunteers from the local watershed group, scouts, or high school students.	Medium	Ongoing	Wood Pawcatuck Watershed Association conducts annual debris cleanups, and Richmond DPW conducts emergency debris removal in anticipation of a heavy precipitation event on an as needed basis. Still relevant, carry forward, revise action
5c	ID and secure stream easements for new stream access points on private lands. Multiple access points will increase the efficiency of clean-up efforts.	Medium	Ongoing	Many landowners are sensitive to the prospect of providing access for debris removal for fear that the easement will also be used by members of the public accessing the river for recreation. Still relevant, carry forward, revise action
5d	Partnership with Wood-Pawcatuck Watershed Association to pursue mitigation actions identified in the Wood-Pawcatuck Watershed Resiliency Management Plan.	Medium	No progress	Still relevant, carry forward
15	Raise access road for Woodriver Drive pump station - Install drainage pipe under access road to relieve water pressure overflowing on to the road. Increase the height of the road by bringing in gravel to raise	Medium	Project delayed/ cancelled	Gravel road to primary pump station adjacent to the Wood River is vulnerable to washout. This is the same Valley Lodge area from action 1 above that gets inundated because it is low laying. The Town raised the roadway in 2017 but did not install cross drainage. Carry forward, combine with action below – Install cross-drainage under to primary pump station adjacent to the Wood River to relieve water pressure overflowing on to the road and raise retaining wall around the pump station at Woodriver Drive to reduce vulnerability of wellhead to

Action	Mitigation Action	2018 Priority	Project Status	Status Description
	roadbed one foot above base flood elevation.			flooding. The Town has noted that the pump station itself does not yet experience flooding, only the roadway does, so this mitigation action may be considered a low priority at this time.
16	Raise the retaining wall around the secondary well bunker to one foot above base flood elevation to prevent flooding of wellhead.	Medium	No progress	Still relevant, carry forward
6	ID dam owners and create dam maintenance plans	Medium	Ongoing	Currently ongoing project at Town Line, Wyoming Dam, state-administered project. Dam number 216 (Wyoming Upper) in Hopkinton/Richmond. The dam was inspected in 2011. The Department of Environmental Management (DEM) owns the dam and Bridge Street, which is a state road, leads to state highway garage. In 2019, DEM's Division of Planning and Development (P&D) retained a consultant. In 2020, P&D applied to the Dam Safety Program to repair the dam, which was approved. RIEMA works with DEM to approve EAPs. Still relevant, carry forward
7	Update construction plans for new Senior Center to improve resilience	Medium	Project completed	There has been a town goal to have a new senior center for years, and it may be coming close to fruition after completion of a recent study. Funding is the primary barrier. There isn't a definite location for where it would be construction. Funding would be needed to maintain and staff, as well as construct. This would be a senior/community center, potential for this to act as a warming/cooling shelter, emergency shelter, etc. https://clerkshq.com/Content/Attachments/Richmond-ri/190604_09.pdf?clientSite=Richmond-ri New action to identify funding and construct new senior center.

Action	Mitigation Action	2018 Priority	Project Status	Status Description
8	Assess municipal radio antennae to determine wind load rating.	High	Project cancelled	This is a state-owned facility. Tower is in bad shape. State may be building a new one. No longer applicable as a town strategy.
9a	Evaluate Shannock Hill tower for structural integrity and resistance to wind damage.	High	Project cancelled	Town recently cut down site vegetation so we can inspect via the road, and this has already reduced vandalism at the site PD is up there a few times per month. This tower is of steel construction, the hardware is intact, and it is therefor the PD does not consider potential wind damage to be a concern. PD will continue regular monitoring and visual evaluations of the structure integrity.
9b	Secure Shannock Hill tower per findings of the structural integrity study. Potential improvements include preventing vandalism/ access, fixing the stairs, installing security cameras, replacing the roof, installing wind straps, and nearby tree clearing to create a laydown zone.	High	Project delayed/ ongoing	State EMA is considering a new tower at this site in the near future. For now, the Town will secure a damaged fence around the site's perimeter but will not put other capital into the site in anticipation of the impending state investment. Carry forward - Add "Repair damaged perimeter fence" to this action
10	Install a generator at Town Hall (an alternate EOC) capable of providing power for air conditioning in the building, especially the computer servers.	Low	Project delayed/ ongoing	No progress but still relevant. The current generator at Town Hall is not capable of powering air conditioning and all computer servers. Carry forward, revise to specify need for load testing the building to determine the size and power generator needed.
11	Improve climate control in records storage room in the basement of Town Hall to reduce mold improve air exchange and protect from fire.	High	Completed	Storage vault - referring to the locked room where meeting minutes, land records, finance records, etc. were kept downstairs in basement. But we think flood problem was in old vault. Records have been relocated to locked room in Town Hall hallway which does not have history of water damage.

Action	Mitigation Action	2018 Priority	Project Status	Status Description
12a	Dry flood-proof Town Hall basement to reduce potential damage to records in Town Hall basement.	High	Project delayed/ ongoing	This is an old building that has been added on to. No floodproofing or flood reduction assessments have been completed. Carry forward.
12b	Additional sump pumps for Town Hall basement with French drains	High	Project delayed/ongoing	No progress, but still relevant
13	Create a dead tree limb removal and tree trimming mitigation program.	Medium	Project on schedule	Scott reports this is underway - aggressive work has been done in the past four years and it continues.
14	Acquire a bucket truck to create internal capacity for Town tree trimming.	Medium	Project cancelled	Town has secured a contract with an outside company to provide a bucket truck on an as-needed basis.
17	Develop a Wildland Urban Interface Fire Plan or Community Wildfire Protection Plan to address the community's ability to maintain a high level of fire protection, prepare for large-scale wildfire/brushfire disasters, and provide training to fire personnel.	High	Project delayed/ongoing	Town FD does an annual training for wildland firefighting. DEM is working on a state wildfire plan.
18	Create the necessary fire breaks and fire roads identified in the Community Wildfire Protection Plan.	Low	Project cancelled	The Town does not have a community wildfire protection plan, but will participate as stakeholders in DEM's planning process.
19	Coordinate with the State to improve emergency access to fire gates by removing boulders and installing breakaway chains	Low	Project delayed/ongoing	Carry forward

Action	Mitigation Action	2018 Priority	Project Status	Status Description
	across the firebreak roads. Estimate of 10 gates			
20	Encourage participation by the Richmond Historic Preservation Commission's historic preservation professionals in pre- and post-disaster emergency planning.	Low	Project cancelled	No longer a need
21	Engage a historic preservation professional in the debris management plan.	Low	Project delayed/ongoing	No progress. This action is looking to getting a historic preservation professional involved in developing a debris management plan. Carry forward, revise to Develop a debris management plan. This would require added budget in planning or DPW's operating budget for professional services and planning to pick back up on the debris management plan. This effort should be reassigned to Public Works.
22	Cross reference Comprehensive Community Plan, Emergency Operations Plan and Hazard Mitigation Plan activities	Medium	Complete	Comp plan was adopted in 2021 and received state certification in early 2022. HMP was referenced in the comp plan. CEMP or EOP may need to be updated.

APPENDIX E: MITIGATION ACTION PRIORITIZATION

	Average Scores	Benefits					Feasibility				Economic		Regulatory		
	3=Very true/Best/Most Benefit/Least Cost/Easy or no permitting; 2=Somewhat true/Some benefit/Moderate Cost/Potential permitting complications; 1=Not true/Little to no benefit/Expensive	Protects Properties and Structures	Protects Natural Resources	Technical/Capacity Improvement (Training, Evaluations, Regulations, etc.)	Improves Public Awareness	Improves Emergency Response or Public Protection After an Emergency	Appropriate Staffing Available	Technically Feasible	Public Support	Town/ Political Support	Cost	Funding Available / Attainable	Permitting/Regulatory Feasibility	Consistent with Local, State, & Federal Goals	Total Score
1	Implement the mitigation strategies identified to reduce flood vulnerability and routine damages in the Valley Lodge neighborhood	3	3	1	2	3	1	2	3	3	1	2	2	3	29
2	Straighten and widen box culvert at Carolina Nooseneck Rd to alleviate flooding at the east end of Buttonwoods Rd.	2	2	1	1	2	1	2	3	3	1	2	2	3	25
3	Elevate the roadbeds at Mechanic Street/ Switch Road at Diamond Brook, Pine Hill at Meadow Brook, and Pine Hill at White Brook	2	2	1	1	2	1	2	3	3	1	2	2	3	24
4	Identify Repetitive Loss homes throughout the Town for Voluntary Acquisition	3	3	1	3	3	2	2	3	3	2	2	2	3	32
5	Research and secure funding from various state and federal grants for Voluntary Acquisition of highly flood-prone properties.	3	3	1	3	2	2	3	3	3	2	3	2	3	33
6	Engage in Voluntary Acquisition Program for 2-3 highly flood-prone properties	3	3	1	3	3	2	3	3	3	2	3	2	3	34
7	Stormwater management improvements that would address runoff from I-95 and Route 3	3	3	1	2	2	2	2	3	2	1	1	1	3	26
8	Upgrade culverts and stormwater runoff on Route 138 – Kingstown Road	2	2	1	2	2	2	2	3	3	1	2	2	3	26
9	Update design storm precipitation amounts for subdivision design	2	2	2	2	2	3	3	3	3	3	3	3	3	33
10	Hire a grant administrator to be tracking, pursuing, and managing HMP-related grants	2	2	2	2	3	1	2	2	2	2	2	2	3	26
11	Coordinate with the WPWA for shared use of the interactive web-based debris inventory tool	2	2	2	2	2	2	2	2	2	2	2	3	2	26

	Average Scores	Benefits					Feasibility				Economic		Regulatory		
	3=Very true/Best/Most Benefit/Least Cost/Easy or no permitting; 2=Somewhat true/Some benefit/Moderate Cost/Potential permitting complications; 1=Not true/Little to no benefit/Expensive	Protects Properties and Structures	Protects Natural Resources	Technical/Capacity Improvement (Training, Evaluations, Regulations, etc.)	Improves Public Awareness	Improves Emergency Response or Public Protection After an Emergency	Appropriate Staffing Available	Technically Feasible	Public Support	Town/ Political Support	Cost	Funding Available / Attainable	Permitting/Regulatory Feasibility	Consistent with Local, State, & Federal Goals	Total Score
12	Continue to remove debris from the stream channels to reduce the risk of culvert or bridge obstruction and damage	2	2	1	2	2	1	2	2	2	1	2	2	2	22
13	Identify the need for new or additional stream access points	1	1	1	2	2	1	2	2	2	1	2	2	2	21
14	Pursue wetland restoration of 2.5 acres (3 parcels) in Beaver River Watershed ranked as priority in the 2021 Beaver River Watershed Assessment.	2	3	1	2	1	1	2	2	2	1	2	2	2	22
15	Pursue permanent land protection for 4 parcels in Beaver River Watershed through land acquisition or partnership	2	3	1	2	1	2	2	2	2	1	2	2	2	23
16	Pursue permanent land protection for 2 parcels in Beaver River Watershed through conservation restriction	2	2	1	2	1	2	2	2	2	1	2	2	2	22
17	Implement recommendations of the upcoming NRCS PL566 program	3	3	1	3	3	1	2	3	3	1	2	2	3	30
18	Raise retaining wall around the pump station at Woodriver Drive	2	2	1	2	2	1	2	2	2	1	2	2	2	22
19	Encourage private owners to create Emergency Action Plans	2	2	2	2	3	1	2	2	2	1	2	2	2	24
20	Assess opportunities for dry flood-proofing of the Town Hall	3	1	1	1	3	1	2	2	3	2	2	3	2	26
21	Implement dry floodproofing at Town Hall	3	1	1	1	3	1	2	2	3	1	2	3	2	25
22	Repair perimeter fencing to secure the Shannock Hill radio communication tower.	2	1	1	1	2	2	2	2	2	2	2	3	2	23
23	Research and install a back-up generator to power all emergency operations at Town Hall	2	1	1	1	2	3	2	2	2	2	2	3	2	24
24	Develop a Richmond debris management plan	2	2	1	1	2	2	2	2	2	2	2	2	2	23

	Average Scores	Benefits					Feasibility				Economic		Regulatory		
	3=Very true/Best/Most Benefit/Least Cost/Easy or no permitting; 2=Somewhat true/Some benefit/Moderate Cost/Potential permitting complications; 1=Not true/Little to no benefit/Expensive	Protects Properties and Structures	Protects Natural Resources	Technical/Capacity Improvement (Training, Evaluations, Regulations, etc.)	Improves Public Awareness	Improves Emergency Response or Public Protection After an Emergency	Appropriate Staffing Available	Technically Feasible	Public Support	Town/ Political Support	Cost	Funding Available / Attainable	Permitting/Regulatory Feasibility	Consistent with Local, State, & Federal Goals	Total Score
25	Update the Richmond Emergency Operations Plan/Community Emergency Management Plan (CEMP)	2	2	2	3	3	2	2	2	3	2	2	2	2	26
26	Purchase a suitable building or property for the new Richmond Community/Senior Center	1	1	1	1	1	2	2	2	2	1	2	2	2	20
27	Develop a Wildland Urban Interface Fire Plan or Community Wildfire Protection Plan	2	3	2	2	3	2	3	2	2	2	2	2	2	28
28	Improve emergency access to fire gates	2	1	1	1	2	3	3	2	2	2	2	3	2	25
29	Increase public education on tick-borne diseases	1	2	2	3	2	2	2	3	2	2	2	2	2	26

APPENDIX F: TECHNICAL AND FINANCIAL ASSISTANCE FOR MITIGATION

STATE RESOURCES

Coastal Resources Center
University of Rhode Island
Narragansett Bay Campus
Narragansett, RI 02882
(401) 874-6224

Coastal Resources Management Council
Stedman Government Center
4808 Tower Hill Road
Wakefield, RI 02879
(401) 222-2476

Department of Administration/Division of Planning
One Capitol Hill
Providence, RI 02908
(401) 222-6478

Department of Environmental Management
235 Promenade Street
Providence, RI 02908
(401) 222-6800

Municipal Resilience Program through the Rhode Island Infrastructure Bank
235 Promenade Street,
Suite 119
Providence, RI 02908
(401) 808-6563

Rhode Island Banking Commission/Associate Director
233 Richmond Street
Providence, RI 02903
(401) 222-2405

Rhode Island Builders Association
Terry Lane
Gloucester, RI 02814
(401) 568-8006

Rhode Island Department of Business Regulations
233 Richmond Street
Providence, RI 02903
(401) 222-2246

Rhode Island Emergency Management Agency
645 New London Avenue
Cranston, RI 02920
(401) 946-9996

Rhode Island Floodplain Mitigation Association
P.O. Box 14235
East Providence, RI 02914

Rhode Island Infrastructure Bank
235 Promenade Street,
Suite 119
Providence, RI 02908
(401) 453-4430

Public Utilities Commission
100 Orange Street
Providence, RI 02903
(401) 222-3500 Ext. 153

State Fire Marshal's Office
272 West Exchange Street
Providence, RI 02903
(401) 222-2335

State of Rhode Island Building Committee Office
Building Commissioner's Office
One Capitol Hill
Providence, RI 02903
(401) 222-352

FEDERAL RESOURCES

Economic Development Administration
Philadelphia Regional Office
The Curtis Center
601 Walnut Street, Suite 140 South
Philadelphia, PA 19106-3323
(215) 597-8822

Federal Emergency Management Agency
Mitigation Division
Mitigation Division
Region I Office
99 High Street
Boston, MA
(617) 223-9561

National Weather Service
Boston / Norton, MA
46 Commerce Way
Norton, MA 02766
(508) 622-3250

National Wild and Scenic Rivers, U.S. Fish and Wildlife Service
64 Maple Street
Burbank, Washington 99323
(509) 546-8333

New England Ecological Services Field Office
70 Commercial St., Suite 300,
Concord, NH 03301
(603) 223-2541

Small Business Administration
10 Causeway Street
Room 265
Boston, MA 02222
(617) 565-5590

U.S. Army Corps of Engineers New England District
696 Virginia Road
Concord, MA 01742
(978) 318-8238

U.S. Department of Agriculture
Natural Resources Conservation Service
451 West Street
Amherst, MA 01002
(413) 253-4362

U.S. Department of Commerce
National Weather Service Forecast Office
445 Myles Standish Boulevard
Taunton, MA 02780
(508) 823-2262

U.S. Department of Housing and Urban Development
Community Development Block Grants
Region I – O'Neill Federal Building
10 Causeway Street
Boston, MA 02222
(617) 565-5354

U.S. Department of the Interior
National Park Service
Rivers and Trails Conservation Program
Regional Office
15 State Street
Boston, MA 02109
(617) 223-5203

U.S. Environmental Protection Agency
Region I Offices
5 Post Office Square - Suite 100
Boston, MA 02109-3912
(617) 565 3400

U.S. Fish and Wildlife Service
Northeast Regional Office
U.S. Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035-9587
(413) 253-8200

OTHER RESOURCES

The Association of State Flood Plain Managers (ASFPM)

Professional association with a membership of almost 7,000 individual members that assists communities with the NFIP. ASFPM has developed a series of technical and topical research papers and a series of proceedings from their annual conferences. Many mitigation "success stories" have been documented through these resources and provide a good starting point for planning.

Flood Plain Management Resources Center

Free library and referral service of the ASFPM for flood plain management publications. Co-located with the Natural Hazards Center at the University of Colorado in Boulder, staff can use keywords to identify useful publications from the more than 900 flood-related documents in the library.

Institute for Business and Home Safety (IBHS) (formerly Insurance Institute for Property Loss Reduction)

An insurance industry – sponsored, nonprofit organization dedicated to reducing losses – deaths, injuries, and property damage – resulting from natural hazards. IBHS efforts are directed at five specific hazards: flood, windstorm, hail, earthquake, and wildfire. Through its public education efforts and information center, IBHS communicates the results of its research and statistical gathering, as well as mitigation information, to a broad audience.

Nature Conservancy and other Non-Profit Organizations

The Nature Conservancy is a global environmental organization working to protect and conserve natural and water habitats through financial investment projects, land management and conservation. They are funded through foundations, private donors, and an in-house investment team. Other similar non-profit organizations such as the Climate Resilience Fund provide grants and funding for the proactive protection of environmental resources.

Volunteer Organizations

Organizations, such as the American Red Cross, the Salvation Army, Habitat for Humanity, Interfaith, and the Mennonite Disaster Service, are often available to help after disasters. Service organizations, such as the Lions, Elks, and VFW are also available. These organizations have helped others with food, shelter, clothing, money, etc. Habitat for Humanity and the Mennonite Disaster Service provide skilled labor to help rebuild damaged buildings incorporating mitigation or floodproofing concepts. The offices of individual organizations can be contacted directly, or the FEMA Regional Office may be able to assist.

Flood Relief Funds

After a disaster, local businesses, residents, and out-of-town groups often donate money to local relief funds. They may be managed by the local government, one or more local churches, or an ad hoc committee. No government disaster declaration is needed. Local officials should recommend that the funds be held until an applicant exhausts all sources of public disaster assistance. Doing so allows the funds to be used for mitigation and other projects that cannot be funded elsewhere.

New England States Emergency Consortium (NESEC)

NESEC conducts public awareness and education programs on natural disaster and emergency management activities throughout New England. Brochures and videotapes are available on such topics as earthquake preparedness, mitigation, and hurricane safety tips. NESEC maintains a WWW home page that is accessible at http://nesec.org/.

APPENDIX G: EXISTING PROTECTION SYSTEMS

FEDERAL AND STATE

Community Rating System (CRS)

A voluntary initiative of the NFIP, the CRS was developed to encourage communities to perform activities that exceed the minimum NFIP flood plain management standards. If a community participating in the CRS performs activities that include maintaining records for flood plain development, publicizing the flood hazard, improving flood data, and conducting flood plain management planning, then the flood insurance premiums paid by policy holders in the community will be reduced by 5 to 45 percent. Developing a flood mitigation plan will help communities gain additional credit under the CRS.

Earthquakes and Hurricanes

A certain amount of funding is allotted to each state per year based on a risk formula for earthquakes. Coastal states are allocated funds based on a risk formula for hurricanes. Each state receiving such funds has the ability to grant project funds to a community. There is not a match requirement on the part of the community, but the funds are limited, and are generally only available once a year. The projects or products proposed for such funding must demonstrate that earthquake or hurricane risk will be reduced or eliminated, and that the proposed project or product is a cost-effective measure (a stringent cost/benefit analysis need not be performed). Information about the amount of funding available per year and the state requirements for eligibility and performance may be obtained from RIEMA at (401) 946-9996.

Economic and Community Development

There may be programs existing to help flood-proof homes using Community Development Block Grant funds. There may be housing assistance programs in the community that can be used following a major flood, achieving both objectives of reducing flood damage and improving the communities housing stock (see Appendix F, Federal Resources, for more information).

Evacuation Plans and Systems

Your community's emergency operations center should have evacuation plans in place. For communities near a nuclear power plant, evacuation plans are required, and may be also used for flood evacuation. RIEMA may have additional evacuation plan information.

Land Use Restrictions

There are several federal and state regulations that serve to restrict land use in certain areas that may help reduce flood hazard vulnerability. If your community has open land owned by the state or federal government, examine what restrictions are placed on its development. In addition, the state Wetlands Protection Act regulates the development of all lands identified as significant to the protection of resources identified in the act.

Septic Systems

State septic system regulations influence development and may be a consideration for mitigation alternatives that include rebuilding and elevation of structures. Specific design requirements must be met for any construction in coastal velocity zones or river floodways. Generally, an inspection of a septic system is required if there is a change in use of the structure, an increase in flow, or a failed system. Limited inspections are required if the footprint of the structure is being changed. Upgrades are required by the state if an inspection reveals a failed system. However, local regulations may be more restrictive than state requirements, requiring inspections or upgrades in other cases.

Warning Systems and Emergency Operations Plans

RIEMA has offices throughout the state that maintain area-wide plans for flood events.

APPENDIX H: FINANCING OPTIONS

Federal Emergency Management Agency

National Flood Insurance Program (NFIP)

All of Rhode Island's 39 municipalities participate in the NFIP. This program is a direct agreement between the federal government and the local community that flood insurance will be made available to residents in exchange for community compliance with minimum flood plain management regulations. Communities participating in the NFIP must:

- Adopt the flood insurance rate maps as an overlay regulatory district.
- Require that all new construction or substantial improvement to existing structures in the flood hazard area be elevated or (if nonresidential) floodproofed to the identified flood level on the maps.
- Require design techniques to minimize flood damage for structures being built in high hazard areas, such as floodways or velocity zones.

In return for community adoption of these standards, any structure in that community is eligible for protection by flood insurance, which covers property owners from losses due to inundation from surface water of any source. Coverage for land subsidence, sewer backup, and water seepage is also available subject to the conditions outlined in the NFIP standard policy (see Appendix F, Federal Resources, for contacts regarding insurance coverage and purchase). Since homeowner's insurance does not cover flooding, a community's participation in the NFIP is vital to protecting property in the flood plain as well as being essential to ensure that federally backed mortgages and loans can be used to finance floodprone property.

Hazard Mitigation Grant Program (HMGP)

Also known as the 404 Program or HMGP, this program is available only after a federally declared disaster occurs. It represents an additional 15 percent of all the infrastructure and individual assistance funds that are provided to states to repair damages and recover from losses and is administered by the state in partnership with FEMA. Having a plan or completed mitigation action matrix prior to a disaster event is extremely helpful in meeting the state's deadlines for applications and ensuring the project is eligible and technically feasible. It provides 75/25 matching grants on a competitive basis to state, local, and tribal governments, as well as to certain nonprofit organizations that can be matched by either cash or in-kind services. The grants are specifically directed toward reducing future hazard losses, and can be used for projects protecting property and resources against the damaging effects of floods, earthquakes, wind, and other hazards. Specific activities encouraged under the HMGP include acquiring damaged structures to turn the land over to the community for open space or recreational use, relocating damaged or damage-prone structures out of the hazard area, and retrofitting properties to resist the damaging effects of disasters. Retrofitting can include wet- or dry-floodproofing, elevation of the structure above flood level, elevation of utilities, or proper anchoring of the structure.

For further information contact the state of Rhode Island hazard mitigation officer at (401) 946-9996 or FEMA Region I at (617) 223-9540.

Flood Mitigation Assistance Program (FMA)

Two programs that have been authorized under the National Flood Insurance Reform Act of 1994 include the Flood Mitigation Assistance (FMA) program and a provision for increased cost of compliance (ICC) coverage. FMA makes grants available on a pre-disaster basis for flood mitigation planning and activities, including acquisition, relocation, and retrofitting of structures. FMA grants for mitigation projects will be available only to those communities with approved hazard mitigation plans.

ICC coverage has recently been implemented for all new NFIP policies and renewals and is intended to be "mitigation insurance" to allow homeowners whose structures have been repeatedly or substantially damaged to cover the cost of elevation and design requirements for rebuilding with their flood insurance claim up to a maximum of $15,000.00. A certain amount of funding is allotted to each state per year based on a risk formula for floods. Each state has the discretion to award funds to communities or to state government agencies. States may use whatever criteria or method they choose to award the funds as long as the applicant and the proposal are eligible. The program may fund up to 75 percent of the cost of the proposed project, with a minimum of 25 percent of the cost coming from the community. A minimum of half the community share must be cash or "hard match."

Funds can also be granted to communities to help them prepare local flood mitigation plans. The same match requirements apply. Once a community receives a planning grant, however, it is not eligible to receive additional planning grants for another five years.

Building Resilient Infrastructure and Communities Program (BRIC)

BRIC is a FEMA program that will support states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency. . . Federal funding is available for up to 75% of eligible activity costs. The remaining 25% must come from non-Federal sources.

Natural Resources Conservation Service (NRCS)

Small Watershed Program and Flood Prevention Program

The Watershed and Flood Prevention Act, P.L. 83-566, August 4, 1954, (16 USC 1001 – 1008) authorized this program. Prior to fiscal year 1996, small watershed planning activities and the cooperative river basin surveys and investigations authorized by Section 6 of the Act were operated as separate programs. The 1996 appropriations act combined the activities into a single program entitled Watershed Surveys and Planning Program.

The purpose of the Watershed Program, including River Basin operations, is to assist Federal, State, local agencies, local government sponsors, tribal governments, and program participants to protect and restore watersheds from damage caused by erosion, floodwater, and sediment, to conserve and develop water and land resources, and solve natural resource and related economic problems on a watershed basis. The program provides technical and financial assistance to local people or project sponsors, builds partnerships, and requires local and state funding contribution.

Resource concerns addressed by the program include watershed protection, flood prevention, erosion and sediment control, water supply, water quality, opportunities for water conservation, wetland and water storage capacity, agricultural drought problems, rural development, municipal and industrial water needs, upstream flood damages, water needs for fish, wildlife, and forest-based industries, fish and wildlife habitat enhancement, wetland creation and restoration, and public recreation in watersheds of 250,000 or fewer acres. Both technical and financial assistance are available.

U.S. Fish & Wildlife Service (USFW) Grant Programming

The U.S. Fish and Wildlife Service offers a number of funding opportunities as conservation and mitigation resources, including grant programming, easements, and funds. Opportunities for support from Habitat Conservation Planning Assistance Grants, the Restoration Act Grant Program, and Habitat Conservation Plan Land Acquisition Grants all act to protect and repair valuable natural area. State or local governments are eligible to receive this funding through h a partnership with the USFW.

Wildlife Habitat Incentives Program

The Wildlife Habitat Incentives Program (WHIP) is a voluntary program for people who want to develop and improve habitat primarily on private land. Through WHIP USDA's Natural Resources Conservation Service (NRCS) provides both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife

habitat. WHIP agreements between NRCS and the participant generally last from 5 to 10 years from the date the agreement is signed.

National Weather Service (NWS)

The Taunton, Massachusetts NWS office has developed a partnership with RIEMA. NWS donates staff time and tide gauges to help gain more lead time for evacuation.

For further information contact NWS at (508) 823-2262. http://www.nws.noaa.gov/.

American Red Cross (ARC)

The ARC chapter of Rhode Island has supplied public education materials and volunteered to conduct training programs and hold seminars for the Rhode Island Hazard Mitigation Project.

For further information contact the Rhode Island Chapter of the American Red Cross at (401) 831-7700. http://www.redcross.org.

U.S. Army Corps of Engineers

Beneficial Uses of Dredged Material – Section 204, Water Resources Development Act of 1992, as amended, authorizes projects for the protection, restoration, and creation of aquatic and ecologically related habitats, including wetlands, in connection with dredging an authorized federal navigation project. Non-federal sponsors are responsible for 25 percent of the project cost and 100percent of the cost of operation, maintenance, replacement and rehabilitation. There is an annual appropriations limit of $15 million. For projects with an estimated federal cost of less than $5 million, divisions have approval authority.

1948 Flood Control Act, as amended - Section 205 (Small Flood Damage Reduction Projects) aids in the development and construction of small flood damage reduction projects for eligible non-federal sponsors. The 1960 Flood Control Act, as amended, provides 100 percent funding for technical and planning guidance to state and local governments and federally recognized Native American tribes to help develop and interpret flood and flood plain data, such as flood hazard mapping, and for assessment for structural and non-structural flood damage reduction measures.

Under Flood Control Act of 1946 – Section 14, as amended, projects are eligible for construction only after an analysis demonstrates the engineering and environmental feasibility and economic justification of the improvement. The local sponsor must be a municipality or public agency. Funding may also be available for flood damage reduction measures if the community writes a request letter to the U.S. Army Corps of Engineers. The non-federal cost share is 35 percent of the analysis and implementation, and the initial $40,000 of the analysis is 100 percent federally funded.

The 1974 Water Resources Development Act, as amended – Section 22 (Planning Assistance to States Program) provides technical assistance for such flood projects as erosion and control. This program uses cost-shared studies with a non-federal sponsor. The non-federal share of the cost is 50 percent and in-kind services are not authorized. The federal limit for each state is $500,000 annually.

For more information, contact the U.S. Army Corps of Engineers at (978) 318-8087 or (978) 318-8647. http://www.usace.army.mil.

State of Rhode Island

The capital budget is approved on a 5-year basis and is proposed by the governor. If there is any surplus available in the emergency fund, this could be a possible source of financing for mitigation projects.

The Rhode Island Infrastructure Bank also provides a variety of loans for mitigation purposes. Initially established as the Clean Water Agency in 1989, the Bank provides funding to municipalities, businesses, and individuals with initiatives that correlate directly with the goals of hazard mitigation and protecting environmental and economic resources. Funds such as the Community Septic System Loan Program, Drinking Water State Revolving Fund, and Municipal Resilience Program aid in community and climate resilience strategies for municipalities across the state and strengthen possible areas of vulnerability.

Rhode Island Department of Environmental Management (DEM)

In the 1980's, four major open space bond issues were approved that resulted in an investment of more than $100 million for recreational and open space land acquisition. Each application is reviewed by a committee to assure consistency with local plans and habitat values. The state participates in funding either through a matching grant or of a revolving loan. Funds may be available through the DEM Parks and Recreation Division for tree trimming, dune restoration and bulkhead repair.

In addition, the state has several funding programs for the acquisition of land or purchase of development rights to protect open spaces. For instance, two Rhode Island municipalities use a real estate transfer tax for land preservation. Rhode Island has incorporated land trusts that work to preserve land and natural resources. Land owners can participate in the Farm, Forest and Open Space Program. Under this program, land may qualify for a reduced property tax assessment if it meets specific criteria as farmland, forest land or open space.

For current funding availability contact the Open Space and Recreational Bond Fund Land Acquisition Program or DEM at (401) 222-2776.

Rhode Island Department of Transportation (DOT)

The State Planning Council designates which Transportation Improvements Plan enhancement projects the state will pursue. Applications for the Federal Wooden Bridge Replacement Program can be made through DOT. In addition, DOT has a debris management program that goes into effect during a storm event. The new federal transportation bill, TEA-21, is a successor to the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA). There are a few categories within this bill that may have available funding for natural hazard mitigation projects. These include transportation enhancement (categories include storm water remediation, storm water runoff protection, and environmental mitigation) and bridge replacement. The municipality must apply for project funds through DOT. The annual funding averages for Rhode Island are $156,781.00. There is an average of $26,749 available under the Bridge Rehabilitation and Replacement category.

For further information contact DOT at (401) 277-2481.

Northeast States Emergency Consortium (NESEC)

Since 1998, RIEMA has been given funds for preventative measures and maintenance. Providence and Woonsocket both received $5,000 grants from NESEC for mitigation activities that were addressed in their local hazard mitigation strategies.

For further information contact at (781) 224-9874.

Municipal

Several utility companies have prevention and clean-up programs that require cooperation from municipalities. For instance, companies are usually willing to co-sponsor planting low-growing trees as part of a tree replacement program. Utility companies will provide the bucket truck area lift if the town or city helps dispose of tree trunks.

The Clean Water Finance Agency has financing programs for local government units and water suppliers. The clean water state revolving fund uses monies from the Federal Clean Water Act to support sewer work such as sewer extensions and septic system repair, and to give homeowners of all incomes low-interest loans for septic system repairs. The community wide onsite wastewater management plan is a Clean Water Finance Agency program for failing or sub-standard septic systems, and it identifies areas in municipalities where system failures could cause degradation to water quality. Municipal loans for large infrastructure projects are also available through this program at discounted interest rates.

APPENDIX I: PUBLIC ENGAGEMENT

HAZARD MITIGATION PLANNING COMMITTEE MEETINGS

The following are copies of all meeting agendas and notes for the committee meetings held by the RHMC.

MEETING 1 (KICKOFF)

Date:	November 15, 2021
Subject:	**Richmond, RI Hazard Mitigation Plan Update Committee Meeting**
Location:	Zoom
Attendance:	Karen Pinch, Town Administrator Randall Gemme, Emergency Management Director Scott Barber, Fire Chief and DPW Director Joseph Arsenault, RIEMA, Exercise Coordinator, former Town Emergency Management Agency Elwood Johnson, Police Chief Shaun Lacey, Town Planner Kevin Aguiar, BETA Group, Inc. Principal in Charge Emily Slotnick, BETA Group, Inc. Project Manager

1. Welcome and Introductions: Kevin Aguiar and Emily Slotnick, BETA Group, Inc.
2. Role of the Hazard Mitigation Planning Committee (HMPC)
    - Participate in up to 5 virtual steering meetings
    - Support outreach efforts through your networks
    - Share knowledge, records, and information on natural hazard evets from last 5 years
        - Committee member noted that COVID got in the way of routine HMP annual updates. Emergency management met weekly for past 1.5 years for COVID, and HMP topics often came up in discussion.
        - The Town/planning department worked with Melinda (RIEMA) about trying to implement one of the 2018 proposed mitigation projects and filed a NOI twice about funding opportunities for floodplain mitigation, but ultimately found that the total package of project was going to be cost prohibitive. Most 2018 projects will still be relevant today.
        - DPW did a lot of tree work on the sides of road, accelerated by die off from gypsy moth infestation which required a huge amount of remediation. DPW has all the paperwork to back that up.
    - Review draft plan sections and provide comments
3. Project Coordination
    - Data collection
        - GIS data
        - Preferred method for file sharing
        - Native (word doc.) version of 2018 plan
        - FEMA NFIP data
        - Dam info from DEM website
        - Previous Mitigation Action Report Card
    - Proposed Plan Layout
4. Public Outreach

MEETING 2

Date: November 29, 2021

Subject: **Richmond, RI Hazard Mitigation Plan Update Committee Meeting**

Location: Zoom

Attendance:
Karen Pinch, Town Administrator
Elwood Johnson, Police Chief
Shaun Lacey, Town Planner
Melinda Hopkins, RIEMA State Hazard Mitigation Officer
Emily Slotnick, BETA Group, Inc. Project Manager

1. Welcome and Introductions
2. Outstanding items from last meeting
    - Public outreach – HMP Update webpage, press release announcing project kick-off, and announcements on Facebook, other social media
    - GIS data and word version of previous plan
3. Review draft public survey
    - One comment – remove reference to sewer, change to drainage basins.
    - Use BETA's survey monkey account.
4. Review hazards of concern - Melinda shared the table of state hazards

    a. Brushfire
    b. Dam Failure
    c. Drought / Extreme Heat
    d. Earthquake
    e. Flood
    f. Geomagnetic Storms (Solar Flares)
    g. Hurricanes / Nor'Easters
    h. Winter Storms / Extreme Cold
    i. Thunder/Lightning Storms
    j. Tornadoes

5. New development sites
6. Review previous mitigation action strategy
    - Committee reviewed the 2018 Mitigation Action Worksheet and provided updates where possible. Emily to send Shaun her edited spreadsheet to work from.
7. Schedule
    - Committee meetings: **Dec 13, January 24, March 7, April 4**
    - Public workshop on **Wed, Feb 16, 6-8**
8. Next steps
    - Committee Meeting Dec. 13
        - Agenda:
            1. Review critical facilities list and map
            2. Review Capabilities Assessment

MEETING 3

Date: December 13, 2021

Subject: **Richmond, RI Hazard Mitigation Plan Update Committee Meeting**

Location: Zoom

Attendance:
Shaun Lacey, Richmond Town Planner
Karen Pinch, Richmond Town Administrator
Scott Barber, Richmond Public Works Director
Elwood Johnson, Richmond Police Chief
Randy Gemme, Richmond Emergency Management Administrator
Joe Arsenault, RIEMA Exercise Coordinator (town resident)
Emily Slotnick, BETA Group

1. Summary of progress since last meeting
    a. HMP webpage is up
    b. Project kick-off announced on Town website and town Facebook page
    c. Survey is live. Link on website and FB
    d. Received 2018 plan native file and existing GIS data
    e. Meeting dates (all virtual):
        i. Committee meeting: Dec 13, January 24, March 7, April 4
        ii. Public meeting: Wed, Feb 16, 6-8pm
2. Outstanding items from last meeting
    a. Include pandemic/infectious disease? Emily will discuss with Melinda Hopkins at RIEMA
    b. Previous mitigation action strategy list
    c. Ask for photos of past natural hazard events
3. Review HMP Goals
    a. 6.2 Mitigation Goals and Objectives: To achieve its mission the Richmond Hazard Mitigation Committee established a series of goals that support the mission. These goals include:
        i. Revised: Protect life and safety from the impacts of natural hazards.
        ii. Revised: Protect property and reduce damages to present and future structures or property from the impacts of natural hazards.
        iii. Revised: Protect critical infrastructure including dams, roads, utilities, and essential services.
        iv. New: Design future local infrastructure improvements to mitigate the impacts of natural hazards and build local resilience.
        v. New: Safeguard Richmond's natural resources, environmental features, and natural ecosystem services to improve resilience to the impacts of natural hazards.
    b. Objectives That Support the Mission:
        i. Upgrading infrastructure

ii. Protecting property
iii. Integrating current planning and management approaches
iv. Improving response effectiveness
v. Maintaining open space
vi. New: Increasing education and awareness of natural hazards

4. Update Critical Facilities Inventory – Committee reviewed Critical Facilities list and made updates.
5. Next steps
    a. Capability assessment
    b. Critical facilities and hazard map review
    c. January 24 Committee Meeting
    d. February 16 Public Workshop

MEETING 4

Date: January 24, 2022

Subject: **Richmond, RI Hazard Mitigation Plan Update Committee Meeting**

Location: Zoom

Attendance:
Shaun Lacey, Richmond Town Planner
Karen Pinch, Richmond Town Administrator
Scott Barber, Richmond Public Works Director
Elwood Johnson, Richmond Police Chief
Randy Gemme, Richmond Emergency Management Administrator
Melinda Hopkins, RIEMA State Hazard Mitigation Officer
Emily Slotnick, BETA Group

1. Summary of progress since last meeting
    A. Previous mitigation action strategy list
    B. Received photos of past natural hazard events
    C. Survey was live through Jan 21. Just under 150 responses.
    D. Communications with RIEMA, Town, and FEMA R1
    E. Draft Capabilities Assessment worksheet finalized
    F. Draft HMP maps finalized
    G. Meeting dates (all virtual):
        1. Committee meeting: January 24, March 7, April 4
        2. Public meeting: Wed, Feb 16, 6-8pm
2. Outstanding items from last meeting – None!
3. Committee comments/questions on Capabilities Assessment Worksheet
    A. ES reviewed responses with the committee
    B. debris management
        1. State debris management plan was approved in 2021.
    C. Floodplain manager is currently the Building Official, but the Town Planner is looking into becoming a Certified Floodplain Manager and taking over the role as floodplain manager for the purposes of NFIP compliance.
    D. Mutual aid – in addition to the water agreement, other MUAs with adjoining PDs in South Kingstown, Charlestown, and neighbors for basic non-emergency support. Also, FD is part of regional group through RI southern firemen's league. Public works at one time had an agreement to assist with neighboring DPW's back and forth, but there may not be anything in writing. This was about 10 years ago when Scott was on the board for the public works association. This group discussed mutual aid at length as far as equipment sharing, inland departments sending resources to coastal communities, etc. Scott will look into whether there was a formal agreement.
    E. School system has many natural disaster/safety programs in place. These are coordinated with Richmond Fire and Police Departments, but are not public info – Elwood is part of the

safety planning team. The schools update their EOPs every year, including schedules for fire drills, evacuation drills, etc.

F. ISO Fire protection classes – split across 2 fire departments based on the water system. Some areas (Hope Valley, Richmond water system) are class 4/5, others are class 9
G. StormReady Classification earned in 2017.

4. Committee comments/questions on HMP maps
5. Planning for Feb 16 public workshop
6. Next steps

A. ES to send out another group email with link to maps
B. BETA to send committee text and flyer to post on webpage and FB about public workshop
C. Public workshop presentation sent to committee by Feb 7
D. BETA developing draft plan sections to send to committee for review
E. March 7 Committee Meeting – mitigation strategy prioritization and plan maintenance

MEETING 5

Date: March 15, 2022

Subject: **Richmond, RI Hazard Mitigation Plan Update Committee Meeting**

Location: Zoom

Attendance:
Shaun Lacey, Richmond Town Planner
Karen Pinch, Richmond Town Administrator
Scott Barber, Richmond Public Works Director
Elwood Johnson, Richmond Police Chief
Randy Gemme, Richmond Emergency Management Administrator
Melinda Hopkins, RIEMA State Hazard Mitigation Officer
Emily Slotnick, BETA Group
Emily Farmer, BETA Group

1. Summary of progress since last meeting
    A. Drafting updated plan chapters – shared chapters 1-5 with Town for review.
    B. Committee meeting dates – see discussion below under "Timeline"
2. Outstanding items from last meeting - None
3. Timeline
    A. Plan remains to post a public draft on the project website by April 1 for 30 days (on track with our original proposed schedule, plan to have agency approval by end of June)
        1. HMP committee members will issue public announcements
        2. HMP committee members will send link to draft plan directly to Planning Board and Town Council
        3. Town Planner and Emergency Manager will send to Planners and Emergency Management Directors in neighboring communities
        4. Town Planner will notify RIDOT Contacts and ask for review and comments
    B. Compile comments week of May 2, meet with committee to discuss proposed revisions, BETA will make a Draft Plan Presentation to Town Council after receiving conditional approval from FEMA
    C. Presentation at Town Council meeting after FEMA conditional approval, pre-adoption of plan
4. Discuss Plan Maintenance Requirements (review 2018 Chapter 8)
5. Mitigation strategy
    - BETA led the committee through a review of the draft 2022 mitigation action strategies, reviewing the action description, implementing agency, costs, and funding sources.
    - Changes made on Mitigation actions from 2018 plan and newer updates.
        1. Amended costs or funding for items 1, 6, 13, 14, 16, 17, 22, 26-30
        2. Amended parties responsible for items 1, 2, 7, 12, 22-30
6. Next steps
    A. BETA to revise mitigation action strategy and send to committee in a worksheet form to complete prioritization.
    B. Draft plan posting – all committee members help spread the word
    C. final committee meeting May 2 and Town Council presentation June 21 (contract ends June 30)

MEETING 6

Date: May 2, 2022

Subject: **Richmond, RI Hazard Mitigation Plan Update Committee Meeting**

Location: Zoom

Attendance:
Shaun Lacey, Richmond Town Planner
Karen Pinch, Richmond Town Administrator
Randy Gemme, Richmond Emergency Management Administrator
Melinda Hopkins, RIEMA State Hazard Mitigation Officer
Emily Slotnick, BETA Group

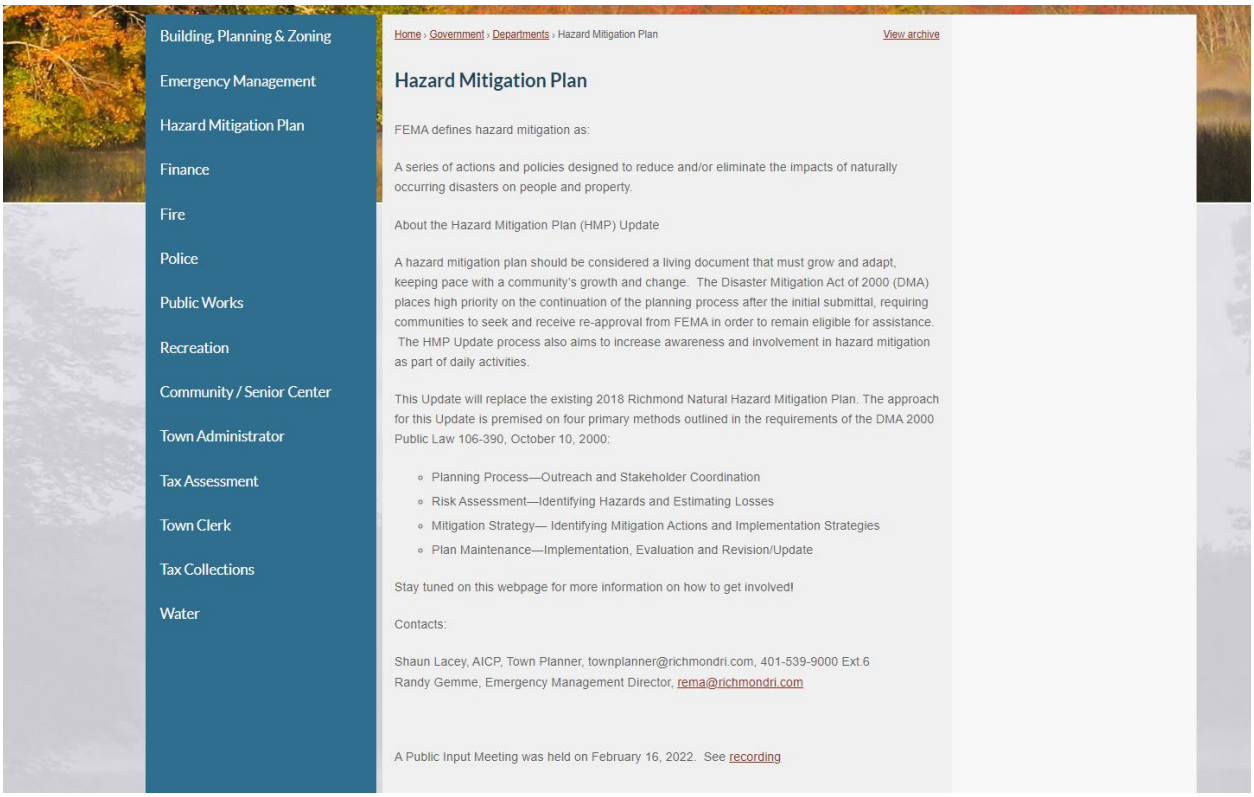
1. Summary of progress since last meeting
    A. Plan posted April 5 on our website and directed people to it via FB and the News Flash section of the homepage, comments directed towards Shaun.
    B. Shaun distributed the draft to neighboring comminutes and partners:
        1. Wood Pawcatuck Watershed Association (Chris Fox)
        2. Wood Pawcatuck Wild & Scenic Rivers Stewardship Council (Antonia Bryson)
        3. South Kingstown (Jay Parker)
        4. Hopkinton (EMA Director)
        5. Exeter (EMA Director)
        6. Charlestown (Jane Weidman)
        7. RIEMA (Melinda Hopkins)
    C. BETA collected committee input and completed action prioritization matrix
    D. BETA incorporated comments on draft plan from Town Solicitor – no other public comments received
    E. BETA completed the local plan review tool
2. Outstanding items from last meeting – None
3. Discuss comments on draft plan, and required revisions
    A. BETA revised the description of the HMPT to mitigate concern about an official Town Committee - the point is that it was not an appointed committee by the town council or codified anywhere in the town's regulations.
    B. The statement that the "Town should consider updating design storm precipitation amounts to promote more resilient development and road crossing design" is confusing because there are no town ordinances or regulations related to road crossing design. BETA changed the wording so that the recommendation applies to the subdivision ordinance and site plan review policy.
4. Timeline
    A. On track with our original proposed schedule to have agency approval by end of June
    B. Draft Plan Presentation to Town Council – Council presentation June 21 (contract ends June 30)

5. Next steps

    A. BETA to submit draft to RIEMA/FEMA for review. RIEMA has 30 working day period, FEMA has 45 calendar days
    B. Minor revisions based on agency review
    C. Present to Town Council for Adoption

PUBLIC MEETINGS

The Public Meeting was held on February 16, 2022. A link is posted to the full presentation and discussion in the image below, taken from the official Town website's page for the Hazard Mitigation Plan.

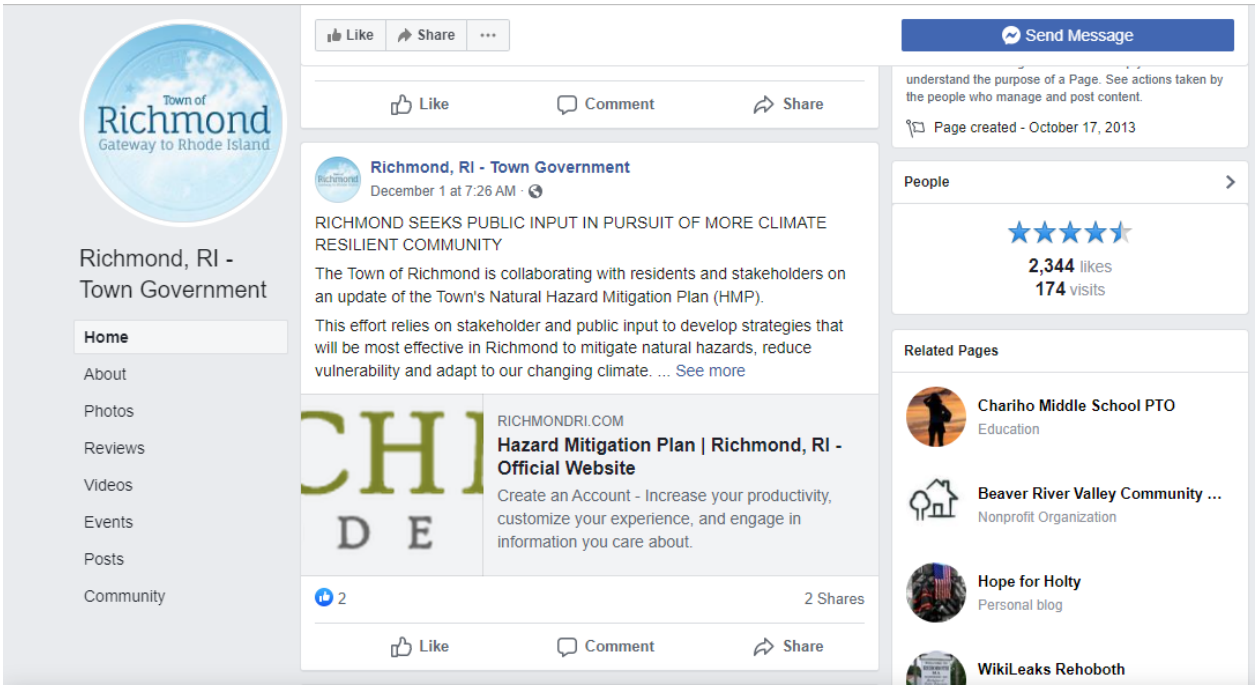


Source: Town of Richmond Website

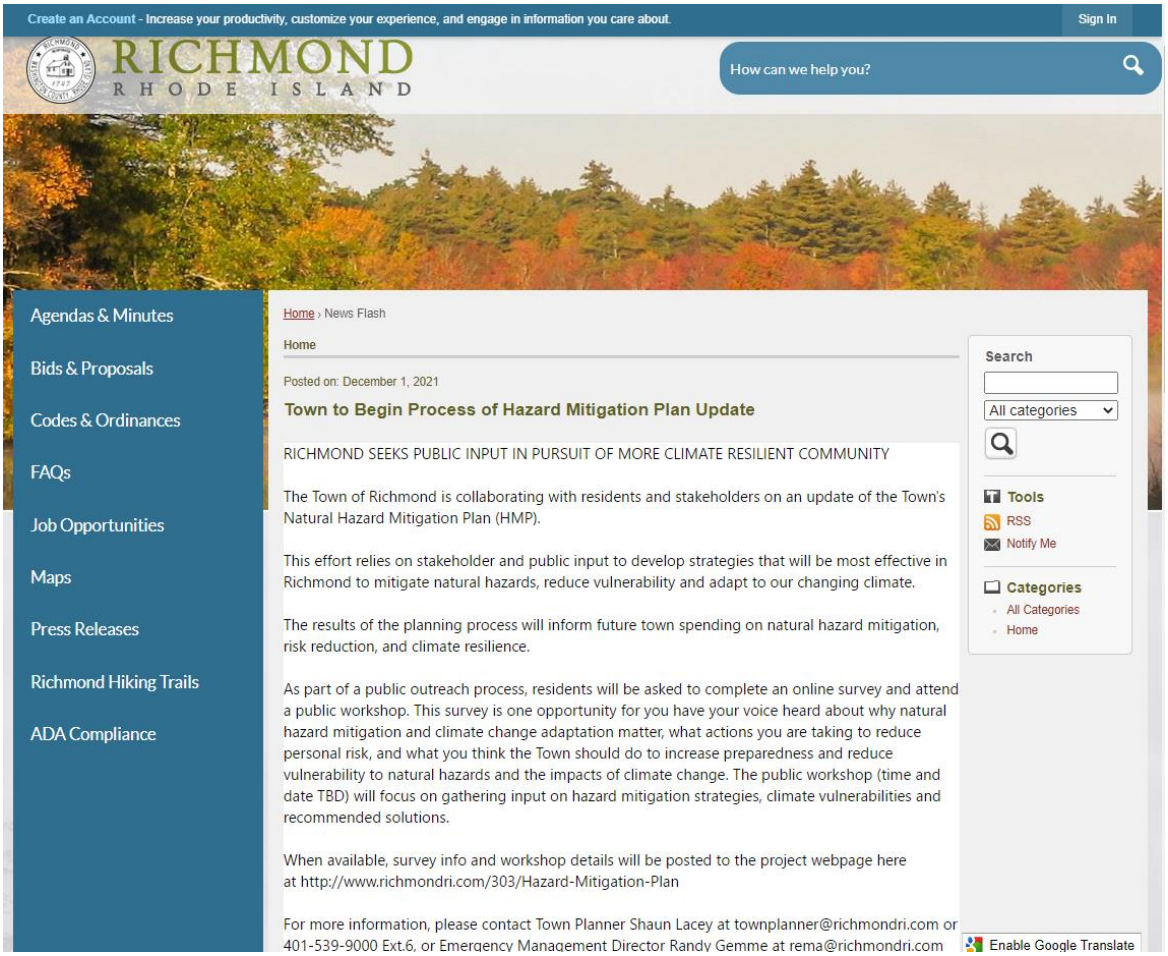
The agenda for the meeting is pictured to the right. After the formal presentation and review of mitigation actions, the several members of the RHMC and members of the public also discussed tree removal and damage from hazard events, the Beaver River Watershed Plan, the possibility of a resident well survey, and localized flooding in the Valley Lodge neighborhood.

PRESS AND MEDIA

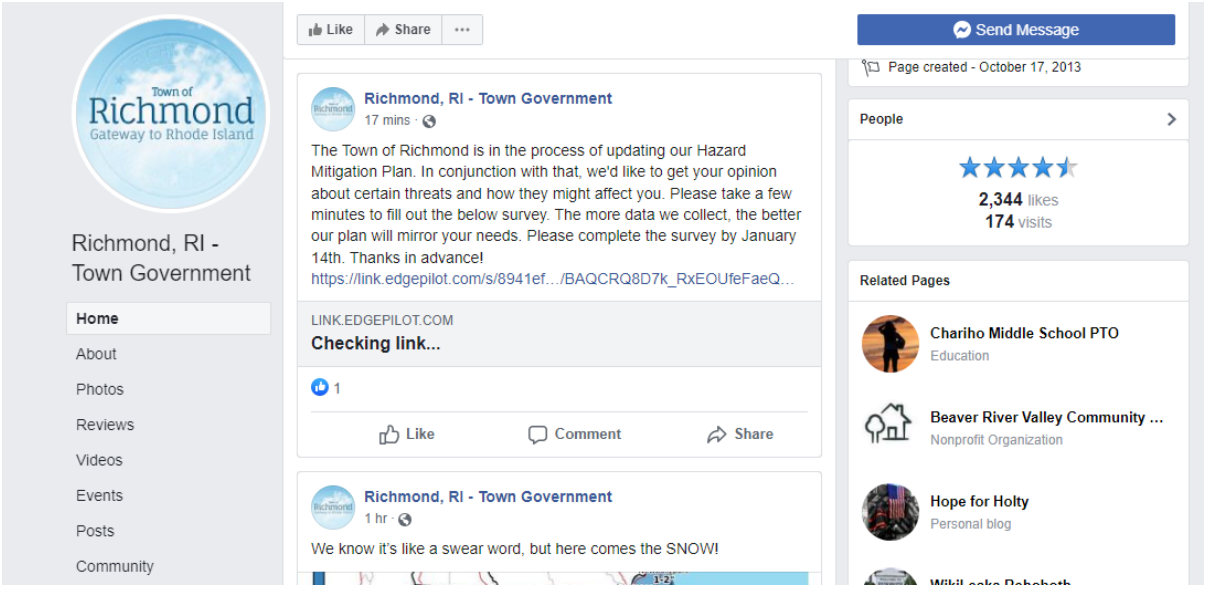
Below is a record of press releases published using the Town's social media presence and website for the announcement of the hazard mitigation planning process and the release of the public survey.



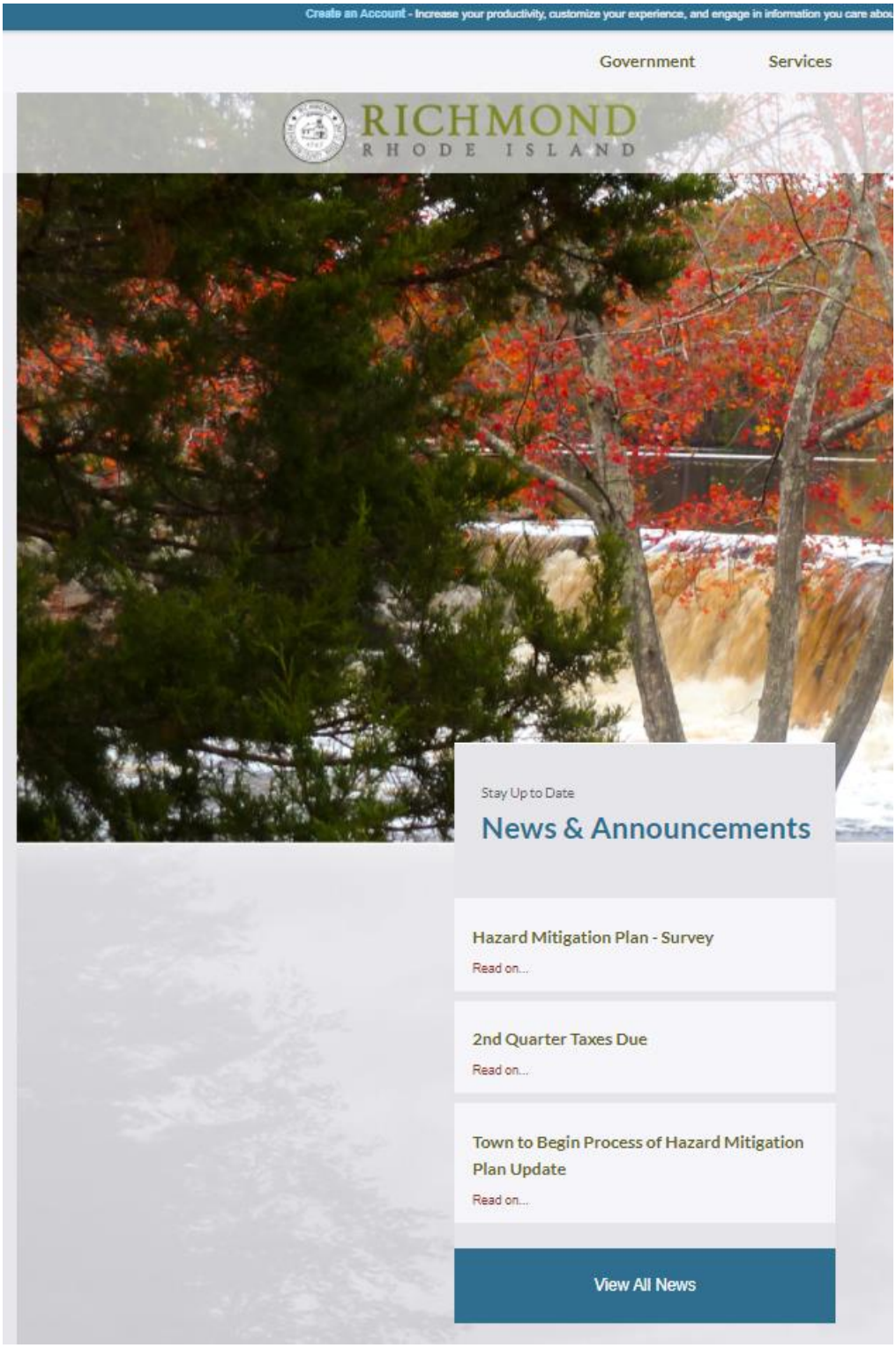
Announcement of hazard mitigation plan process kickoff and request for public involvement on Town's official Facebook, December 1, 2021.



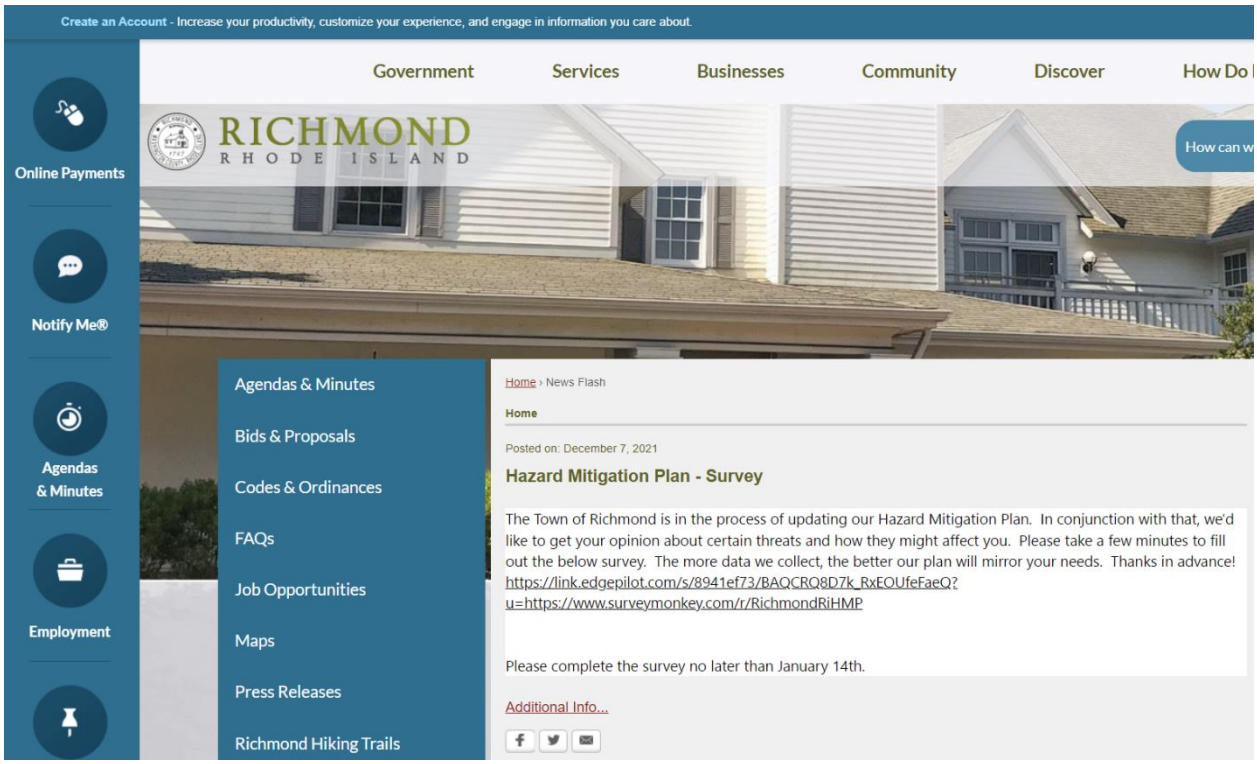
Announcement of hazard mitigation plan process kickoff and request for public involvement on Town's official website, December 1, 2021.



Announcement of release of public survey and request for input from Town's offical Facebook, December 7, 2021.



Announcement of release of public survey and request for input from Town's official website, December 7, 2021.



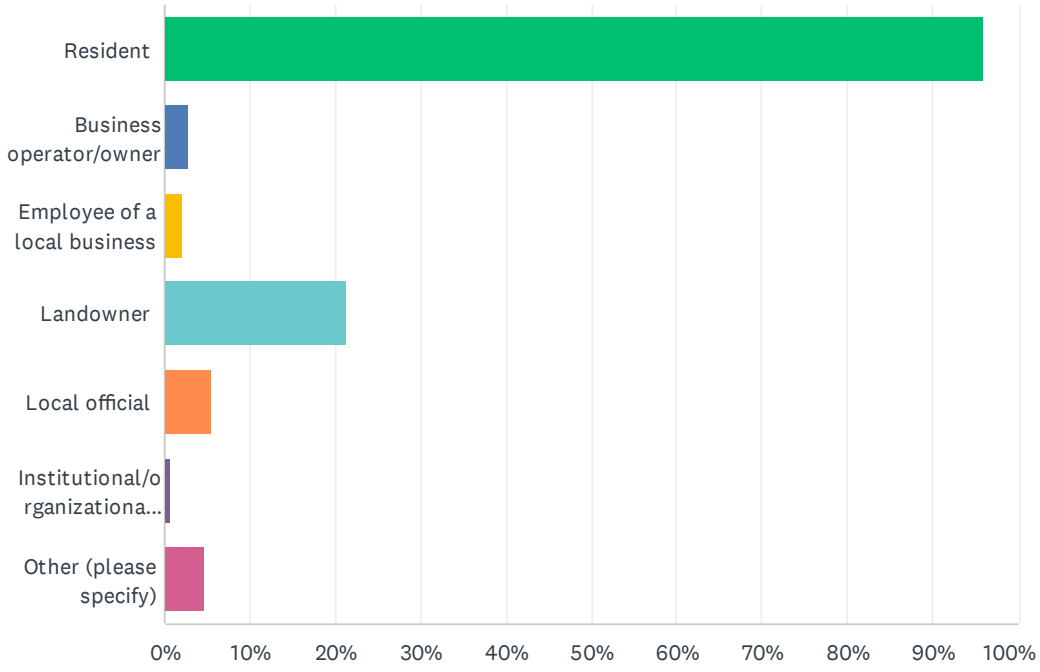
Official Town website page including the survey description and link, December 7, 2021

PUBLIC SURVEY

Please see attached document for a full view of survey results. All personal contact information provided by respondents has been removed.

Q1 Which options below best define your role(s) in Richmond? (please select all that apply)

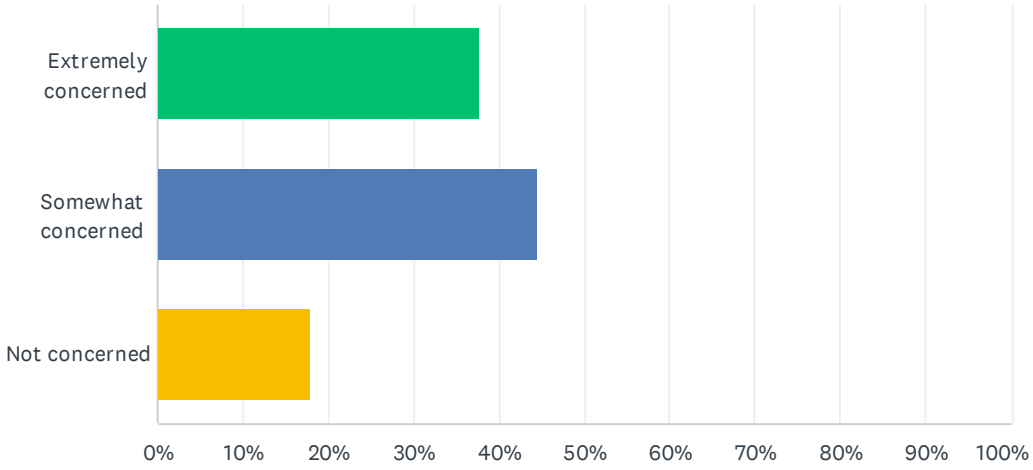
Answered: 146 Skipped: 0



ANSWER CHOICES	RESPONSES	
Resident	95.89%	140
Business operator/owner	2.74%	4
Employee of a local business	2.05%	3
Landowner	21.23%	31
Local official	5.48%	8
Institutional/organizational partner	0.68%	1
Other (please specify)	4.79%	7
Total Respondents: 146		

Q2 How concerned are you about the impacts of climate change for Richmond as a whole?

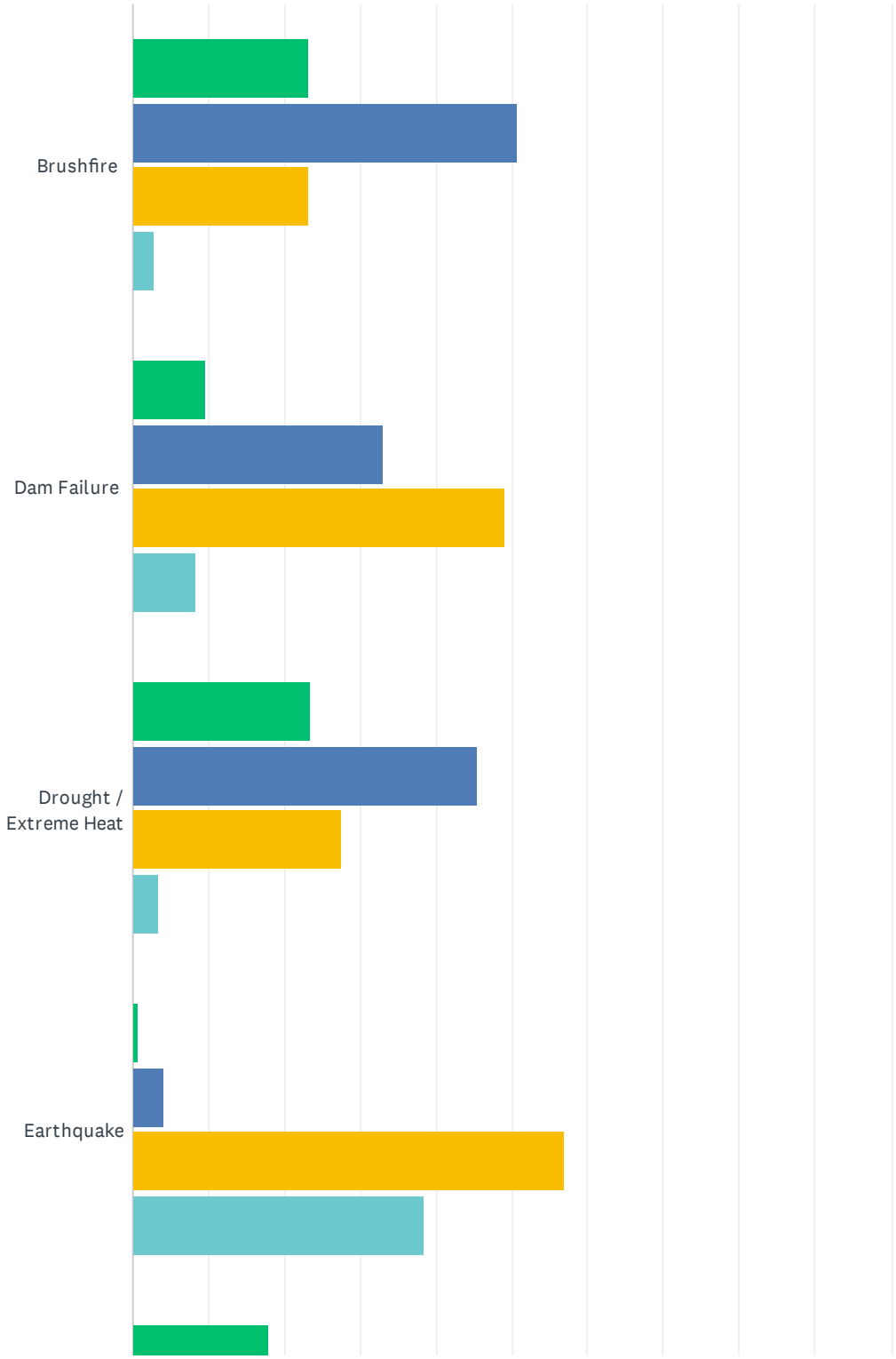
Answered: 146 Skipped: 0

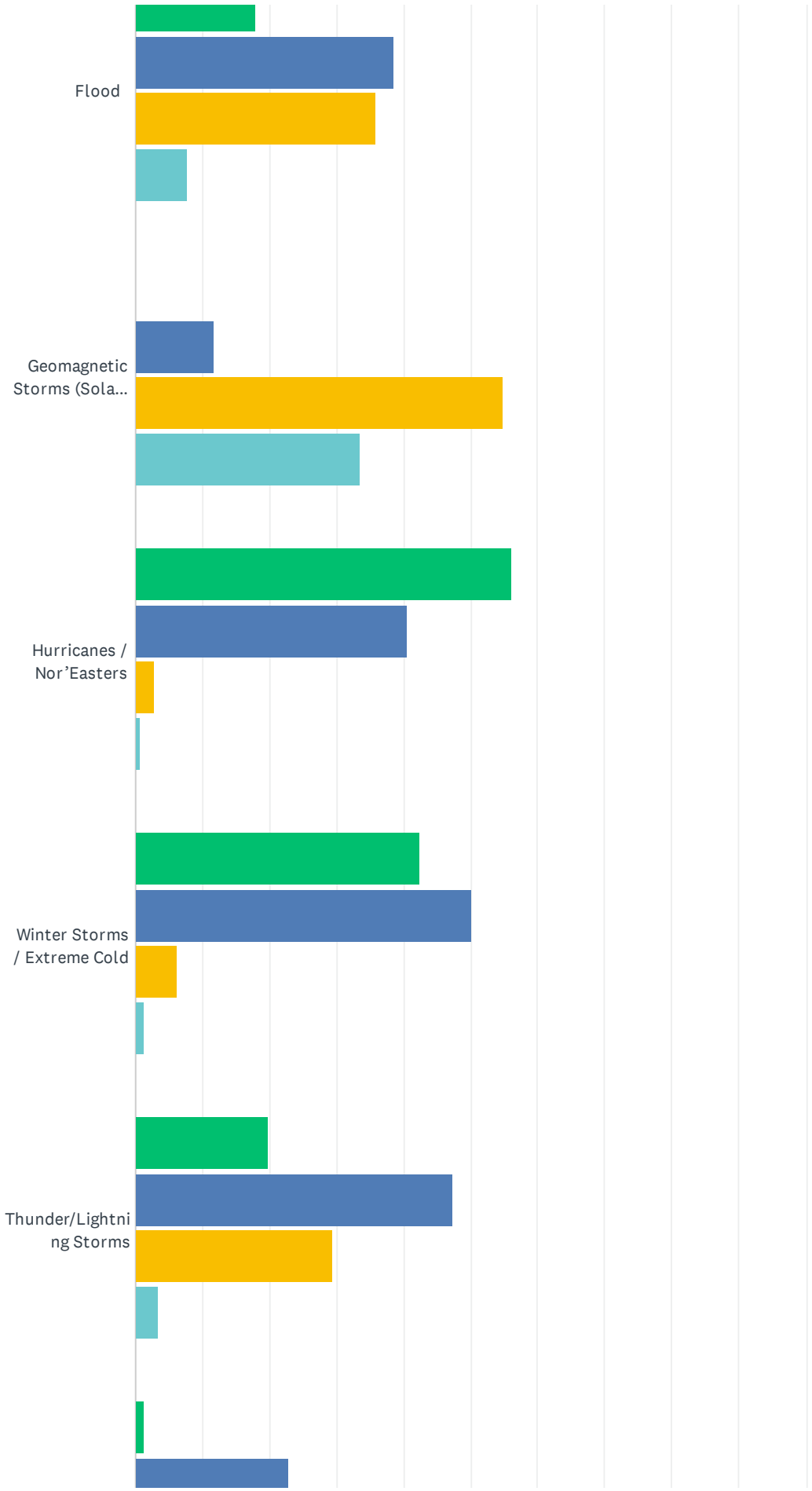


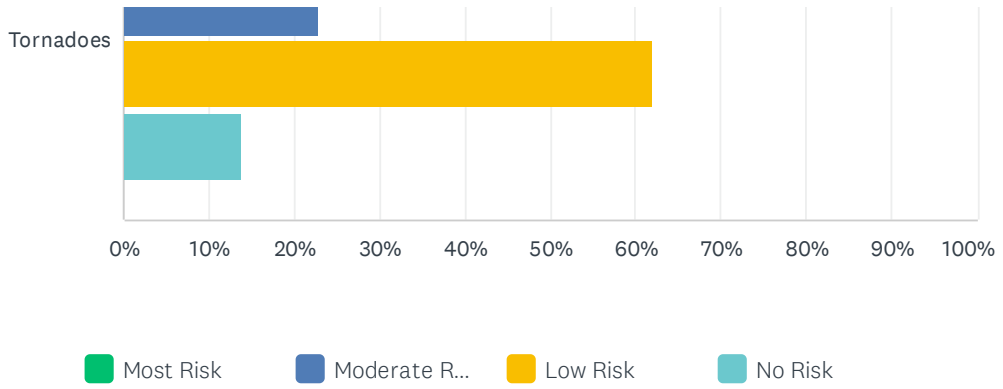
ANSWER CHOICES	RESPONSES	
Extremely concerned	37.67%	55
Somewhat concerned	44.52%	65
Not concerned	17.81%	26
TOTAL		146

Q3 The Town of Richmond's 2022 Natural Hazard Mitigation Plan is evaluating the following natural hazards as concerns of the Town. Please rank these hazards according to your perception of which present the most risk to the community.

Answered: 146 Skipped: 0



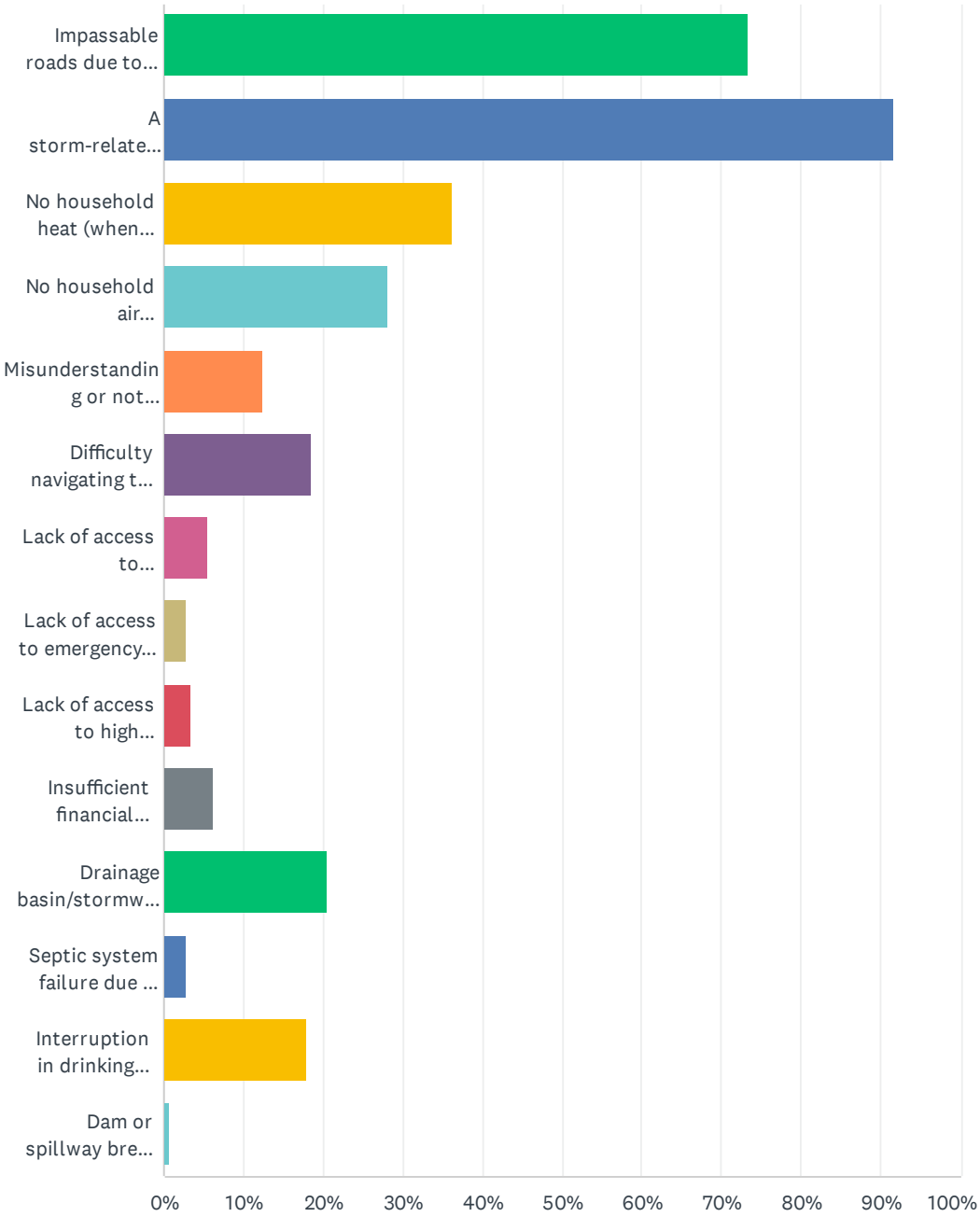

Flood
Geomagnetic Storms (Sola...
Hurricanes / Nor'Easters
Winter Storms / Extreme Cold
Thunder/Lightning Storms



	MOST RISK	MODERATE RISK	LOW RISK	NO RISK	TOTAL	WEIGHTED AVERAGE
Brushfire	23.29% 34	50.68% 74	23.29% 34	2.74% 4	146	1.95
Dam Failure	9.66% 14	33.10% 48	48.97% 71	8.28% 12	145	1.44
Drought / Extreme Heat	23.45% 34	45.52% 66	27.59% 40	3.45% 5	145	1.89
Earthquake	0.68% 1	4.11% 6	56.85% 83	38.36% 56	146	0.67
Flood	17.93% 26	38.62% 56	35.86% 52	7.59% 11	145	1.67
Geomagnetic Storms (Solar Flares)	0.00% 0	11.64% 17	54.79% 80	33.56% 49	146	0.78
Hurricanes / Nor'Easters	56.16% 82	40.41% 59	2.74% 4	0.68% 1	146	2.52
Winter Storms / Extreme Cold	42.47% 62	50.00% 73	6.16% 9	1.37% 2	146	2.34
Thunder/Lightning Storms	19.86% 29	47.26% 69	29.45% 43	3.42% 5	146	1.84
Tornadoes	1.38% 2	22.76% 33	62.07% 90	13.79% 20	145	1.12

Q4 In the last five years, have you directly experienced any of the following in your community (select all that apply)?

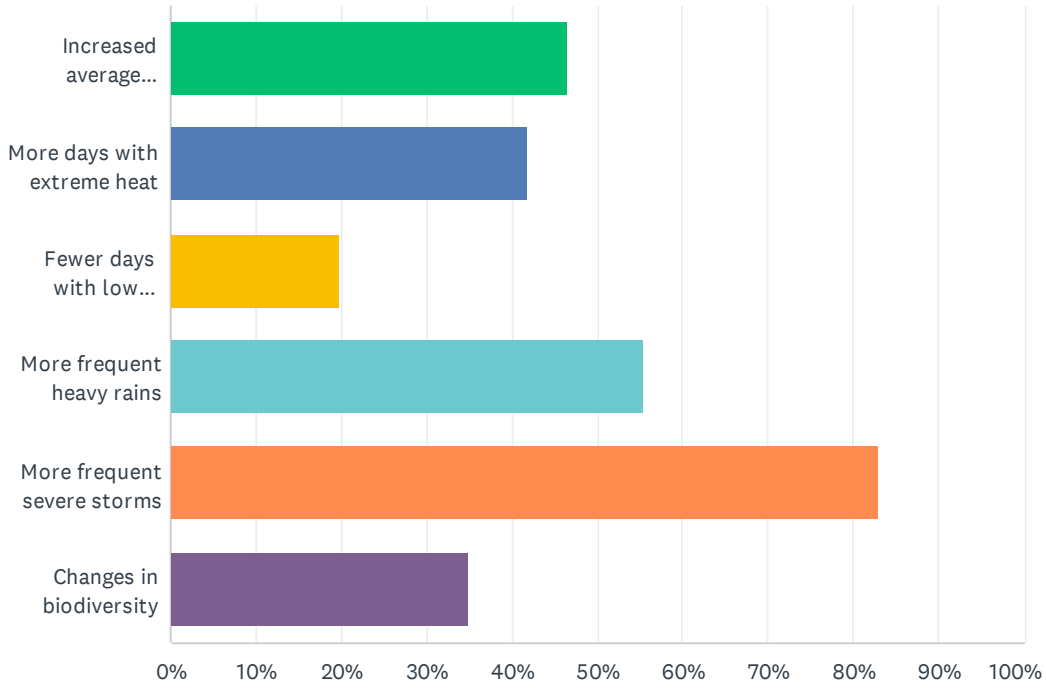
Answered: 146 Skipped: 0



ANSWER CHOICES	RESPONSES	
Impassable roads due to flooding or severe weather damage	73.29%	107
A storm-related power outage	91.78%	134
No household heat (when needed)	36.30%	53
No household air conditioning (when needed)	28.08%	41
Misunderstanding or not receiving Town communication and alerts	12.33%	18
Difficulty navigating the Town website	18.49%	27
Lack of access to transportation	5.48%	8
Lack of access to emergency services	2.74%	4
Lack of access to high quality/nutritious food	3.42%	5
Insufficient financial resources to cover bills if unable to work for 1-2 weeks	6.16%	9
Drainage basin/stormwater overflow after strong rains or storms	20.55%	30
Septic system failure due to higher groundwater or flooding	2.74%	4
Interruption in drinking water service	17.81%	26
Dam or spillway breach or failure	0.68%	1
Total Respondents: 146		

Q5 According to the latest climate projections from the Current State of Climate Science in Rhode Island: A Report from the STAB to the EC4, the Town of Richmond is vulnerable to the following impacts of climate change. Please select the THREE (3) climate change impacts that you think are the greatest threat to your community.

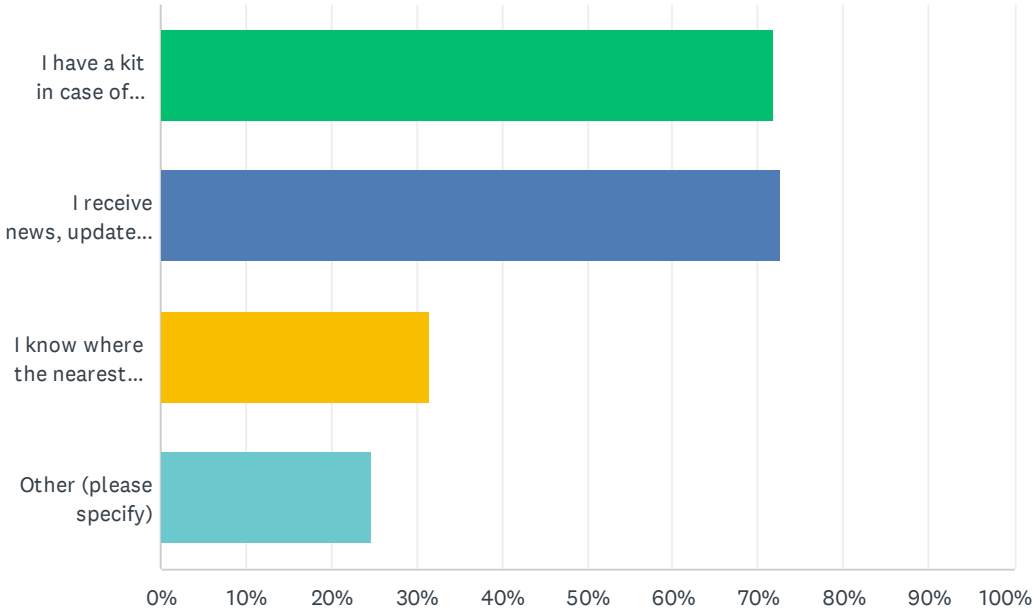
Answered: 146 Skipped: 0



ANSWER CHOICES	RESPONSES	
Increased average temperatures year-round	46.58%	68
More days with extreme heat	41.78%	61
Fewer days with low temperatures below freezing	19.86%	29
More frequent heavy rains	55.48%	81
More frequent severe storms	82.88%	121
Changes in biodiversity	34.93%	51
Total Respondents: 146		

Q6 What steps have you already taken to prepare for extreme events? (select all that apply)

Answered: 146 Skipped: 0



ANSWER CHOICES	RESPONSES	
I have a kit in case of emergencies (which may include food, water, flashlights, batteries, and other supplies)	71.92%	105
I receive news, updates, and information about emergency preparedness	72.60%	106
I know where the nearest emergency shelter is	31.51%	46
Other (please specify)	24.66%	36
Total Respondents: 146		

Q7 What resources do you need to feel more prepared?

Answered: 107 Skipped: 39

Q7 What resources do you need to feel more prepared?

Answered: 107 Skipped: 39

#	RESPONSES	DATE
1	nothing	1/19/2022 2:01 AM
2	I'm 78 so my concern as I age is being able to find transportation to a shelter or groceries in an emergency 8f I can no longer drive.	1/16/2022 7:33 AM
3	none	1/13/2022 6:44 PM
4	Power storage (battery for solar at home) - should make a kit - check with neighbors to plan how to help elderly etc- would be good to know in advance who might need help (chainsaw, snow shoveling, etc) - does town coordinate volunteers indifferent neighborhoods?? That might be nice.	1/13/2022 5:45 PM
5	Improved electrical infrastructure	1/13/2022 3:52 PM
6	None	1/13/2022 2:01 PM
7	Public Water System	1/3/2022 9:57 PM
8	storm shutters and other home improvements	1/3/2022 9:48 PM
9	none	1/3/2022 3:16 PM
10	Finances	1/3/2022 11:39 AM
11	don't know	12/26/2021 9:14 PM
12	N/a	12/25/2021 7:25 AM
13	More information about town emergency services	12/21/2021 12:53 PM
14	Better control of trees risking power lines.	12/21/2021 10:02 AM
15	Emergency Warnings!	12/20/2021 10:38 PM
16	None	12/20/2021 2:08 PM
17	getting help to cut down insect and storm damaged trees	12/20/2021 12:51 PM
18	Hard to say at this point	12/20/2021 10:35 AM
19	Electrical supply must be less susceptible to storm-induced outages.	12/20/2021 10:32 AM
20	Community guidance on local preparedness measures.	12/13/2021 10:00 PM
21	Unknown	12/13/2021 1:30 PM
22	Emergency generator	12/13/2021 12:36 PM
23	none	12/13/2021 12:25 PM
24	Drinking water during power outage	12/13/2021 11:31 AM
25	I think Richmond is better prepared than many other towns	12/13/2021 11:15 AM
26	sand bags. water diversion to Wood river or retention areas	12/13/2021 10:55 AM
27	Generator	12/12/2021 8:12 AM
28	Just had whole house generator installed. Love the town emergency threat announcements	12/11/2021 10:18 PM
29	None	12/11/2021 2:20 PM
30	Under ground electric lines	12/11/2021 12:03 PM

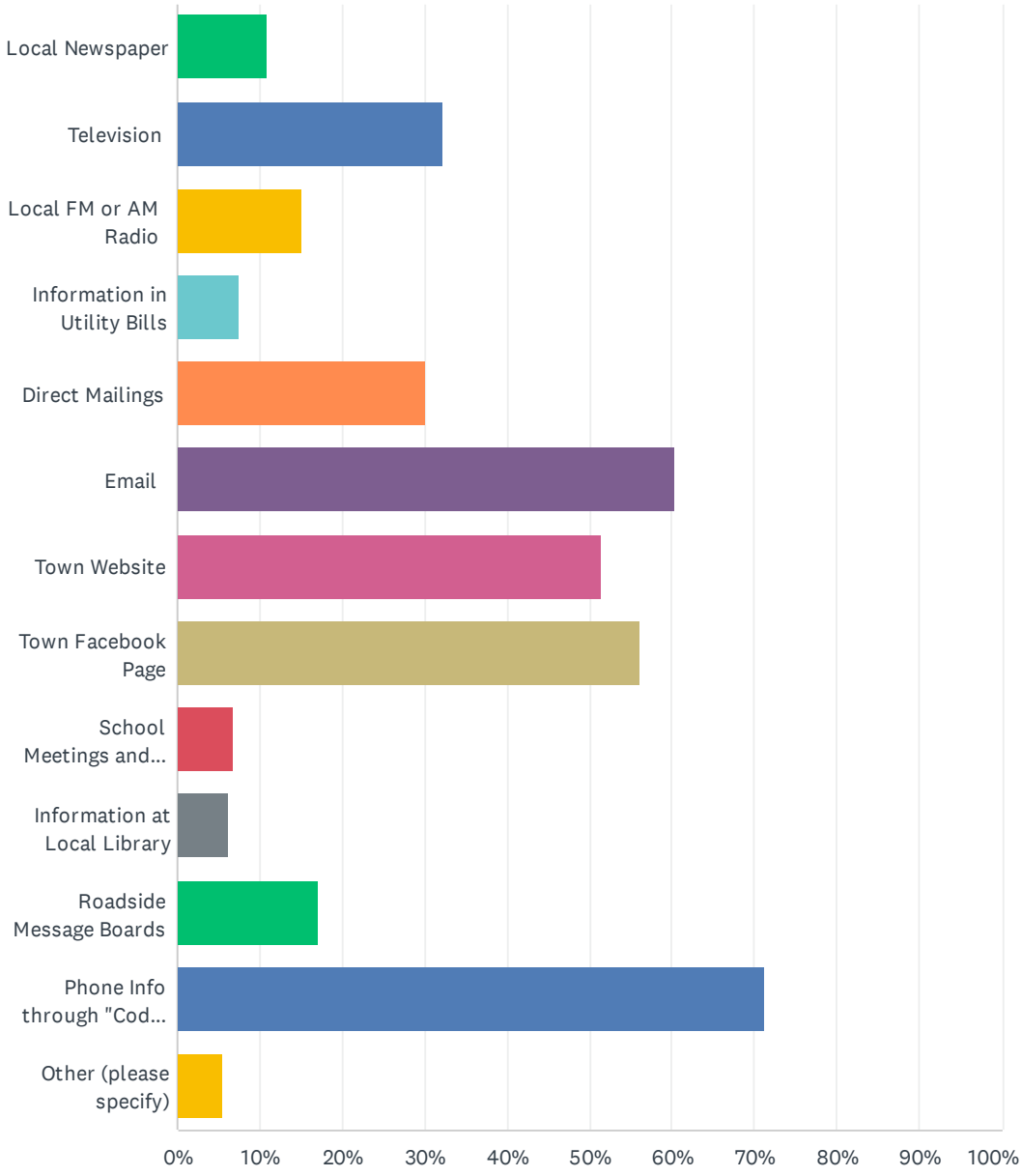
31	Tree limbing and removal along roadways and adjacent to utilities.	12/11/2021 9:10 AM
32	evacuation route(s)	12/11/2021 12:43 AM
33	generator	12/10/2021 11:08 PM
34	Text alerts, knowing what hazards exist	12/10/2021 7:22 PM
35	Community sudden emergency plans and more education on top 3-5 steps to take in a dire emergency a more clearly described IC	12/10/2021 7:55 AM
36	not sure	12/9/2021 6:34 PM
37	Nothing at the moment	12/9/2021 2:08 PM
38	A better outlet for announcing town problems related to climate	12/9/2021 9:50 AM
39	None	12/9/2021 9:16 AM
40	Power	12/9/2021 8:54 AM
41	Utility services to be prompt to resolve power outage or emergency	12/9/2021 2:40 AM
42	Na	12/8/2021 10:37 PM
43	Not sure	12/8/2021 9:50 PM
44	Richmond and national grid need to cut down the dead trees from the gypsy mouth infestation that could potentially fall on power lines	12/8/2021 9:07 PM
45	NA	12/8/2021 8:57 PM
46	NA	12/8/2021 8:38 PM
47	Generator	12/8/2021 8:26 PM
48	Emergency kit, Location of evacuation routes and shelters	12/8/2021 7:56 PM
49	Not sure	12/8/2021 6:59 PM
50	None	12/8/2021 4:36 PM
51	Access to drinking water	12/8/2021 3:57 PM
52	Better power grid	12/8/2021 3:14 PM
53	none at this time	12/8/2021 3:03 PM
54	not sure	12/8/2021 2:55 PM
55	Simple, brief, concise communication from the town before, during, and after severe weather	12/8/2021 12:45 PM
56	I don't know	12/8/2021 12:21 PM
57	None at this time	12/8/2021 12:15 PM
58	Wood stove and food storage.	12/8/2021 11:32 AM
59	N/A	12/8/2021 11:24 AM
60	A plan to mitigate damage from blasting in our quarries and gravel plants.	12/8/2021 11:13 AM
61	I just try to keep myself prepared for a few days without power	12/8/2021 11:02 AM
62	Event information	12/8/2021 9:53 AM
63	NA	12/8/2021 9:53 AM
64	N/A	12/8/2021 9:46 AM
65	Not sure	12/8/2021 9:36 AM
66	I was born an raised to be self sufficient	12/8/2021 9:07 AM
67	None	12/8/2021 8:59 AM

68	We believe we are prepared	12/8/2021 7:22 AM
69	A generator	12/8/2021 7:01 AM
70	Better communication from utilities during outages	12/8/2021 7:00 AM
71	More info	12/8/2021 6:54 AM
72	Town resources to be actively available: food pantry, extra home emergency supplies, flood mitigation. Active tree trimming. Town preparedness website.	12/8/2021 6:05 AM
73	Automatic standby generator	12/8/2021 5:57 AM
74	Accurate reporting and not TV storm hype	12/8/2021 5:43 AM
75	.	12/8/2021 5:40 AM
76	Unsure	12/8/2021 12:42 AM
77	None	12/7/2021 11:44 PM
78	Fuel	12/7/2021 11:30 PM
79	Preparation for storms	12/7/2021 11:16 PM
80	Alert system	12/7/2021 11:10 PM
81	None	12/7/2021 10:56 PM
82	more timely power restoration and assistance with dead tree removal	12/7/2021 9:31 PM
83	N/A	12/7/2021 9:21 PM
84	Lower taxes	12/7/2021 9:15 PM
85	None	12/7/2021 9:08 PM
86	power grid stability! cut back the trees!	12/7/2021 9:04 PM
87	Federal assets	12/7/2021 8:38 PM
88	Generator	12/7/2021 8:25 PM
89	I would like to be able to grow my own food.	12/7/2021 7:44 PM
90	Free emergency kirs	12/7/2021 7:40 PM
91	NA	12/7/2021 7:40 PM
92	Tree trimming and/or removal	12/7/2021 6:52 PM
93	Food, medical	12/7/2021 6:46 PM
94	Public transportation	12/7/2021 6:41 PM
95	Dead tree removal along town roads	12/7/2021 6:31 PM
96	Better tree removal from power lines	12/7/2021 6:19 PM
97	Communication	12/7/2021 6:17 PM
98	None	12/7/2021 6:13 PM
99	tree trimming over wires	12/7/2021 5:52 PM
100	Generator	12/7/2021 4:59 PM
101	Dealing with damaged trees after a storm is awful	12/7/2021 4:02 PM
102	NA	12/7/2021 3:56 PM
103	None	12/7/2021 3:34 PM
104	Keep up good work of supporting removal of tree hazards by roads and power sources	12/7/2021 3:28 PM
105	More updates from the town on what is being done to prepare overall. Resources on how to	12/7/2021 2:15 PM

	prepare within your own household.	
106	Access to more storage space	12/7/2021 1:46 PM
107	I'm not sure at this time.	12/7/2021 1:12 PM

Q8 What is the most effective way for you to receive information about how to make your home, business and neighborhood less vulnerable to natural hazards? Please check all that apply.

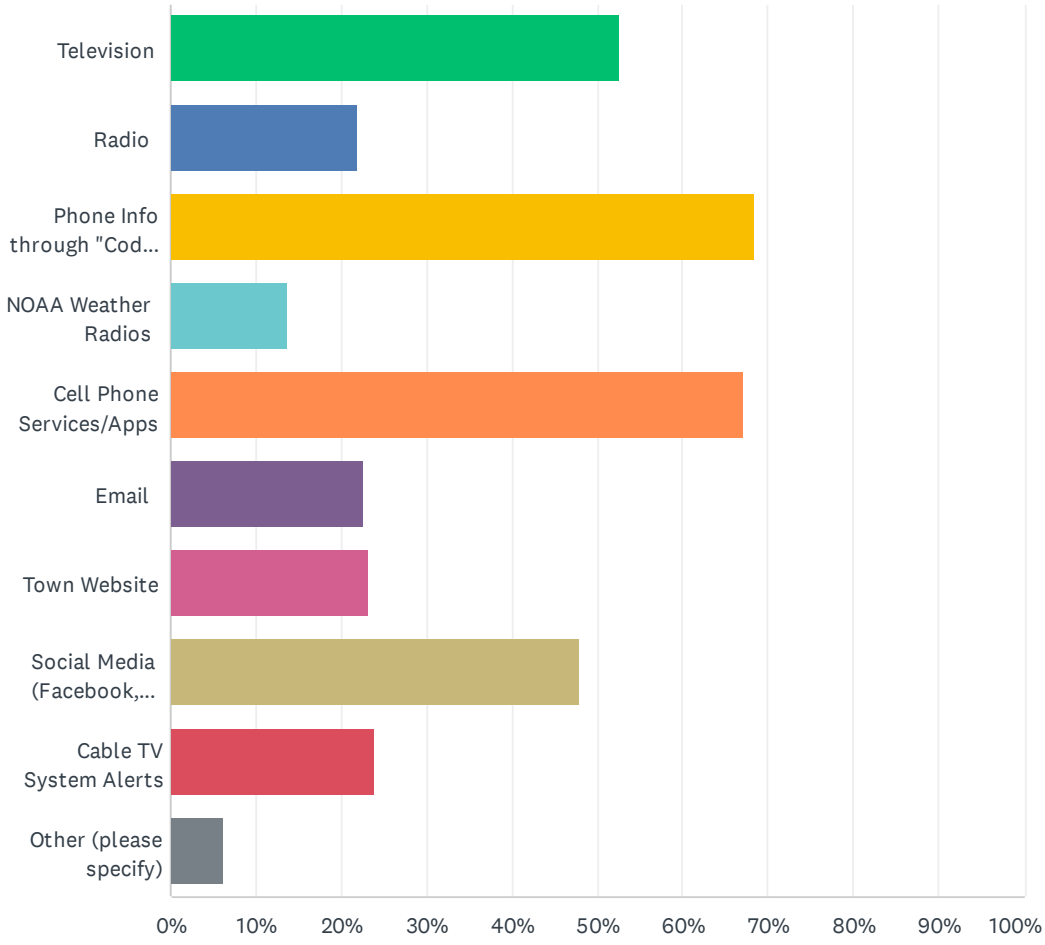
Answered: 146 Skipped: 0



ANSWER CHOICES	RESPONSES	
Local Newspaper	10.96%	16
Television	32.19%	47
Local FM or AM Radio	15.07%	22
Information in Utility Bills	7.53%	11
Direct Mailings	30.14%	44
Email	60.27%	88
Town Website	51.37%	75
Town Facebook Page	56.16%	82
School Meetings and Messages	6.85%	10
Information at Local Library	6.16%	9
Roadside Message Boards	17.12%	25
Phone Info through "Code Red" Systems	71.23%	104
Other (please specify)	5.48%	8
Total Respondents: 146		

Q9 How do you currently receive warnings regarding severe weather or other emergency events? Please check all that apply.

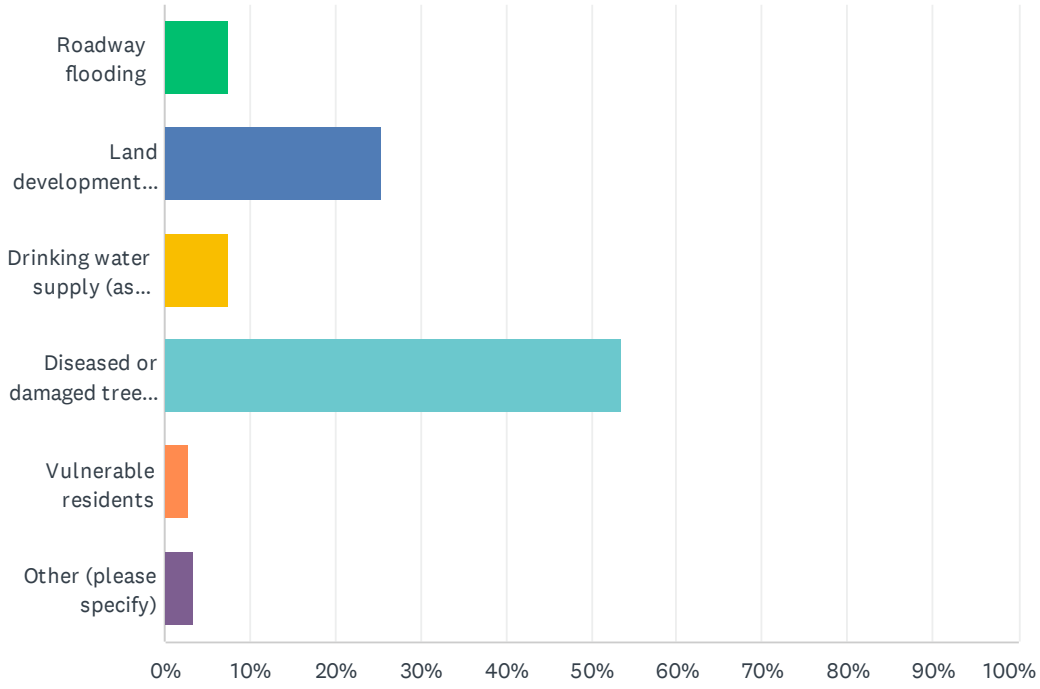
Answered: 146 Skipped: 0



ANSWER CHOICES	RESPONSES	
Television	52.74%	77
Radio	21.92%	32
Phone Info through "Code Red" Systems	68.49%	100
NOAA Weather Radios	13.70%	20
Cell Phone Services/Apps	67.12%	98
Email	22.60%	33
Town Website	23.29%	34
Social Media (Facebook, Twitter, etc.)	47.95%	70
Cable TV System Alerts	23.97%	35
Other (please specify)	6.16%	9
Total Respondents: 146		

Q10 What would you consider Richmond's greatest vulnerability regarding natural hazards?

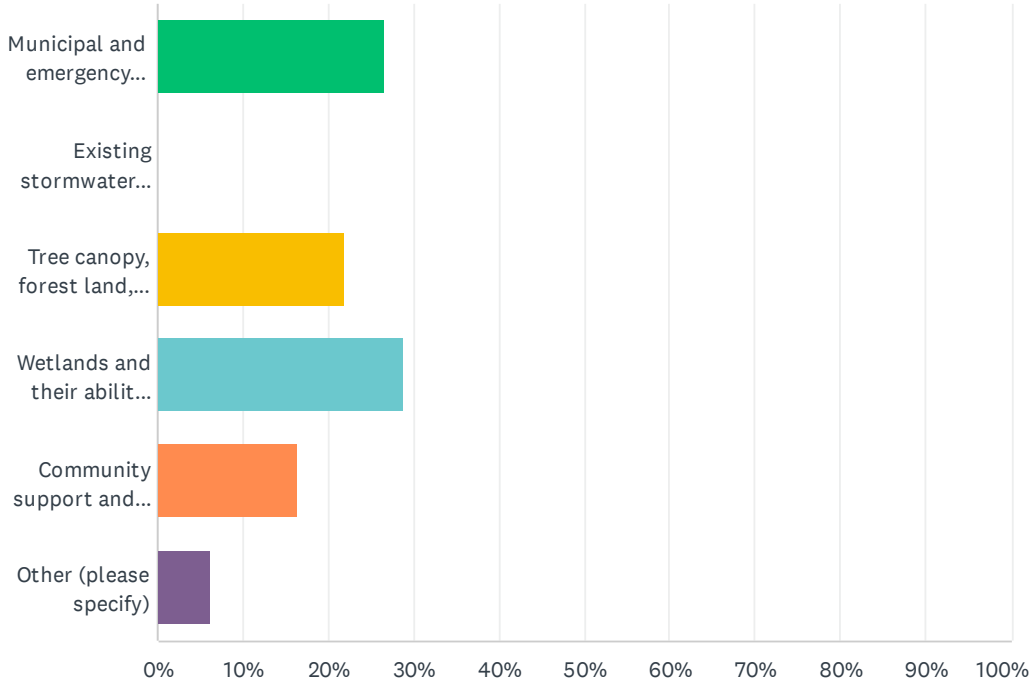
Answered: 146 Skipped: 0



ANSWER CHOICES	RESPONSES	
Roadway flooding	7.53%	11
Land development encroaching on natural resources	25.34%	37
Drinking water supply (as impacted by droughts and/or floods)	7.53%	11
Diseased or damaged trees (may lead to power outage, personal injury, temporary road closure)	53.42%	78
Vulnerable residents	2.74%	4
Other (please specify)	3.42%	5
TOTAL		146

Q11 What is Richmond 's greatest strength considering climate resilience?

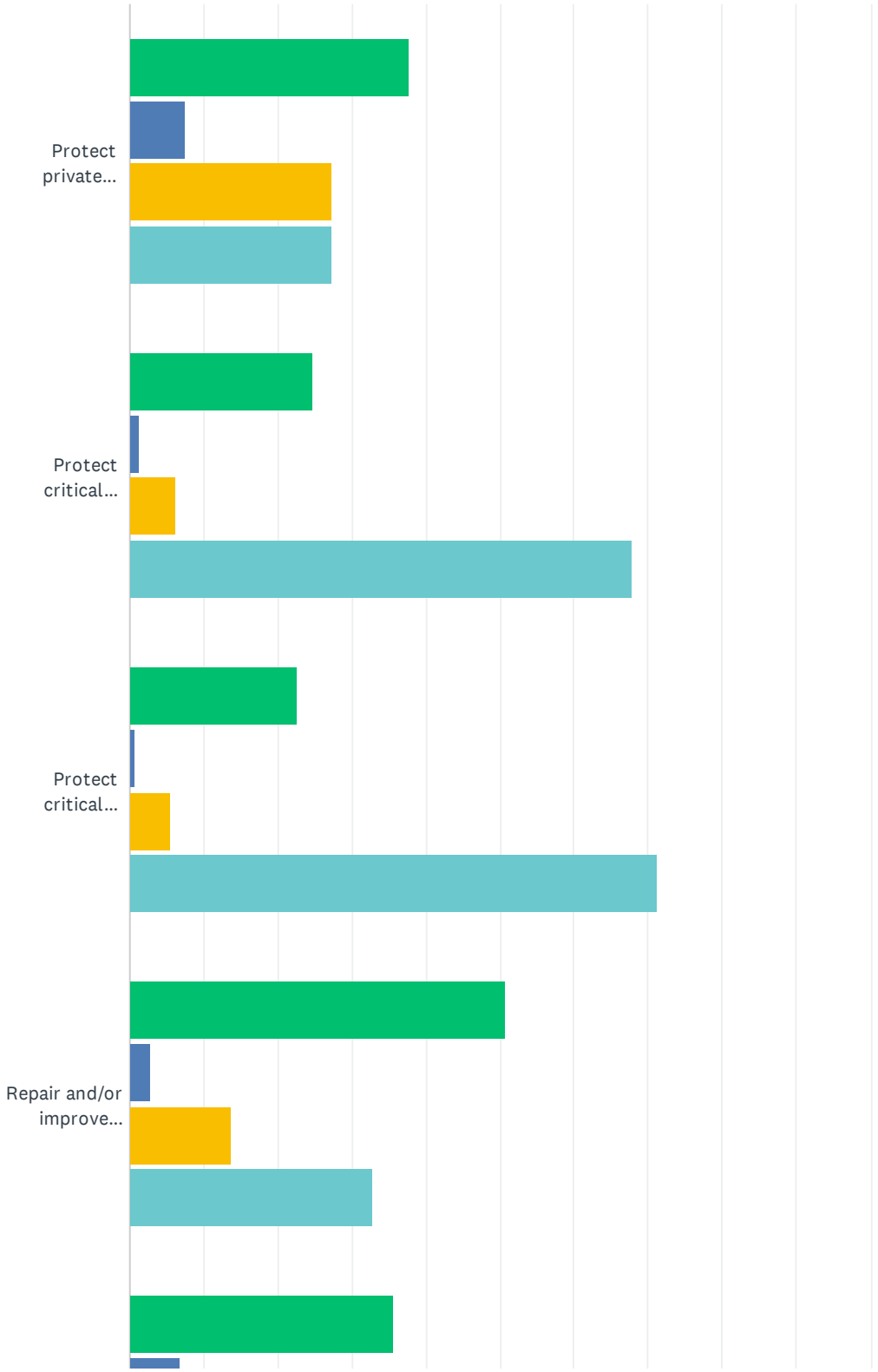
Answered: 146 Skipped: 0

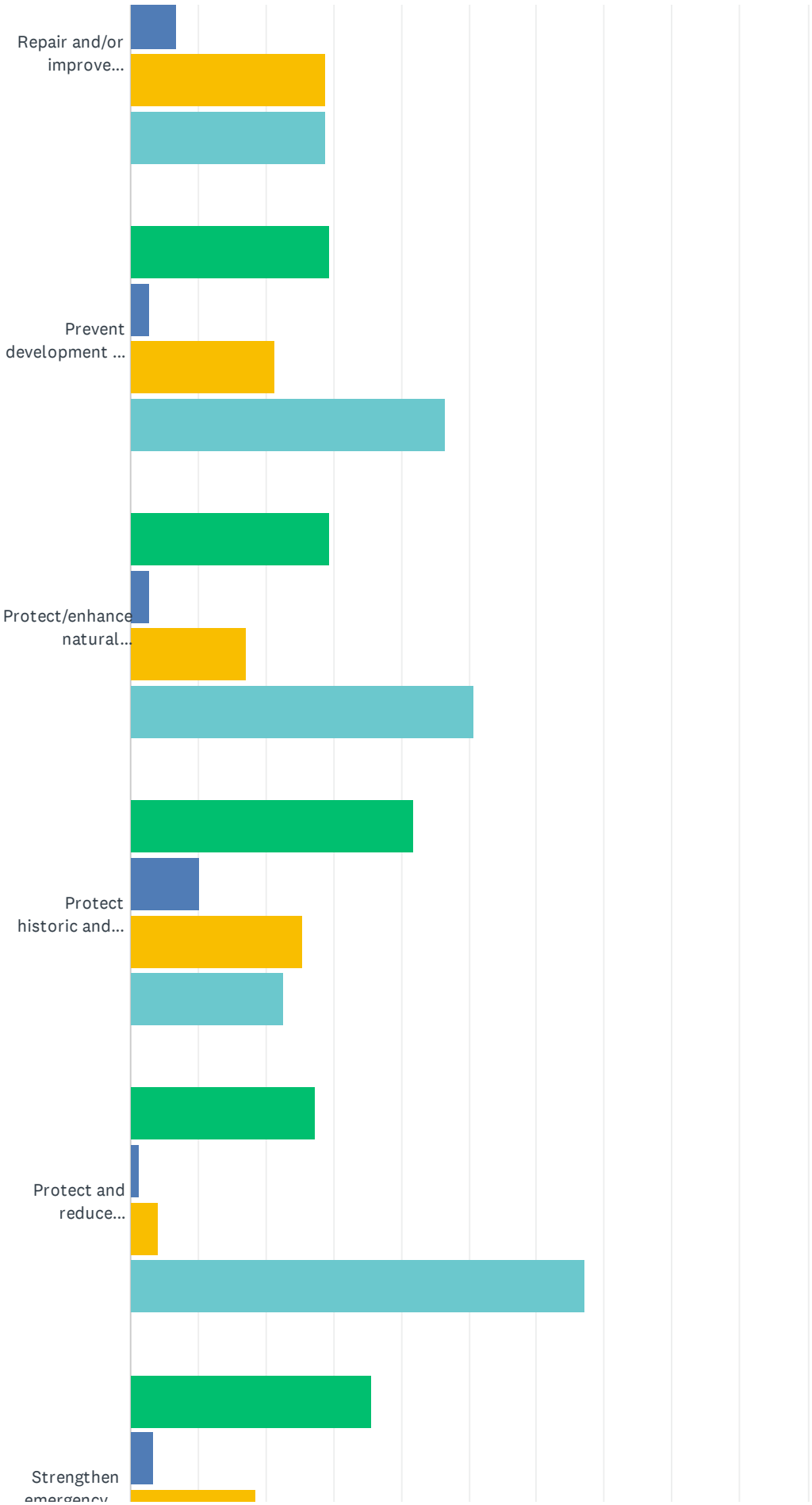


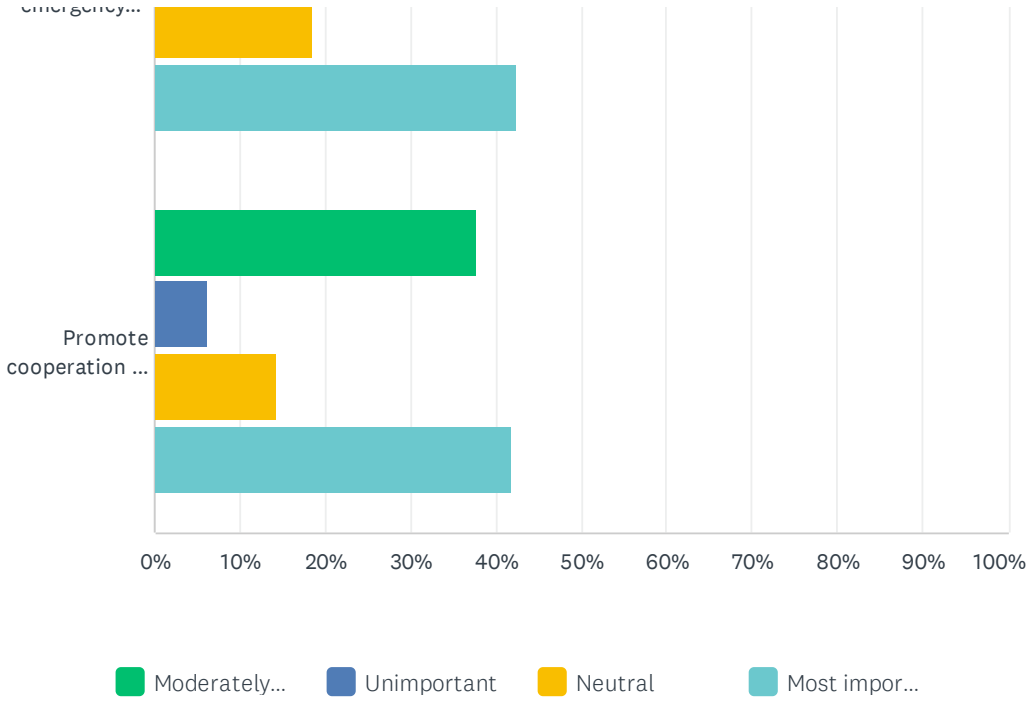
ANSWER CHOICES	RESPONSES	
Municipal and emergency services	26.71%	39
Existing stormwater system	0.00%	0
Tree canopy, forest land, and street trees	21.92%	32
Wetlands and their ability to provide flood storage	28.77%	42
Community support and volunteers	16.44%	24
Other (please specify)	6.16%	9
TOTAL		146

Q12 How important are each of the following items for the Town to prioritize spending its resources for hazard mitigation? (select most important, moderately important, unimportant, neutral)

Answered: 146 Skipped: 0




Repair and/or improve...
Prevent development ...
Protect/enhance natural...
Protect historic and...
Protect and reduce...
Strengthen emergency


emergency...
Promote cooperation ...
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Moderately...
Unimportant
Neutral
Most impor...

	MODERATELY IMPORTANT	UNIMPORTANT	NEUTRAL	MOST IMPORTANT	TOTAL	WEIGHTED AVERAGE
Protect private property	37.67% 55	7.53% 11	27.40% 40	27.40% 40	146	1.65
Protect critical facilities (for example: fire stations, hospitals, nursing homes, etc.)	24.66% 36	1.37% 2	6.16% 9	67.81% 99	146	2.54
Protect critical infrastructure (for example: transportation networks, energy and water distribution systems, etc.)	22.60% 33	0.68% 1	5.48% 8	71.23% 104	146	2.60
Repair and/or improve stormwater system to prevent flooding and infrastructure damage	50.68% 74	2.74% 4	13.70% 20	32.88% 48	146	2.03
Repair and/or improve drinking water system to prevent damage and service interruptions	35.62% 52	6.85% 10	28.77% 42	28.77% 42	146	1.64
Prevent development in hazard-prone areas	29.45% 43	2.74% 4	21.23% 31	46.58% 68	146	2.01
Protect/enhance natural features to aid in mitigation (restore wetlands, streams, forests, etc.)	29.45% 43	2.74% 4	17.12% 25	50.68% 74	146	2.14
Protect historic and cultural landmarks	41.78% 61	10.27% 15	25.34% 37	22.60% 33	146	1.62
Protect and reduce potential damage to other public utilities (for example: electric, gas, phone, cable, internet, etc.)	27.40% 40	1.37% 2	4.11% 6	67.12% 98	146	2.58
Strengthen emergency services (police, fire, ambulance, etc.)	35.62% 52	3.42% 5	18.49% 27	42.47% 62	146	2.02
Promote cooperation and information sharing among public agencies, citizens, non-profit organizations, and businesses in order to facilitate emergency responses	37.67% 55	6.16% 9	14.38% 21	41.78% 61	146	2.07

Q13 What other climate adaptation or hazard mitigation measures should be taken in Richmond in the next five years?

Answered: 98 Skipped: 48

Q13 What other climate adaptation or hazard mitigation measures should be taken in Richmond in the next five years?

Answered: 98 Skipped: 48

#	RESPONSES	DATE
1	protecting more of our woodlands, wetlands, and air quality	1/19/2022 2:01 AM
2	clean-up of grossly unkept properties of some residents	1/17/2022 3:06 PM
3	No	1/13/2022 6:44 PM
4	Reduce energy consumption - invest in green energy like solar in already developed areas - like on rooftops - and protect forests which store carbon and mitigate impacts	1/13/2022 5:45 PM
5	Tree service, dead trees along roads	1/13/2022 4:42 PM
6	Na	1/13/2022 3:52 PM
7	Stop building new homes	1/13/2022 2:01 PM
8	Beef up fire departments, limit private burning and clear out dead trees/brush.	1/3/2022 9:57 PM
9	plant trees/rain gardens	1/3/2022 9:48 PM
10	Stop spending tax payer money for the sake of spending.	1/3/2022 3:16 PM
11	Invasive species	1/3/2022 11:39 AM
12	don't know	12/26/2021 9:14 PM
13	N/A	12/25/2021 7:25 AM
14	Public education about impact of climate change on both town and natural resources	12/21/2021 12:53 PM
15	Transportation supports for vulnerable residents	12/21/2021 10:02 AM
16	Stop clearing land for solar farms!!!	12/20/2021 10:38 PM
17	Drought resilience and infrastructure improvements to reduce impact from severe storms and flooding. Move utilities underground and repair drainage systems to prevent road way damage.	12/20/2021 12:54 PM
18	continue to cut dead trees away from power lines	12/20/2021 12:51 PM
19	Identify and modify roadways historically subject to flooding	12/20/2021 10:35 AM
20	Removal of trees that could threaten roads and power lines. Maintenance of stormwater retention/detention structures. Tightening stormwater requirements for future development	12/20/2021 10:32 AM
21	Community measures to strengthen ecosystem functioning.	12/13/2021 10:00 PM
22	Cut trees impinging on wires	12/13/2021 1:30 PM
23	no idea	12/13/2021 12:25 PM
24	No more clear cutting land for Residential development,	12/13/2021 11:31 AM
25	slow down development---population increasing too rapidly	12/13/2021 11:15 AM
26	flooding. KG Ranch Rd and Valley lodge.	12/13/2021 10:55 AM
27	electric school busses	12/13/2021 10:10 AM
28	Whatever science suggests!	12/12/2021 8:12 AM
29	Tree trimming next to power lines, minimize any solar development approval and encourage purchase of land by land trust for conservation purposes	12/11/2021 10:18 PM

30	Protect alternate energy sources such as solar panels, wind turbines	12/11/2021 12:03 PM
31	Create disincentives to minimize land clearing to accommodate solar energy.	12/11/2021 9:10 AM
32	repave Tug Hollow road and other roads that have seious potholes	12/11/2021 12:43 AM
33	encourage residents to replace trees, sell sponsorships for planting seedlings where trees are gone	12/10/2021 11:08 PM
34	Stop developers who are trying to destroy the natural beauty and rural nature of this town	12/10/2021 7:22 PM
35	The building of houses in drought-prone areas.	12/9/2021 6:58 PM
36	I have no idea. Am I supposed to know that?	12/9/2021 6:34 PM
37	Increase availability of public transportation	12/9/2021 2:08 PM
38	More dem workers taking part in restoring flood area	12/9/2021 9:50 AM
39	Get rid of all the dead trees	12/9/2021 9:16 AM
40	To refuse any 5G service or cell towers in our area it’s top priority	12/9/2021 2:40 AM
41	Na	12/8/2021 10:37 PM
42	Not sure	12/8/2021 9:50 PM
43	Cut down the dead trees	12/8/2021 9:07 PM
44	Re-forest	12/8/2021 8:57 PM
45	Dead trees along power lines	12/8/2021 8:38 PM
46	Cut more trees	12/8/2021 8:26 PM
47	Cannot think of anymore.	12/8/2021 7:56 PM
48	I don’t know.	12/8/2021 4:36 PM
49	Tree inspections	12/8/2021 3:57 PM
50	More windmills	12/8/2021 2:55 PM
51	Stop putting up solar panels	12/8/2021 12:45 PM
52	With so much wooded area, fire is a real threat. The dead trees from the forest tent and gypsy moth caterpillars are a disaster waiting to happen. Continued removal of these is critical.	12/8/2021 12:15 PM
53	Clearing tree limbs from power lines.	12/8/2021 11:32 AM
54	N/A	12/8/2021 11:24 AM
55	Encourage electric vehicles by installing charging stations	12/8/2021 11:19 AM
56	Prevent further development of businesses encroaching on protected forestry and wildlife. Prevent introducing invasive and foreign species to the area that can inflict permanent damage to our native species of wildlife and plant life. Monitor vibrational impact throughout surrounding areas from local blasting to further understand the impact and susceptibility to quaking.	12/8/2021 11:13 AM
57	tree maintenance seems to be the most common issue leading to outages	12/8/2021 11:02 AM
58	Not sure	12/8/2021 9:53 AM
59	Repair storm drains and remove dead trees	12/8/2021 9:53 AM
60	Continue to address dead trees	12/8/2021 9:46 AM
61	Teach people to be self sufficient	12/8/2021 9:07 AM
62	Fix the roads so they don’t fill with water and flood houses	12/8/2021 8:59 AM
63	Invasive plant control.	12/8/2021 8:37 AM
64	Improve power infrastructure and extend water services throughout town	12/8/2021 7:53 AM

65	Beaver damage maintenance	12/8/2021 7:24 AM
66	Stop solar farm projects	12/8/2021 7:22 AM
67	Don’t know	12/8/2021 7:00 AM
68	Provide financial assistance, matching funds, tax incentives, etc. to residents to aide in hazard mitigation on their properties. The adverse weather, tree damage and flooding is the most significant impact to community.	12/8/2021 6:05 AM
69	We should not be choosing from that list but improving all of those	12/8/2021 5:43 AM
70	.	12/8/2021 5:40 AM
71	Unsure	12/8/2021 12:42 AM
72	None	12/7/2021 11:44 PM
73	Cutting grasses out of Alton Pond and other similar waterways that are increasingly filling with vegetation	12/7/2021 11:30 PM
74	Pass	12/7/2021 11:10 PM
75	N\A	12/7/2021 10:56 PM
76	N/A	12/7/2021 9:21 PM
77	Infrastructure	12/7/2021 9:15 PM
78	I'm not sure	12/7/2021 9:08 PM
79	lyme disease	12/7/2021 9:04 PM
80	Fewer golf courses	12/7/2021 8:38 PM
81	N/A	12/7/2021 8:25 PM
82	Less development for so-called green projects	12/7/2021 7:56 PM
83	It is important to make sure the town had resources to clear roadway quickly after damage.	12/7/2021 7:44 PM
84	Water holding tanks	12/7/2021 7:40 PM
85	Deforestation for solar fields impacts climate, wells, etc and should be stopped. Plan for next batch of caterpillars so we don't have the dead tree issues again.	12/7/2021 7:40 PM
86	Tree trimming and/or removal	12/7/2021 6:52 PM
87	Reduce waste, reduce development	12/7/2021 6:41 PM
88	Plant and vegetation management on town properties	12/7/2021 6:31 PM
89	Replant trees that got cut down. No more oaks. Find a tree that is quality. Maybe evergreens like spruce	12/7/2021 4:59 PM
90	Make sure culverts and storm drains are all up to snuff.	12/7/2021 4:02 PM
91	Control beavers causing floods	12/7/2021 3:56 PM
92	Stop deforestation	12/7/2021 3:34 PM
93	Work to clear street hazards	12/7/2021 3:28 PM
94	Educating residents on simple measures they can take to be prepared.	12/7/2021 2:15 PM
95	Trim deadwood	12/7/2021 2:15 PM
96	Safety of wildlife	12/7/2021 1:46 PM
97	I'm not sure at this time.	12/7/2021 1:12 PM
98	Protect resources while improving economic development instead of residential	12/7/2021 1:08 PM

Q14 Are there any additional comments or questions you would like to share?

Answered: 74 Skipped: 72

Q14 Are there any additional comments or questions you would like to share?

Answered: 74 Skipped: 72

#	RESPONSES	DATE
1	no	1/19/2022 2:01 AM
2	No	1/13/2022 6:44 PM
3	No	1/13/2022 5:45 PM
4	No	1/13/2022 4:42 PM
5	No	1/13/2022 3:52 PM
6	Stop building solar farms	1/13/2022 2:01 PM
7	Thank you for doing this proactively. PS I don't know anything about solar flares/geomagnetic storms but it looks like tornadoes are gaining a foothold.	1/3/2022 9:57 PM
8	no	12/26/2021 9:14 PM
9	No	12/25/2021 7:25 AM
10	No	12/21/2021 12:53 PM
11	To not clear land for solar panels!	12/20/2021 10:38 PM
12	No	12/20/2021 12:51 PM
13	I think that COVID money (~$800k?) that is coming to the town ought to be put to use for hazard mitigation. I also think that some consideration should be given to maintenance/upgrade of public structures to provide capabilities for dealing with future emergencies. (e.g. South Road School in Wakefield). I made a comment early on about food security. I'm a bit concerned about the future reliability of having a single food market serving this town	12/20/2021 10:32 AM
14	Suburbanization is ecosystem impairing and has high greenhouse gas emissions, with good practices and renewable energy investment, the per capital greenhouse gas foot print can be dramatically lowered.	12/13/2021 10:00 PM
15	No	12/13/2021 1:30 PM
16	don't spend a lot of money on something we have little control over	12/13/2021 12:25 PM
17	What is the plan/list (timeline) for road reconstruction	12/13/2021 11:31 AM
18	Not at this time	12/13/2021 11:15 AM
19	Divert water from Rte. 3 and Rte. 95. 140 homes at risk in the KG Ranch/Valley Lodge area	12/13/2021 10:55 AM
20	Thank you	12/13/2021 10:10 AM
21	No	12/12/2021 8:12 AM
22	Not now	12/11/2021 12:03 PM
23	Open space provides many public benefits to town residents without the need to provide many services. Town should provide more significant tax incentives for those that do not develop their property.	12/11/2021 9:10 AM
24	avoid plastics, try bamboo,	12/10/2021 11:08 PM
25	No	12/10/2021 7:22 PM
26	no	12/9/2021 6:34 PM

27	No	12/9/2021 9:50 AM
28	No	12/9/2021 9:16 AM
29	Please protect Richmond and surrounding area from dangerous cell towers . Please learn about the danger of them and don't fund or allow any 5G tower	12/9/2021 2:40 AM
30	Na	12/8/2021 10:37 PM
31	No	12/8/2021 9:50 PM
32	Cut down the dead trees! Scott Barber rules!	12/8/2021 9:07 PM
33	No	12/8/2021 8:26 PM
34	No.	12/8/2021 7:56 PM
35	No	12/8/2021 4:36 PM
36	N	12/8/2021 3:57 PM
37	Question 12 lists the options in a strange order - they're like 3 1 2 4, in order of importance.	12/8/2021 2:55 PM
38	No	12/8/2021 12:45 PM
39	I think our town does a great job of sharing information on social media and also via the Code Red alert calls. We have excellent staff of all sorts that help us to prepare for and recover from these crisis. Our people are our greatest asset as we go through these environmental and climate related changes.	12/8/2021 12:15 PM
40	No	12/8/2021 11:24 AM
41	There are organizations that have a substantial impact on the environment in Richmond currently operating under 501c3 statuses, preventing them for paying local taxes. These organizations are considered non-profit, and advertise land they do not own as part of their property to attract more Business. These organizations hold huge masses of land compared to residents, and their daily activities impact residents greatly. They should be responsible for Property taxes in Richmond.	12/8/2021 11:13 AM
42	Some of these questions do not pertain to hazzard mit. due to climate change	12/8/2021 10:50 AM
43	No	12/8/2021 9:53 AM
44	NA	12/8/2021 9:53 AM
45	Climate change has been happening for millions of years, we cannot play God. We must use our heads and adapt.	12/8/2021 9:07 AM
46	None	12/8/2021 8:59 AM
47	The town does a great job of checking drains and culverts to prevent road flooding	12/8/2021 8:59 AM
48	No	12/8/2021 8:37 AM
49	Beavers are becoming an increasing threat to flooding and land damage.	12/8/2021 7:24 AM
50	I think private use of fireworks should be banned in Richmond. We have too many trees and the risk for fire is too great.	12/8/2021 7:01 AM
51	No	12/8/2021 7:00 AM
52	flooding and power outages are significant now and needs to be addressed before more adverse weather increases due to climate change	12/8/2021 6:05 AM
53	No	12/8/2021 5:43 AM
54	8	12/8/2021 5:40 AM
55	No	12/8/2021 12:42 AM
56	No	12/7/2021 11:44 PM
57	Pass	12/7/2021 11:10 PM

58	Not at this time	12/7/2021 10:56 PM
59	N/A	12/7/2021 9:21 PM
60	No	12/7/2021 9:15 PM
61	No	12/7/2021 9:08 PM
62	no	12/7/2021 9:04 PM
63	N/A	12/7/2021 8:25 PM
64	This survey seems to include drinking water issues from a town supply perspective. Well owners should be taken into account too. When there's no power, there's no water for well owners...well pumps won't work.	12/7/2021 7:40 PM
65	No	12/7/2021 6:52 PM
66	We need affordable housing to keep Richmond diverse	12/7/2021 6:41 PM
67	Thanks for getting out this survey. Climate change is causing significant changes and great inpacts	12/7/2021 6:31 PM
68	Impact of the climate here has mostly been increased precipitation and wind storms. Those are the true dangers to town.	12/7/2021 4:59 PM
69	Nope	12/7/2021 4:02 PM
70	No	12/7/2021 3:34 PM
71	I am waiting to see how the determinations for adjustments will be made: how decision makers are selected, and hope the public will be included in open public dialog.	12/7/2021 3:28 PM
72	thank you	12/7/2021 2:15 PM
73	Not at this time	12/7/2021 1:46 PM
74	Not at this time.	12/7/2021 1:12 PM

Q15 Thank you for completing the survey. Please enter your email address if you'd like to receive updates on hazard mitigation and climate adaptation projects in Richmond.

Answered: 65 Skipped: 81

APPENDIX J: ADOPTION RESOLUTION

RESOLUTIONS
Instr: 2022-12

06/29/2022
1 Pages

TOWN OF RICHMOND, RHODE ISLAND
TOWN COUNCIL RESOLUTION # 2022-13
ADOPTING THE RICHMOND, RHODE ISLAND
HAZARD MITIGATION PLAN - 2022 UPDATE

WHEREAS, the TOWN OF RICHMOND recognizes the threat that natural hazards pose to people and property within THE TOWN OF RICHMOND; and

WHEREAS the TOWN OF RICHMOND has prepared a multi-hazard mitigation plan, hereby known as RICHMOND, RI HAZARD MITIGATION PLAN 2022 UPDATE in accordance with federal laws, including the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended; the National Flood Insurance Act of 1968, as amended; and the National Dam Safety Program Act, as amended; and

WHEREAS the RICHMOND, RI HAZARD MITIGATION PLAN 2022 UPDATE identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the TOWN OF RICHMOND from the impacts of future hazards and disasters: and

WHEREAS adoption by the RICHMOND TOWN COUNCIL demonstrates its commitment to hazard mitigation and achieving the goals outlined in the RICHMOND, RI HAZARD MITIGATION PLAN 2022 UPDATE.

NOW THEREFORE, BE IT RESOLVED BY THE TOWN OF RICHMOND, RHODE ISLAND, THAT: In accordance with Article 3, Section 4 of the Home Rule Charter, the RICHMOND TOWN COUNCIL adopts the RICHMOND, RI HAZARD MITIGATION PLAN 2022 UPDATE. While content related to THE TOWN OF RICHMOND may require revisions to meet the plan approval requirements, changes occurring after adoption will not require RICHMOND TOWN COUNCIL to re-adopt any further iterations of the plan. Subsequent plan updates following the approval period for this plan will require separate adoption resolutions.

GIVEN UNDER THE SEAL OF THE TOWN COUNCIL OF THE TOWN OF RICHMOND ADOPTED THIS 21ST DAY OF JUNE, 2022.

ATTEST: E F Liese
Erin F. Liese, CMC
Town Clerk

TOWN COUNCIL
RICHMOND RHODE ISLAND

Nell Carpenter
Nell Carpenter
Council President