



Town of Barrington Rhode Island

Hazard Mitigation & Flood Management Plan

2022



Prepared By:

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Town of Barrington Rhode Island

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Adopted by Barrington Town Council

Approved by FEMA

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EXECUTIVE SUMMARY

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Executive Summary

In 1995 the Federal Emergency Management Agency (FEMA) enacted a National Mitigation Strategy, which promoted the partnership of government and the private sector to effectively “build” safer communities. The strategy encourages the identification of natural hazards that may affect individuals or communities and thereupon take action to reduce the associated risk (FEMA. National). The subsequent passage of the Disaster Mitigation Act (DMA) of 2000 provided the legal basis for FEMA to require mitigation planning at both the State and local level as a condition of mitigation grant assistance (FEMA. Disaster).

The Town of Barrington’s first Hazard Mitigation Plan (HMP) was developed in 2004. Over the years periodic reviews and updates of the original document have occurred. In 2022 a Steering Committee under the auspicious of the Town’s Emergency Management Committee (EMC) was formed. The Steering Committee was comprised of EMC members along with residents and other stakeholders, and chaired by Teresa Crean, Director of Planning, Building & Resiliency. The Steering Committee was tasked with identifying natural hazards considered to pose the greatest threat to Barrington and to arrive at practical, meaningful, achievable, and cost-effective mitigation solutions to reduce both human and property losses should such hazards occur. In recognition of the Town’s current and projected future vulnerability to flooding, the Town opted to intensify their focus on flooding within the HMP Update. Further, as the Town is in the process of becoming a FEMA Community Rating System (CRS) program participant, it was determined advantageous to integrate CRS Activity 510 - Floodplain Management Planning in the HMP update.

As such, this document was developed coordinating the DMA Planning Regulations and the CRS Activity 510 Planning Process into a single plan that meets the goals, intent, and requirements of each program. As discussed in **Section 2**, an integral part of the planning process was community and stakeholder engagement. In addition to the publicized Steering Committee meetings being open to the public, a number of outreach activities were held to ensure the community, neighboring municipalities, and other stakeholders had the opportunity to provide input and feedback on the *Plan*. Public engagement is important as it ensures the plan reflects community values and priorities, and builds a constituency educated in hazard mitigation and supportive of implementing activities and projects that will minimize community impacts and disruptions from natural hazards. The integrated and community centric DMA and CRS planning process was highly successful, culminating in this document: ***Town of Barrington Rhode Island 2022 Hazard Mitigation & Flood Management Plan.***

The Town of Barrington 2022 Hazard Mitigation & Flood Management Plan (HM&FMP) has been approved by the Rhode Island Emergency Management Agency (RIEMA) and the Federal Emergency Management Agency (FEMA) and formally adopted by the Barrington Town Council on XXXX, 2022.

ASSESSMENT

As detailed in **Section 4**, the Steering Committee discussed for possible inclusion in this *Plan*, all of the hazards identified in the Rhode Island State Hazard Mitigation Plan (RI-SHMP). Recognizing that the Town has limited fiscal and staffing resources, those hazards determined to pose little threat to the Town have not been considered herein. Using a priority ranking process, this *Plan* focuses on those hazards considered as having a greater likelihood of occurring or potentially having a greater impact on the community should they occur. These include: Flood-Related Hazards; Wind-Related Hazards; Winter-Related Hazards; Infectious Disease-Related Hazards (Vector-borne Diseases Transmitted by Ticks and Mosquitoes, and Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses); and Other Hazards (Earthquakes, Extreme Heat, Drought, Brush Fires). The *Plan* also addresses how climate change and sea level rise will exacerbate the risks from many of these hazards.

To determine how to mitigate these threats, it was first necessary to understand Barrington's community profile (**Section 3**) and evaluate the Town's vulnerable community assets (**Section 4**). A capability assessment (**Section 5**) to understand what measures the Town currently implements in terms of hazard mitigation was also undertaken. The assemblage of this information was used as a basis in determining goals and strategies to minimize long-term vulnerabilities to the identified hazards (**Section 6**).

This *Plan*, which will supersede the Town's 2017 Hazard Mitigation Plan (HMP), pays tribute to and builds upon the good work that created that document. Portions of the 2017 Plan have been revised, eliminated, or restructured as deemed appropriate. A number of the Town's other key planning documents, technical reports, historical data, and other resources were also used in preparing this *Plan*. Appreciation and gratitude are extended to all the resources used herein, including local knowledge from the Steering Committee, community members, and other stakeholders.

Advances in the ability to predict the occurrence and effects of natural disasters, including model simulations and GIS data and mapping capabilities, provided the Town with significant updated and improved information. As such, new information and some new sections were added to this *Plan* in order to reflect the most current understanding of natural hazards that pose significant threats to Barrington and how the Town can better prepare for these risks.

Major Findings

With an extensive coastline and significant sections of the Town in low-lying areas, Barrington is one of Rhode Island's most vulnerable communities to the natural hazard of flooding and storm surge. The community's vulnerability will increase in the coming decades as climate change increases the potential for more frequent and intense rainfall events and sea level rise (SLR). As reflected in the *Plan*, climate change will also exacerbate a number of the other profiled hazards. Major findings of this *Plan* include:

Flood-Related Hazards

- ❖ As a low-lying community with roughly 20 miles of shoreline, coastal flooding is highly probable and may have long-term serious consequences for the Town of Barrington.
- ❖ A number of the Town's critical facilities which serve vulnerable populations (children, seniors, special needs) are located in areas at risk from flooding and storm surge.
- ❖ FEMA's high risk flood zones (the V and the A Zone) which FEMA denotes as the Special Flood Hazard Area (SFHA) is the most vulnerable to flooding during major precipitation events. The total assessed value for properties with any portion of the parcel intersecting the SFHA represents approximately 41% of Barrington's property tax base.
- ❖ The Rhode Island Coastal Resources Management Council (CRMC) has adopted the NOAA SLR high curve projection for use in planning and coastal permitting. Based on NOAA's 2022 "worst-case" high curve projection, Rhode Island could experience up to 6.5 feet of SLR by 2100. Irrespective of the specific timeline, the potential impact from SLR on the Town cannot be understated.
- ❖ Higher sea levels will significantly increase the amount of property at risk from flooding and storm surge. Structures and infrastructure (roads, bridges, sewer pump stations, etc.) in low-lying areas will be at risk from rising sea levels, including sections of Route 114 which is under State jurisdiction. In addition to structures and infrastructure, SLR will have a deleterious impact on coastal wetlands.

- ❖ Even without additional SLR (i.e. under current conditions), a 100-Year storm event (which has a 1% chance of occurring any year) is projected to cause some level of damage to 1,894 primary structures in Barrington, with 308 of those sustaining greater than 50% damage.
- ❖ More intense rainfall events are projected to increase the occurrence of inland flooding due to sheet flow or overbank flow.
- ❖ The likelihood of continued coastal erosion is high and will be accelerated with sea level rise and more frequent and intense storms.

Wind-Related Hazards

- ❖ Barrington can expect an event characterized as *High Wind* roughly once or twice a year and some of those will include thunderstorms.
- ❖ While there is a low probability of a tornado occurring, if it does, it is more likely during peak hurricane season (mid-August through October).
- ❖ There is a high probability of a Tropical Cyclone (Tropical Depressions/Storms and Hurricanes) occurring over the ensuing 5-year period. The Intergovernmental Panel on Climate Change (IPCC) climate models predict hurricanes becoming more intense, with stronger winds and heavier precipitation, through the 21st century.
- ❖ Major hurricanes pose a significant threat to sections of Town, particularly due to surge inundation. Due to the extensive shoreline, even a Category 1 hurricane could flood large sections of Town within a short period of time.
- ❖ The Town has critical facilities serving vulnerable populations (children, seniors, special needs) located in areas at risk from storm surge.

Winter-Related Hazards

- ❖ There is a high annual probability of a winter weather event impacting the Town. NCEI data suggests that annually, all Rhode Island towns can expect to experience about one nor'easter and two to seven winter weather events of some significance. That being said, it is likely that the extreme cold temperatures will only occur for short periods of time.

Vector-borne Diseases Transmitted by Ticks and Mosquitoes

- ❖ There is a low probability of mosquito-transmitted Eastern Equine Encephalitis or West Nile Virus occurring in Barrington over the upcoming 5-year period. However, there is a high probability that a number of Barrington residents will be infected by Lyme disease transmitted by ticks.

Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses

- ❖ It is uncertain when the current Coronavirus pandemic will end. It is highly likely that Barrington will continue to experience some level of Coronavirus cases, as well as influenza cases, during the ensuing 5-year period.

Earthquakes

- ❖ The probability of a significant earthquake impacting Barrington over the next five years is low.

Extreme Heat

- ❖ As the annual number of high heat days (over 90°F) is expected to increase, extreme heat events remain a danger, particularly to sectors of the population more at risk (infants and young children, seniors, low-income residents, people with chronic medical conditions, outdoor workers, etc.).

Drought

- ❖ The probability of a long-term drought occurring over the next five years is low. Although some models suggest that less frequent but more intense precipitation events coupled with a projected warming trend may increase the probability of a short-term (one to three month) drought, the probability over the next 5 years is considered moderate.

Brush Fires

- ❖ Barrington's at topography, along with the overall humid weather, puts the Town at a low risk for wildland and brush fires.

MITIGATION STRATEGY

The *Mitigation Strategy* is the culmination of the planning process. It provides the Town with the basis for action to reduce the risk to people and property from hazards and assists the Town in achieving compatible economic, environmental, and social objectives. The *2022 Hazard Mitigation & Flood Management Plan (HM&FMP)* Steering Committee used the assessment information to develop a broad-based mission statement, goals, and actions which are intended to guide the Town's day-to-day operations and long-term approach to reduce the impacts of hazards and improve flood management.

It was important to the Town of Barrington to develop a comprehensive and aggressive *Mitigation Strategy* that will lead to a safer and more sustainable community. The Town has and will continue to implement and institutionalize hazard mitigation and flood management through its human, legal, and fiscal resources; effective coordination and communication with the state, neighboring jurisdictions, stakeholders, community members, and across Town departments; and use of knowledge and tools to analyze and cope with hazard risks. As the Town has undertaken to develop a combined hazard mitigation and flood management plan, the *Mitigation Strategy* includes a mix of mitigation and non-mitigation actions. Non-mitigation actions include activities that are emergency response or operational preparedness in nature.

Goals

The mitigation strategy *Goals* are the foundation behind the development of a comprehensive range of specific attainable mitigation actions for the Town. During the development process, the 2017 HMP goals were reviewed for relevancy, and updated as follows:

◆ **Goal 1: Reduce impacts from current and future natural hazards to the built environment.**

Policy 1.1: Consider the effects of projected sea level rise and flooding in the site selection and planning of parks, buildings, and other public projects.

Policy 1.2: Reduce the impact of development within the floodplain and other vulnerable areas.

◆ **Goal 2: Preserve and enhance the capacity of the natural environment to improve Barrington's resilience against impacts of natural hazards.**

Policy 2.1: Identify and protect critical open space areas that are vulnerable to natural hazards and sea level rise (SLR).

Policy 2.2: Plan and implement projects that allow natural systems to adapt over time to changes in sea level rise and the climate.

Policy 2.3: Preserve existing tree canopy and maintain public trees for their value as green infrastructure and their ability to mitigate natural hazards such as stormwater, flooding, erosion, and extreme heat.

◆ **Goal 3: Protect public health, safety, and existing properties against impacts of flooding through implementation of Community Rating System (CRS) Activities, with emphasis on expanding flood insurance coverage and reducing NFIP flood insurance premiums for Barrington property owners.**

Policy 3.1: Continue to comply with National Flood Insurance Program (NFIP) requirements.

Policy 3.2: Actively participate in the Community Rating System Program.

Policy 3.3: Maintain a FEMA-approved hazard mitigation plan that is based on current, scientifically-based data and proposes mitigation strategies on natural hazards and climate change.

◆ **Goal 4: Through communication and educational outreach, improve the community's awareness and capacity to reduce or adapt to impacts from natural hazards.**

Policy 4.1: Inform the public on the concept of community resilience and the risk of impacts from natural hazards, with an emphasis on stream and coastal flooding; storm surge; tropical storms, hurricanes, and other high wind events; and winter storms.

Policy 4.2: Educate the public on the value of trees to mitigate hazards such as stormwater, flooding, erosion, and extreme heat; and encourage tree protection and planting in the community.

Action Plan

To comprehensively address the four *Goals*, the Steering Committee reviewed an extensive array of possible actions. Through combining some actions and eliminating others, the Committee identified 25 specific actions to be considered for implementation by the Town during the five-year duration (2022-2027) of this *Plan*. The *Mitigation Action Plan (Section 6)* includes a mix of physical initiatives through capital improvement projects and programming, as well as passive initiatives through regulatory and policy measures. All of the selected actions have been deemed feasible, reflect updated priorities including response to climate change and accelerated sea level rise, and address the Town's current and projected future needs.

The *Action Plan* is organized by *Goal* and includes a summary of the action, along with other descriptors such as the lead authority, magnitude of cost, mitigation category (prevention, property protection, public education & awareness, natural resource protection, structural projects, and emergency services), and the STAPLEE priority ranking. The STAPLEE method (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) was the process the Steering Committee used to prioritize the proposed actions.

The actions will be implemented through the Town's personnel, legal, and fiscal resources; intergovernmental coordination and communication; academic resources and analysis tools; and through the involvement of the Town's residents, business owners, and institutional leaders. The Town also recognizes the need to work collaboratively across municipal lines, and with state and federal agencies, in order to effectively address actions that will improve, not only the Town, but the region, and by extension, the State.

Plan Adoption

After the Steering Committee determined the objectives of the *Plan* had been met, a *Public Review Draft* was made available to the public-at-large. The Committee established a 3-week review period culminating in a Public Hearing which was hosted by the Barrington Conservation Commission. The Public Review Period and Public Hearing were well advertised through a press release and two Public Hearing Legal Notices in the local newspaper, the Town's website, a kiosk at the public library, and an email to the agencies and organizations listed in **Appendix 2-3**, which includes the Barrington Town Council, Town Boards and Commissions, neighboring municipalities, and local, regional, and state stakeholders. Community members and other stakeholders were encouraged to provide input and feedback throughout the Public Review Period to the Planning, Building & Resiliency Office and/or at the Public Hearing.

All input and feedback were considered when finalizing the *Plan* prior to submitting to the Rhode Island Emergency Management Agency (RIEMA) for review. Upon approval by RIEMA, the Plan was forwarded to the Federal Emergency Management Agency (FEMA). **FEMA approved the Plan on XXXX, 2022 conditional on local adoption.** Adoption by the local governing body is important as it demonstrates the jurisdiction's commitment to fulfilling the hazard mitigation goals and actions outlined in the plan. **The Barrington Town Council adopted the Hazard Mitigation & Flood Management Plan on XXX, 2022; the Resolution has been included as Appendix 7-2.**

The Town Council adoption of the *Plan* recognizes it as a guidance for Town-wide natural hazards mitigation, enabling Barrington to continue to work toward building a safer, disaster resilient, and sustainable community through the implementation and maintenance of mitigation actions. Town Council adoption also makes Barrington eligible for federal grants available through FEMA's Hazard Mitigation Assistance Grants, including the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA) Program, Building Resilient Infrastructure & Communities (BRIC), and Pre-Disaster Mitigation (PDM) program.

Additionally, the Town will be awarded CRS credit points for this *Plan*. The CRS program has a point system based on implementing activities that go beyond the minimum NFIP floodplain management standards. CRS credit points correspond to potential discounts on NFIP premiums for property owners within the participating jurisdiction.

Implementation and Plan Maintenance

To be effective, mitigative actions need to be implemented on an ongoing basis prior to the occurrence of disasters. The Town of Barrington recognizes this and is committed to implement the *Action Plan* (**Section 6**) on an ongoing basis, as well as support a process by which the local government will integrate hazard mitigation planning into other departmental measures.

When creating this *Plan*, numerous local plans, policies, codes, and programs that guide development in Barrington were consulted (**Section 5**). The Town intends to continue plan integration, ensuring that whenever appropriate the *HM&FMP* strategies will be integrated into new or updated local plans and policies.

With respect to the *HM&FMP*, the Town considers it a dynamic document. To ensure it remains effective over the 5-year implementation period, it will be reviewed minimally on an annual basis (preferably on a semi-annual basis), and as readily as possible following a natural disaster should one occur. These reviews will serve as opportunities to assess the progress and effectiveness of implemented mitigation measures, and to update the *Plan* as deemed appropriate to reflect items such as changes in the community, availability of funding and staffing resources, or an improved understanding of the Town's strengths and vulnerabilities.

For the *Plan* to remain relevant, continued community involvement throughout the implementation and maintenance process will be essential. Ongoing community engagement is an asset to the process as it continues the hazard risks discussion and builds support for mitigation activities. Throughout the 5-year implementation period, community members will be given the opportunity to affect the content and outcomes of the *HM&FMP* through outreach, public meetings, and community forums.

In addition to the annual reviews, the *Plan* will undergo a 5-year full update. The 5-year update will be completed in accordance with Disaster Mitigation Act requirements, in order to maintain eligibility for FEMA mitigation grant funding. To ensure that the revised plan will be approved within the 5-year cycle, it is proposed that the Town commence the update on the fourth anniversary of the *Plan* adoption date.

SECTION 1

Introduction

Subsections

- 1.1 PURPOSE AND MISSION STATEMENT
- 1.2 ORGANIZATION OF THE DOCUMENT

1 Introduction

The 2022 *Hazard Mitigation & Flood Management Plan (HM&FMP)* is a critical planning document for the Town of Barrington. With extensive coastline and floodplain areas, Barrington is one of Rhode Island's most vulnerable communities to the impacts from natural hazards. The potential impacts range from minor short-term events such as street flooding and snowstorms, to catastrophic events, such as the Hurricane of 1938. Risks will continue to grow in the coming decades due to sea level rise and other anticipated deleterious effects of climate change. By planning ahead, Barrington becomes pro-active rather than reactive, and can significantly reduce the damaging effects of future disasters, minimizing loss of life, injuries, destruction of property and infrastructure, and economic and social disruption.

1.1 PURPOSE AND MISSION STATEMENT

The purpose of this *Plan* is to guide hazard mitigation efforts by identifying natural hazards with a higher likelihood of occurring or potentially having a greater impact on the community should they occur; determining the vulnerability of the community to these hazards; and establishing clear goals and strategies that mitigate the risks.

As flooding has historically been a problem for the Town of Barrington, and climate change and sea level rise (SLR) models indicate it will continue to worsen in the future, the Steering Committee chose to expand the FEMA required 5-year Hazard Mitigation Plan (HMP) update to include additional focus on flooding and flood management. The resulting 2022 *Hazard Mitigation & Flood Management Plan (HM&FMP)* was prepared pursuant to the requirements of the Federal Disaster Mitigation Act of 2000, integrates the 10-step planning process outlined in Community Rating System (CRS) Activity 510, and aligns with the State of Rhode Island's objectives for natural hazard mitigation included in the RI State Hazard Mitigation Plan.

The hazards addressed in this *Plan* include: Flood-Related Hazards; Wind-Related Hazards; Winter-Related Hazards; Infectious Disease-Related Hazards (Vector-borne Diseases Transmitted by Ticks and Mosquitoes, and Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses); and Other Hazards (Earthquakes, Extreme Heat, Drought, Brush Fires). The *Plan* also addresses how climate change, including sea level rise, poses a significant threat to the community in terms of exacerbating many of the identified hazards.

The *Plan's* purpose is captured in the following Mission Statement, adopted by the Steering Committee to serve as a framework for development of the *Plan*.

Mission Statement

It is the mission of the 2022 *Hazard Mitigation & Flood Management Plan (HM&FMP)* to reduce Barrington's vulnerability to impacts of natural hazards, including safeguarding against the increased threats from climate change and sea level rise. By identifying areas at risk and sustainable, cost-effective mitigation measures, the *HM&FMP* seeks to reduce the adverse impacts of natural hazards on Barrington's people, critical facilities, built & natural environment, and economy.

1.2 ORGANIZATION OF THE DOCUMENT

The *Town of Barrington 2022 Hazard Mitigation & Flood Management Plan* is organized as described below. As noted, the CRS Activity 510 planning process guided plan development. This process proved successful, encouraging community and stakeholder engagement, and the integration of key planning documents and other resources. The planning process led to a well-structured, community-centric *Plan* that addresses risk and vulnerability through a variety of hazard mitigation measures.

Executive Summary: provides an overview of the planning process and collaborative effort undertaken by the Town to create this document. The Executive Summary also sets forth the major assessment findings, goals, how the *Action Plan* was developed, and how *Plan* adoption, implementation, and maintenance will help ensure the Plan remains relevant and provides effective guidance as Barrington continues to build a safer, disaster resilient, and sustainable community.

Section 1 - Introduction: identifies the purpose and structure of the *Plan*. A brief summary of the information presented in each Section is provided.

Section 2 - Planning Process with Public Input: provides a description of the overall planning process and identifies the Steering Committee members. As the Town intends to participate in the Community Rating System (CRS) program, the CRS Activity 510 planning process was used to guide plan development. As shown in this Section, that process aligns with the Disaster Mitigation Act (DMA) of 2000 Hazard Mitigation Plan requirements. This Section also provides a discussion of public involvement, identifying how the community, neighboring jurisdictions, and other stakeholders were given the opportunity to provide input and feedback on the *Plan*. This Section furthers outlines the extensive plan integration effort undertaken as part of the planning process.

Section 3 – Community Profile: provides a glimpse of the history and character of the Town, as well as general information about the government structure, population, and demographics.

Section 4 – Risk Assessment: comprises two key elements: Hazard Identification and Vulnerability Analysis. The Hazard Identification reviews and ranks the potential natural hazards which are likely to impact all or part of Barrington. Ranking is used to determine which hazards have a higher likelihood of occurring, or potentially having a greater impact on the community should they occur. The hazards addressed in this *Plan* include: Flood-Related Hazards (Inland Flooding, Coastal Flooding/Storm Surge, Coastal Erosion); Wind-Related Hazards (High Winds, Tornadoes, Tropical Cyclones); Winter-Related Hazards (Heavy Snow, Ice, Extreme Cold); Infectious Disease-Related Hazards (Vector-borne Diseases Transmitted by Ticks and Mosquitoes, and Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses); and Other Hazards (Earthquakes, Extreme Heat, Drought, Brush Fires). A profile for each of these hazards is provided with the following information: description and extent (strength or magnitude of impact); location (geographic area affected); previous occurrences; climate change impacts; and probability of future events.

The Vulnerability Analysis considers how vulnerable the community is to the various identified hazards. The analysis addresses what is at risk (built environment including public infrastructure, natural environment, local economy, and people) and what the impacts might be (structural and environmental damage, economic loss, inconvenience to residents, physical and emotional harm, and loss of life). The Vulnerability Analysis employed both a quantitative analysis (wherein data was available) and a qualitative analysis that relied on local knowledge and rational decision making.

Section 5 – Capability Assessment: provides an overview of what mitigation mechanisms are already in place. In other words, what policies, programs, regulations, authorities, personnel, funding, and other resources are available to the Town to accomplish mitigation and reduce long-term vulnerability. A Capability Assessment is an important step because understanding what is already in place and the effectiveness of those capabilities provides the opportunity to identify where additional measures or revisions to existing measures are needed.

Section 6 – Mitigation Strategy: is the culmination of the planning process, built upon the preceding Sections, particularly the findings from the *Risk Assessment (Hazard Identification and Vulnerability Analysis)*, and *Capability Assessment*. This Section includes a broad-based mission statement, goals, and actions which are intended to guide both the Town's day-to-day operations and long-term approach to reduce the impacts of hazards and improve flood management. The *Action Plan*, which will serve as a roadmap for the next 5 years, was developed by reviewing and prioritizing an array of possible actions. To comprehensively address the mitigation *Goals*, actions across a number of mitigation categories (prevention, property protection, public education & awareness, natural resource protection, structural projects, and emergency services) have been included in the *Action Plan*. As the Town has limited fiscal and staffing resources, the *Action Plan* places greater focus on mitigation measures for the higher ranked hazards.

Section 7 – Plan Adoption, Implementation and Maintenance: provides the *Plan* adoption process which represents community and local government support. In addition, by adopting the *Plan* the Town is eligible for FEMA Hazard Mitigation Assistance Grants and CRS credit points.

This Section also identifies a process for monitoring the overall progress of mitigation strategies and completed initiatives. The *Action Plan* includes descriptors for each mitigation action, such as lead authority and timeframe, which will aid implementation by providing a clear course for how the measure is to be incorporated into departmental and committee-based work plans and budgets. To ensure the *Plan* remains relevant, this Section stipulates an annual review and five-year update. Structured maintenance of the *Plan* provides a defined opportunity to evaluate the effectiveness of implemented mitigation measures, address changing conditions, identify funding mechanisms, and facilitate integration of the *HM&FMP* into other Town planning documents and strategies.

Appendices: This section contains a number of supporting documents including:

Appendix 2-1 CRS Credit
Appendix 2-2 Outreach Activities
Appendix 2-3 Coordination

Appendix 4-1 Hazard Ranking - Vulnerability Summary
Appendix 4-2 Maps
Appendix 4-3 Critical Facilities Vulnerability Analysis
Appendix 4-4 Building and Roads Vulnerability Analysis

Appendix 5-1 Planning and Regulatory Capabilities
Appendix 5-2 Administrative and Technical Capabilities
Appendix 5-3 Financial Capabilities

Appendix 6-1 Possible Actions
Appendix 6-2 STAPLEE Analysis

Appendix 7-1 Local Mitigation Plan Review Tool
Appendix 7-2 Town of Barrington Resolution

SECTION 2

Planning Process with Public Input

Subsections

2.1 ORGANIZE

2.2.1 10-Step Planning Process

2.2.2 Local Government Involvement: Steering Committee

2.2 PUBLIC INVOLVEMENT

2.2.1 Prior to HM&FMP Planning Process

2.2.1.1 URI-CI Climate Response Initiative

2.2.1.2 MRP CRB Workshop

2.2.2 Throughout HM&FMP Planning Process

2.3 PLAN INTEGRATION AND COORDINATION

2.3.1 Plan Integration

2.3.1.1 2017 HMP

2.3.1.2 Comprehensive Community Plan

2.3.1.3 Community Rating System

2.3.2 Coordinate with Agencies & Organizations

2 Planning Process with Public Input

Hazard Mitigation Plan: The Town of Barrington has successfully met the following requirements →

44 CFR Subsection D §201.6(b): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

- 1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- 2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
- 3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

44 CFR Subsection D §201.6(c)(1): The plan shall include the following:

- 1) Documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

CRS - Flood Management Plan: The Town of Barrington has successfully met the following Mitigation Strategy requirements based on the 10-step planning process for CRS Activity 510 →

Organize to Prepare the Plan (Step 1); Involve the Public (Step 2); and Coordinate (Step 3)

2.1 ORGANIZE

The Town of Barrington is cognitive of the importance to update and coordinate local planning initiatives. As the *2017 Hazard Mitigation Plan* (HMP) was scheduled to be updated in 2022, and as the most prevalent natural hazard facing the Town of Barrington is flooding, the Town decided to expand the update process to effectively create a combined *Hazard Mitigation & Flood Management Plan* (HM&FMP).

CRS CREDIT:			
Mitigation Planning Element	CRS Planning Step	Max Pts	Est Pts
Phase I - Planning Process	1. Organize to Prepare the Plan	15	

CRS Coordinator's Manual – Activity 510: Floodplain Management Planning

As the Town has submitted an application to participate in FEMA's Community Rating System (CRS) Program, it was determined that the *Plan* should be created using the CRS Activity 510 planning process. This process allows the Town to maximize CRS credit for this *Plan* while meeting the Disaster Mitigation Act (DMA) 2000 Hazard Mitigation Plan requirements. This coordinated approach strengthened the planning process and led to a well-structured, community-centric plan that addresses risk and vulnerability through a variety of hazard mitigation measures. The Town contracted with Civil Engineer & Resilience Planning Consultant Kim Jacobs (KMJ-CE/RP) to draft the *Plan*, provide technical assistance to the Steering Committee, facilitate meetings and outreach efforts, and coordinated plan review with RIEMA.

Planning is essential.

Dwight D. Eisenhower

2.1.1 10-Step Planning Process

As indicated, the Town decided to undertake development of a combined *Hazard Mitigation & Flood Management Plan*. By implementing the CRS Activity 510 planning process outlined in **Table 2-1**, the *Plan* meets DMA requirements while maximize CRS Activity 510 credit. An overview of the estimated CRS credit achieved by this *Plan* has been included in **Appendix 2-1**.

Table 2-1 shows the alignment of the DMA planning regulations to the 10-Step planning process. It should be noted that Steps 2 and 3 were implemented throughout the entire planning process.

Table 2-1 10-Step Planning Process & DMA Planning Regulations

CRS Activity 510 Planning Process	DMA Planning Regulations (44 CFR 201.6)
Phase I – Planning Process	
Step 1. Organize to Prepare the Plan	§201.6(c)(1)
Step 2. Involve the Public	§201.6(b)(1)
Step 3. Coordinate	§201.6(b)(2) & (3)
Phase II – Risk Assessment	
Step 4. Assess the Hazard	§201.6(c)(2)(i)
Step 5. Assess the Problem	§201.6(c)(2)(ii) & (iii)
Phase III – Mitigation Strategy	
Step 6. Set Goals	§201.6(c)(3)(i)
Step 7. Review Possible Activities	§201.6(c)(3)(ii)
Step 8. Draft an Action Plan	§201.6(c)(3)(iii)
Phase IV – Plan Maintenance	
Step 9. Adopt the Plan	§201.6(c)(5)
Step 10. Implement, Evaluate, and Revise the Plan	§201.6(c)(4)

2.1.2 Local Government Involvement: Steering Committee

The Town of Barrington's first Hazard Mitigation Plan (HMP) was developed in 2004. A subsequent update occurred in 2010 and then again in 2017. Barrington's Emergency Management Committee (EMC) is the primary body tasked with overseeing hazard mitigation in the Town.

At the Barrington Town Council meeting on March 7, 2022, the Council authorized the update and expansion of the 2017 Hazard Mitigation Plan. In support of the CRS Activity 510 planning process, the Town Council also authorized the formation of a Steering Committee, comprised of Town staff (EMC Committee members), residents (including a business representative), and other stakeholders, to guide plan development. The Steering Committee members are listed in **Table 2-2**, with public representation comprising more than 50% of the membership. The Town's Consultant for the *HM&FMP*, served on the Committee throughout the planning process in an advisory capacity.

The Steering Committee met seven times throughout the development of this *Plan*, and their input and feedback were integral to its success. The date and key agenda items for each of the Steering Committee meetings have been provided in **Table 2-4**. As shown, the Steering Committee was actively engaged in all aspects of plan development, with emphasis on reviewing the impact of hazards on people and property; considering a variety of ways to reduce and prevent damage from flooding and other hazards; recommending appropriate and feasible measures to improve community resilience through implementation of mitigation actions; and engaging the public in the plan development process. The Committee meetings were open to the public and publicized on the Town's Upcoming Meetings Calendar and Secretary of State's website.

Table 2-2 Steering Committee

Barrington Town Staff (EMC Members)	Members of the Public
Committee Chair Teresa Crean, AICP, Director of Planning, Building & Resiliency	Matt Amaral, resident Senior Account Executive OceanPoint Insurance; Proprietor Grapes & Grains and Evergreen Consulting Group; Chair Barrington Economic Development Commission; Chair Emeritus, Barrington Business and Community Association
Gerald Bessette, ADSFM, CFI-1, Fire Chief and Emergency Management Director and/or designee Normand Menard, Emergency Management Coordinator	John Garabedian, resident former business owner Garabedian Construction; former member of Barrington Harbor Commission
Alan Corvi, Director of Public Works and/or designee Colin O'Hara, DPW Engineer	Michael Holtzman, resident former reporter with <i>The Call</i> and <i>The Herald News</i>
Dennis Begin, Building Official	Sandra Wyatt, resident Barrington Land Conservation Trust (BLCT) member; Annawamscut Brook Macro Invertebrate Study Coordinator; former Chair Allin's Cove Neighborhood Coalition; former BLCT manager of Allin's Cove Conservation Area
Brian Hunt, Harbormaster	Rachel Calabro, MS, RI Department of Health Climate Change Program Manager
Colonel Michael E. Correia, Chief of Police	Nathan Vinhateiro, PhD, Assistant Director URI Coastal Institute and/or Amber Neville, Assistant Director URI Coastal Institute
	Jen West, Coastal Training Program Coordinator Narragansett Bay National Estuarine Research Reserve
<i>Kim Jacobs, Civil Engineer & Resilience Planning Consultant, served on the Committee in an advisory capacity</i>	

The Town departments represented on the Steering Committee are responsible for implementing the majority of the *Plan's* recommendations and, as shown in **Table 2-3**, collectively have authority over all six categories of flood mitigation activities. The Director of Planning, Building & Resiliency, has primary responsible for the community's land use and comprehensive planning, served as Chair of the Steering Committee, and has been actively involved in all aspects of the planning process.

Table 2-3 Town of Barrington Department Responsibility

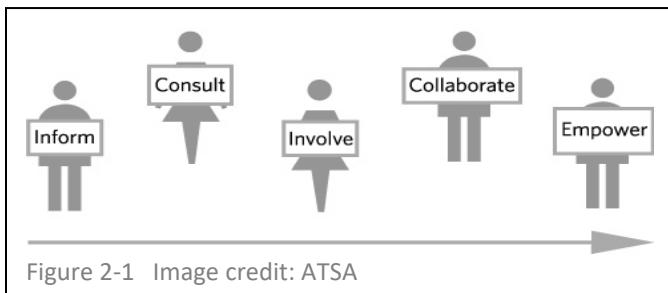
Department	Land Use and Comprehensive Planning	6 Categories of Flood Mitigation					
		Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Structural Projects	Emergency Services Protection
Planning & Resilience	x	x	x	x	x	x	
Building & Zoning	x	x	x	x	x	x	
Fire & Emergency Management		x	x	x		x	x
Police Department		x	x	x			x
Public Works		x	x	x	x	x	x
Harbormaster		x	x	x	x		x

2.2 PUBLIC INVOLVEMENT

Public participation is a central component of the planning process which helps to provide critical information about the local occurrence of hazards, qualify past successful mitigation measures, and identify where additional work is needed to reduce the potential damages from hazard events. Public participation also builds understanding of the concept of hazard mitigation and climate change, therein helping to create a base of support for implementing *Plan* activities.

CRS CREDIT:			
Mitigation Planning Element	CRS Planning Step	Max Pts	Est Pts
Phase I - Planning Process	2. Involve the Public	120	120
CRS Coordinator's Manual – Activity 510: Floodplain Management Planning			

It was important to the Town of Barrington that this *Plan* reflects the community's values and priorities. For that reason, the Town wanted an equal or greater public representation on the Steering Committee. Additionally, to engage the public-at-large, the Town conducted an extensive public outreach process that included the opportunity for residents, business owners, local boards and commissions, neighboring communities, academia, private and non-profit organizations, state agencies, and other interested stakeholders to attend and participate in public meetings, provide input through an online survey, and ask questions of or provide comments to the Planning Office about the *HM&FMP* as it was being drafted. All input received was appreciated and considered in finalizing this *Plan*.



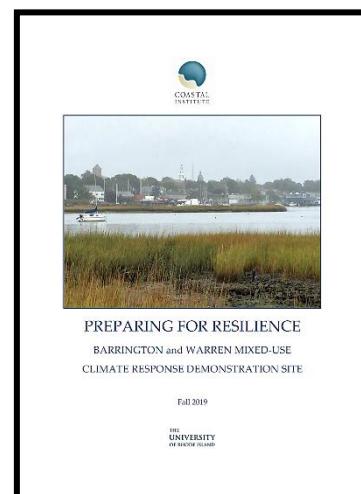
Following is an overview of public engagement that was essential to the development of the *Town of Barrington 2022 Hazard Mitigation & Flood Management Plan*.

2.2.1 Prior to HM&FMP Planning Process

It should be noted that even prior to the commencement of the *HM&FMP* planning process, several initiatives with highly successful public engagement took place; the outcomes of which have helped to shape this *Plan*. Two of those initiatives have been documented below.

2.2.1.1 URI-CI Climate Response Initiative

In 2017 the Town of Barrington, in conjunction with its neighboring community of Warren, participated in the University of Rhode Island Coastal Institute's (URI-CI) Climate Response Initiative. This ongoing program brought together a team of experts, as well as a group of graduate students from the University of Pennsylvania (UPenn) School of Design, to explore adaptation strategies that will promote resilience of coastal municipalities and enhance ecosystem sustainability (URI-CI. *Preparing for Resilience: Barrington and, 4*). As discussed in both the 2019 and 2021 Reports, throughout this program there have been numerous opportunities for public participation including the following:



Walking Tour & Panel Discussion (May 31, 2017 - Barrington Town Hall) ♦ a Town-organized walking tour of sites vulnerable to SLR, followed by a panel discussion with local experts on various coastal resilience topics

Building a Resilient Community Workshop (August 14, 2018 - Barrington Public Library) ♦ as part of Barrington's Emergency Preparedness Week, a hands-on workshop facilitated by Barrington's Planning Office and Save The Bay was conducted with attendees focused on evaluating and suggesting mitigation measures for a number of Barrington's coastal areas prone to flooding

Health Risks in a Changing Climate Presentation (August 18, 2018 - Barrington Public Library) ♦ as part of Barrington's Emergency Preparedness Week, demonstration site member Teresa Crean provided a public lecture titled *Health Risks in a Changing Climate*

Tour of Barrington (October 3, 2018) ♦ at several locations in Barrington the team demonstrated how high the water is projected to rise by 2030, 2050, and 2095 based on NOAA's 2017 SLR projections

Land Use Planning Strategies Workshop (October 4, 2018 - Barrington Public Library) ♦ analyzed the vulnerability of selected Town sites to sea level rise and storm surge, and explored existing and new land use planning strategies necessary for adapting to changing conditions

Buyouts Workshop (November 13, 2018 - RI Dept of Administration, Providence; December 12, 2018 - URI Coastal Institute, Narragansett; February 20, 2019 - RI Emergency Management Agency, Cranston) ♦ as numerous homes will be lost to SLR, these public forums provided the opportunity for Barrington's leadership and residents to discuss property buy-out programs with regional and state experts

UPenn Presentation (January 28, 2019 - Warren Town Hall) ♦ the University of Pennsylvania graduate students in City & Regional Planning presented the findings from their semester-long planning study of coastal resilience in Barrington and Warren

Transportation Network Workshop (May 23, 2019 - Barrington Public Library) ♦ analyzed Barrington's transportation network for vulnerability to sea level rise and storm surge, and explored strategies for making the transportation network more resilient to changing conditions

Climate Change Impacts Presentation (January 26, 2020 - Bay Spring Community Center) ♦ the Barrington Farm School hosted a presentation on the climate change impacts in coastal Rhode Island

Resilience & Energy Committee Presentation (September 28, 2021 - Barrington Public Library) ♦ presentation on GIS flood risk analysis maps by URI-Cl intern Patrick MacMeekin and demonstration site member Teresa Crean

The following reports and a geospatial analysis, all available online, have thus far been created as part of the Mixed-Use Climate Response Demonstration Site Initiative. These are important resources for the Town and have been integrated into the development of this *Plan*. Activities identified in the reports that were reviewed for possible inclusion in the 2022-2027 *Action Plan* are listed in **Appendix 6-1**.

- *A Future with Water: Sea Level Rise in Rhode Island* (The University of Pennsylvania School of Design)
- *Preparing for Resilience: Barrington and Warren Mixed-Use Climate Response Demonstration Site (2019)*
- *Preparing for Resilience: Barrington, Warren and Bristol Mixed-Use Climate Response Demonstration Site (2021)*
- *Geospatial Analysis of Sea Level Rise for Rhode Island Municipalities (2021)*

2.2.1.2 MRP CRB Workshop

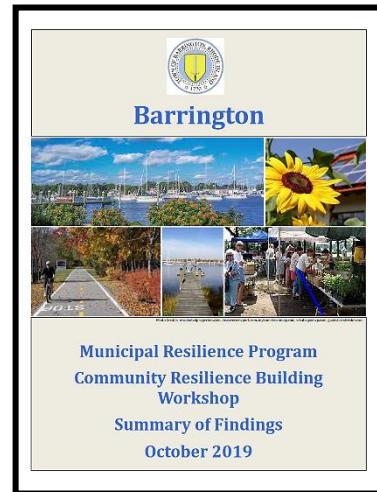
In July 2018 Governor Raimondo introduced the Resilient Rhody: Municipal Resilience Program (MRP) which outlines a comprehensive Climate Resilience Action Strategy for the State. Through the MRP program the State is providing support to communities to engage in a municipal-driven process referred to as Community Resilience Building (CRB) which was developed by The Nature Conservancy (TNC). The Nature Conservancy has honed their highly successful CRB program over the past decade in response to the need for communities and other organizations and enterprises to build resilience and adapt to the extreme weather and hazards resulting from climate change (Community Resilience Building, 2).

In March 2019, the Town of Barrington and its neighboring Town of Warren submitted a joint application to participate in the Municipal Resilience Program and were selected as first round recipients to complete the CRB process and be designated as Resilient Rhody Municipalities.

The towns held a joint CRB Workshop on September 24, 2019. The workshop was organized through the Rhode Island Infrastructure Bank in partnership with The Nature Conservancy and effectively brought together local, regional, and state stakeholders, including the Town's EMC members, to comprehensively identify and prioritize steps to reduce risks and improve resilience within the towns and the region.

The Workshop Objectives included:

- Understand connections between natural hazards, climate change, and local planning/mitigation efforts
- Evaluate strengths and vulnerabilities of infrastructure, natural resources, and population
- Develop and prioritize resilient actions for the municipality and region; residents; neighborhoods; community groups; and local organizations, institutions, and businesses
- Explore nature-based solutions to support sustained resilience
- Identify immediate opportunities to advance actions that reduce the impact of hazards and increase resilience in the community and/or the region



The Town of Barrington appreciated the opportunity afforded to them by the Rhode Island Infrastructure Bank and The Nature Conservancy to engage in a CRB Workshop. The Workshop successfully helped to advance comprehensive community resilience planning and hazard mitigation efforts. An overview of the discussion and outcome from the Workshop was documented in the Summary of Findings Report; an important resource for the Town which has been integrated into the development of this *Plan*. A link to the report is available on the Town of Barrington's website and activities from this report that were reviewed for possible inclusion in the 2022-2027 *Action Plan* are listed in **Appendix 6-1**.

2.2.2 Throughout HM&FMP Planning Process

A key element in the mitigation planning process is creating a plan that accurately reflects the community's values and priorities and promotes discussion among community members about creating a safer, more disaster-resilient community.

As previously indicated, the public was involved in the planning process from the onset, comprising more than 50% of the Steering Committee membership. In addition, throughout the planning process, the public was given opportunities to be involved through outreach efforts that sought to deepen the public's understanding of hazard risks and encourage input on the development of resilient solutions. Community members provided local

knowledge of past hazard occurrences, described problem areas and issues of concern, helped identify community assets and mitigation alternatives, and provided ideas for continuing public involvement after *Plan* adoption. All input and feedback received was appreciated and taken into consideration in finalizing this *Plan*.

The Town engaged in a total of ten outreach activities which included newspaper articles, an informational Project webpage, a public opinion survey, informational posters, a public information meeting, a 3-week Public Review Period commencing with disseminating the *Public Review Draft*, a Public Review Period/Hearing Press Release, a kiosk at the Public Library, and a Public Hearing. An overview of the outreach activities has been included in **Table 2-4**. Additional information for each activity, including copies of the newspaper articles, results of the survey, and examples of the posters has been provided in **Appendix 2-2**. Just as public involvement throughout the planning process was a priority, after the Town Council adopts the *HM&FMP*, it is important to the Town that the public continue to be involved in the ensuing *Plan* implementation and maintenance phase.

Because community and stakeholder engagement are important, the public informational meeting and Public Hearing were publicized in the local newspaper and posted on the Town's website. In addition, an email highlighting these and other outreach activities was sent to 16 local government & school district groups, including the Barrington Town Council and other Boards and Commissions, and 33 stakeholders from various agencies and organizations outside of Barrington's governmental structure (**refer to Appendix 2-3**).

Table 2-4 Summary of Steering Committee Meetings and Public Outreach

Event	Overview	Date
Outreach Activity #1	<p>Newspaper Article: An article was published in the local newspaper, the Barrington Times, informing the public about the project and encouraging interested community members to volunteer to be on the Steering Committee to guide plan development.</p>	Published in March 2, 2022 edition
Kickoff & Coordination Meeting	<ul style="list-style-type: none"> Committee introductions Project Consultant provided a brief Project overview including DMA & CRS planning process The proposed meeting schedule was discussed The importance of engaging the public in the process and potential outreach projects were discussed; press releases will be approved by the Committee Chair A draft of the project webpage and public opinion survey were reviewed and revisions will be made based on Committee input The Committee will review the draft posters and finalize for distribution at next meeting 	March 23, 2022 (9-10am)
Outreach Activity #2	<p>Project Webpage: Information about the HM&FMP, including opportunities for the public to be involved in the Project were posted on the Town's website - HM&FMP Project webpage. The webpage was updated on several occasions throughout the Project to promote upcoming meetings and outreach activities, provide additional information and the status of the Project, and to provide links to the <i>Public Review Draft</i>.</p>	Launched on March 25, 2022 (continued throughout the project)
Outreach Activity #3	<p>Public Opinion Survey: An online survey was created, with input from the Steering Committee, to gather public opinion related to hazard mitigation & flood management. The survey was highly publicized and garnered an outstanding response with 442 participants. The Committee appreciated the community input from the survey, the results of which were used by the Committee to help guide and focus their mitigation planning efforts.</p>	March 29 through April 19, 2022

Successful Outreach

- Informs and educates about hazards and risks
- Invites interested parties to contribute their views and ideas for mitigation
- Identifies conflicts and incorporates different perspectives and priorities early in the process
- Provides data and information that improves overall quality and accuracy of the plan
- Ensures transparency and builds trust
- Maximizes opportunities for implementation through greater consensus and acceptance

Source: FEMA Local Mitigation Planning Handbook 2013, page 3-2

Steering Committee Meeting #1	<ul style="list-style-type: none"> Follow-up items from the previous meeting were discussed: project webpage has been created; public opinion survey is ready to go live; and the press release is scheduled to be in March 30th edition of Barrington Times (<i>note: after meeting found out that the Times was unable to include press release so it will be in the April 6th edition</i>) A draft of the informational posters was reviewed and revisions will be made based on Committee input; there was a discussion on where to put up the posters and a commitment from various members to put them up in high pedestrian traffic locations around Town Project Consultant provided an overview of plan integration; Committee members were asked to review the draft list of key planning documents and suggest additional resources Project Consultant provided an overview of the coordination with agencies & organizations to inform them about the Project and opportunities to provide input and feedback; Committee members were asked to review the draft list and suggest additional groups A list of State and Federal declared disasters (1954 – 2021) was reviewed and discussed The Chair provided an overview of the impact of climate change including sea level rise A discussion took place on what hazards are more likely to impact Barrington; the Committee reviewed the hazards included in the Town's 2017 HMP and the 2019 RI State HMP; the Committee determined the hazards to be included in the 2022 update 	March 30, 2022 (9-10:15am)
Outreach Activity #4	<p>Informational Posters:</p> <p>Several styles of posters were created with input from the Steering Committee, to publicize the project and the various ways that the public could become involved. Over 30 posters were put up around Town in high pedestrian traffic areas. Some of the locations where the posters were displayed include: Town buildings; Shaw's; CVS; Starbucks; Ace Hardware; Barrington Books; Grapes & Grains; OceanPoint Insurance; Barrington Appliance; Barrington Pizza; Atria Bay Spring Village; Barrington Cove Apartments; and utility poles in the New Meadow Road and other neighborhood areas. The posters were also sent out to the Town departments; the school community via the School Superintendent; various other groups; and to over 6000 people through a Town eblast.</p>	Posted/Sent beginning March 30, 2022 through April 19, 2022
Steering Committee Meeting #2	<ul style="list-style-type: none"> Follow-up items from the previous meetings were discussed: since the press release was delayed a week it was agreed to extend the public opinion survey for an extra week to encourage community participation; press release scheduled for April 6th edition of Barrington Times; changes to informational posters based on Committee input and extension of public survey timeline were made and Committee members will disseminate; no additional documents were suggested for the plan integration list; no additional groups were suggested for the coordination with agencies & organizations list A discussion took place on the elements included in a hazard profile which is part of the Risk Assessment; Committee members will be provided draft hazard profiles for review and input A draft list of critical assets was reviewed and revisions will be made based on Committee input; the Project Consultant will review the Comprehensive Plan to determine other potential critical assets 	April 5, 2022 (9-10:15am)
Outreach Activity #5	<p>Newspaper Article:</p> <p>An article was published in the local newspaper, the Barrington Times, informing the public about the Project and promoting upcoming opportunities to learn more about the Project and ways the public can provide input. The article outlined various public outreach activities including the online survey, project webpage, and attendance at the Steering Committee and informational meetings.</p>	Published in April 6, 2022 edition
Steering Committee Meeting #3	<ul style="list-style-type: none"> The Committee approved the minutes from the March 23 & 30, and April 5, 2022 meetings Follow-up items from the previous meetings were discussed: to date approximately 40 people have taken the public opinion survey; discussion ensued on how to encourage greater community engagement; the updated critical asset list was reviewed and some natural resources will be included The Risk Assessment (hazard profiles & vulnerability analysis) was discussed; suggested changes will be made by the Project Consultant and approved by the Committee Chair Project Consultant provided a draft hazard ranking form which Committee members will fill out independently; Project Consultant will tally the forms and provide an overall Committee hazard ranking Public Informational meeting scheduled for April 26th was discussed 	April 12, 2022 (9-10:15am)

Event	Overview	Date
Steering Committee Meeting #4	<ul style="list-style-type: none"> Follow-up items from the previous meetings were discussed: the public opinion survey ended on April 19th with 442 respondents Discussion continued on the hazard profiles & vulnerability analysis; suggested changes will be made by the Project Consultant and approved by the Committee Chair The Committee composite hazard ranking was reviewed and finalized The Project Consultant presented a draft critical asset vulnerability analysis which will be completed with input from the Committee Chair A discussion took place on the Capability Assessment; Committee members will be provided a draft to review A reminder was made that tonight (April 26th) there is the Public Informational meeting at 6:30pm hosted by the Resilience & Energy Committee 	April 26, 2022 (9-10:15am)
Outreach Activity #6	<p>Public Information Meeting: A public meeting, hosted by the Resilience & Energy Committee, was held to promote discussion among R&E Committee members and other attendees about creating a safer, more resilient community and to solicit input for consideration and integration into the development of the Plan; particularly past occurrence of local natural hazards and potential future areas/issues of concern. The Town's Project Consultant gave a PowerPoint presentation followed by an open discussion/Q&A period.</p>	April 26, 2022 (6:30pm)
Steering Committee Meeting #5	<ul style="list-style-type: none"> Follow-up items from the previous meetings were discussed: the Project Consultant provided a brief overview of the Public Informational meeting on April 26, 2022; the draft capability assessment was discussed and will be updated based on Committee input The 2017 Mission Statement and Goals were discussed and updated The status of the 2017 Action Plan was reviewed to determine the continued relevance of those actions; it was determined that all non-completed actions would be continued in the 2022 Action Plan – but may be modified and/or reorganized to take into consideration possible actions from other key planning documents and input from the Committee and the community from the public opinion survey Additional possible actions from a number of planning documents, community input from the public opinion survey, and personal experience were discussed; the Project Consultant will provide the Committee with the updated Action Plan to review 	May 3, 2022 (9-10:15am)
Steering Committee Meeting #6	<ul style="list-style-type: none"> The Committee approved the minutes from the April 12 & 26, and May 3, 2022 meetings Follow-up items from the previous meetings were discussed: rather than listed under critical assets, some natural resources, such as wetlands and waterways, will be represented on a separate map and addressed in the vulnerabilities to the Natural Environment section; no additional changes were suggested to the updated Risk Assessment, Capability Assessment, or Mission Statement, Goals, and Action Plan The Project Consultant provided an overview of the remaining outreach activities; the Committee determined that a press release, a public hearing legal notice, updated information on the Project webpage, a kiosk at the library, and coordination with the extensive list of agencies & organizations were effective mechanisms to publicize the PR Draft and Public Hearing (June 14, 2022); it was determined not to hold a second informational meeting or put up posters The Committee conducted a STAPLEE Analysis to prioritize the proposed 2022 Actions Two motions were made and unanimously approved: #1 -Authorized the Project Consultant to disseminate the <i>Public Review DRAFT</i> on May 24, 2022 and publicize draft through identified outreach activities; #2 - Authorized the Project Consultant to schedule a Public Hearing on June 14, 2022 	May 17, 2022 (9-10:15am)
Outreach Activity #7	<p>Press Release: A press release was issued in the local newspaper, the Barrington Times, informing the public about the upcoming Public Hearing and alerting the community that the <i>Public Review Draft</i> would be available for viewing and/or download through the Town's website/Town Clerk's office. The press release explained the purpose and content of the <i>DRAFT</i> and how to provide input and feedback to the Planning, Building & Resiliency Office and/or at the upcoming Public Hearing. A notice of the Public Hearing was also posted on the Town's website and information from the Press Release was emailed to the groups, agencies, and organizations listed in Appendix 2-3.</p>	Published in May 18, 2022 edition

Event	Overview	Date
Outreach Activity #8	<p>Disseminate Public Review Draft (Public Review Period): The preliminary <i>HM&FMP-Administrative Draft</i> was developed and modified throughout the planning process with Steering Committee, community members, and stakeholders input and feedback incorporated into the document. At the Steering Committee's May 17, 2021 meeting, members were satisfied with all key elements of the preliminary draft and authorized the Town's Project Consultant to finalize the document and disseminate a <i>Public Review (PR) Draft</i>.</p> <p>The <i>PR Draft</i> was posted on the Town's website (HM&FMP Project webpage) on May 24, 2022, initiating a three-week public review period which allowed the community and stakeholders ample time to read, evaluate, and provide input or feedback on the <i>PR Draft</i> prior to or at the Public Hearing. Information from the press release and a link to the <i>PR Draft</i> was emailed to the groups, agencies, and organizations listed in Appendix 2-3.</p>	May 24 through June 14, 2022
Outreach Activity #9	<p>Kiosk at the Public Library: A kiosk was set up at the Barrington Public Library to publicize that the <i>PR Draft</i> was available to the public-at-large and encourage the community to provide input and feedback either prior to or at the Public Hearing.</p>	May 26 through June 15, 2022
Outreach Activity #10	<p>Public Hearing At the end of the three-week <i>Public Review Period</i>, a Public Hearing was held hosted by the Conservation Commission. The Public Hearing was widely advertised (including a press release in the Barrington Times, information on the Town's website, a kiosk at the Barrington Library, an email to the groups, agencies, and organizations listed in Appendix 2-3, and a Public Hearing legal notice in the May 25 and June 8, 2022 editions of the Barrington Times), to provide an opportunity for the general public, neighboring jurisdictions, and other stakeholders to provide pre-adoption input and feedback of the <i>Draft HM&FMP</i>.</p> <p>At the Public Hearing, the Town's Consultant directed a Power Point presentation providing an overview of the benefits of a <i>HM&FMP</i>, how the <i>Plan</i> was prepared, the hazards included, what is at risk, the actions identified to help mitigate the risks, and how the <i>Plan</i> is to be implemented. A public comment/question-and-answer session followed the presentation providing the public the opportunity to give input and feedback. During the Public Review Period the Town did not receive any comments from members of the public. At the Public Hearing several Conservation Commission members asked questions and provided feedback; no members of the public spoke. The Conservation Commission voted unanimously in support of the <i>Plan</i> being submitted to RIEMA/FEMA for review and approval.</p>	June 14, 2022 (7pm)
RIEMA & FEMA Conditional Approval	<p>Final Draft Plan Submitted to RIEMA/FEMA: Under the guidance of the Director of Planning, Building & Resiliency, the Town's Consultant finalized the <i>Plan</i> and submitted it to RIEMA for review.</p> <p>Town received FEMA approval (July xx, 2022) contingent upon final adoption by the Barrington Town Council.</p>	
Town Council Adoption	<p>Town Council Adoption of HM&FMP: The Town Council formally adopted the <i>2022 Hazard Mitigation & Flood Management Plan</i> at their XXX, 2022 meeting. The Town Council Resolution adopting the <i>Plan</i> is included in Appendix 7-2. After adoption, the <i>Final HM&FMP</i> was provided to RIEMA and FEMA Region 1.</p>	Will be finalized after FEMA conditional approval

2.3 PLAN INTEGRATION AND COORDINATION

Hazard mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability to hazards. Coordination with other community planning efforts and organizations is therefore paramount to the success of the *Plan*.

CRS CREDIT:		
Mitigation Planning Element	CRS Planning Step	Max Pts
Phase I - Planning Process	3. Coordinate	35

CRS Coordinator's Manual – Activity 510: Floodplain Management Planning

2.3.1 Plan Integration

For the purpose of developing a comprehensive and community-centric *HM&FMP*, numerous local plans, policies, codes, and programs that guide development in Barrington were consulted in order to complement and build on past planning initiatives. As demonstrated in **Appendix 5-1**, a detailed review of Barrington's existing studies, reports, and technical documents was undertaken to ensure that the community's needs, goals, and actions prioritized in those documents were recognized and incorporated, wherein appropriate, into the *HM&FMP*. This is specifically evidenced in **Appendix 6-1**, where actions and initiatives from many of these planning initiatives were compiled and subsequently reviewed by the Steering Committee for possible inclusion in the *2022-2027 Action Plan*.

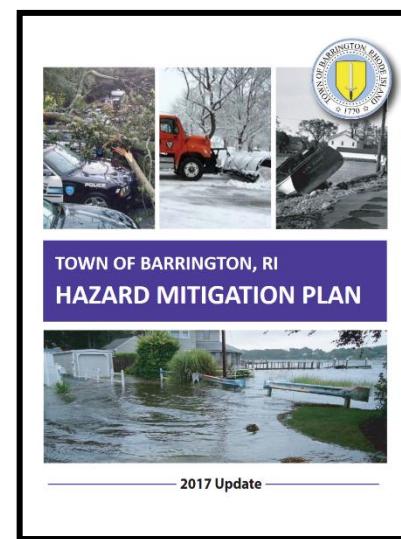
The planning documents and measures included in **Appendix 5-1 and 5-2**, supplemented by the knowledge and experiences of the Steering Committee members, community, and other engaged stakeholders have successfully created a community-based hazard mitigation strategy.

A **Bibliography & Works Cited** section has been provided to recognize and pay tribute to the broad array of resources that were used in the development of this *Plan*. Special recognition is made to the numerous FEMA, NOAA, RIEMA, URI-Coastal Resources Center, and RI Statewide Planning resources relied upon for the development of this document. The 2022 *HM&FMP* adheres to the guidelines outlined in the Disaster Mitigation Act of 2000; FEMA's *Local Mitigation Plan Review Guide* (October 2011), *Local Mitigation Planning Handbook* (March 2013), and *CRS Coordinators Manual* (2017).

2.3.1.1 2017 Hazard Mitigation Plan

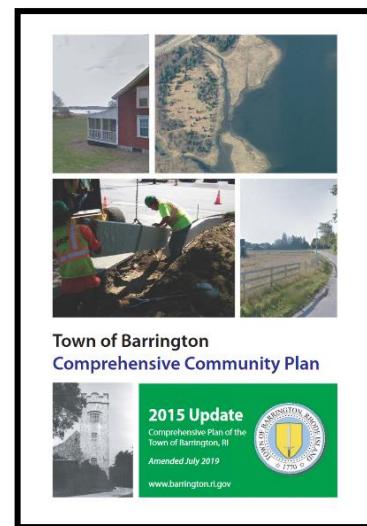
This *Plan* serves as the 5-year update to the Town's 2017 Hazard Mitigation Plan (HMP) and is built upon the foundation of that document. As flooding is the most prevalent natural hazard facing the Town of Barrington, there has been additional focus on flood management measures and the document has been renamed the *Town of Barrington 2022 Hazard Mitigation & Flood Management Plan*.

In developing this *Plan*, portions of the 2017 HMP were restructured, eliminated, or revised. New sections were added in order to reflect the most current understanding of natural hazards that pose significant threats to Barrington and how the Town has and can effectively continue to mitigate these threats. New actions or modifications to the 2017 actions were primarily the result of an extensive plan integration process combined with Steering Committee, community, and stakeholder input.



2.3.1.2 Comprehensive Community Plan

The planning efforts associated with the *HM&FMP* have been coordinated with the Town's Comprehensive Community Plan (CCP). The Town of Barrington Planning, Building & Resiliency Department in conjunction with the Town Planning Board, led the effort to develop the 2015 Comprehensive Community Plan (CCP) which was updated and amended in 2019. The CCP includes a Natural Hazards Element which describes critical issues, planning opportunities, and sets of goals, strategies and actions related to natural hazards, including the threat of sea level rise. To ensure alignment between the documents, the Natural Hazard and other applicable elements were reviewed in developing this *HM&FMP*.



2.3.1.3 Community Rating System

The Community Rating System (CRS) is a voluntary incentive program designed to encourage communities to engage in various community focused activities which promote a comprehensive approach to floodplain management beyond the minimum National Flood Insurance Program (NFIP) requirements. In March 2021, the Town of Barrington submitted a *CRS Letter of Intent and Community Self-Assessment* to FEMA for participation in the CRS program. Prior to being admitted into the program a FEMA Community Assistance Visit (CAV) is required. Due to the Covid-19 pandemic CAVs were somewhat curtailed, however the Town is hopeful FEMA will schedule Barrington's CAV in the near future.

As the Town intends to participate in the CRS Program, it was determined that the *Plan* should be created using the CRS Activity 510 planning process. This process allows the Town to maximize CRS credit for this *Plan* while meeting the Disaster Mitigation Act (DMA) 2000 Hazard Mitigation Plan requirements. A CRS activity credit checklist has been included in **Appendix 2-1**. It lists the 10 planning steps associated with CRS Activity 510 (Floodplain Management Planning) alongside the section within this document that describes the completion of the step and the corresponding anticipated credit.

CRS uses a Class Rating System to determine flood insurance premium reductions for residents. CRS Classes are rated from 10 (lowest rating) to 1 (highest rating). Most communities enter the program at a CRS Class 9 or 8. As shown in **Table 2-5**, a Class 9 rating entitles residents both in and out of the Special Flood Hazard Areas (SFHAs) to a 5% discount on their NFIP flood insurance premiums. As a community engages in additional mitigation activities, its residents become eligible for increased premium discounts (FEMA. *Community*).

Table 2-5 CRS Credit Points, Classes and Premium Discounts (FEMA. *Community*)

Credit Points	Class	Premium Reduction SFHA	Premium Reduction Non-SFHA
0 – 499	10	0	0
500 – 999	9	5%	5%
1,000 – 1,499	8	10%	5%
1,500 – 1,999	7	15%	5%
2,000 – 2,499	6	20%	10%
2,500 – 2,999	5	25%	10%
3,000 – 3,499	4	30%	10%
3,500 – 3,999	3	35%	10%
4,000 – 4,499	2	40%	10%
4,500+	1	45%	10%

Note:
Premium
reductions
are
subject to
change.

2.3.2 Coordination with Agencies and Organizations

The Steering Committee recognized that the planning process would be greatly enhanced by inviting local, regional, state, and federal agencies and organizations to participate in the process. Coordination with these key groups was initiated at the beginning of the planning process through an email informing them of the development of the *Plan* and welcoming them to provide information or opinions, and participate in meetings or other outreach activities.

As information from many of these groups was used in the development of the *Plan*, it was important to the Town that they were provided an opportunity for pre-adoption review of the *HM&FMP*. In the email sent by the Town's Project Consultant, a link to the *Public Review Draft* and the date of the Public Hearing was provided.

As shown in **Appendix 2-3**, the Town coordinated with 16 local government & school district groups, as well as 33 agencies and organizations outside of Barrington's governmental structure.

SECTION 3

Community Profile

Subsections

- 3.1 WELCOME TO BARRINGTON
- 3.2 GOVERNMENT
 - 3.2.1 Municipal Government
 - 3.2.2 School District
 - 3.2.3 Budget
- 3.3 GEOGRAPHY
- 3.3 POPULATION AND DEMOGRAPHICS

3 Community Profile

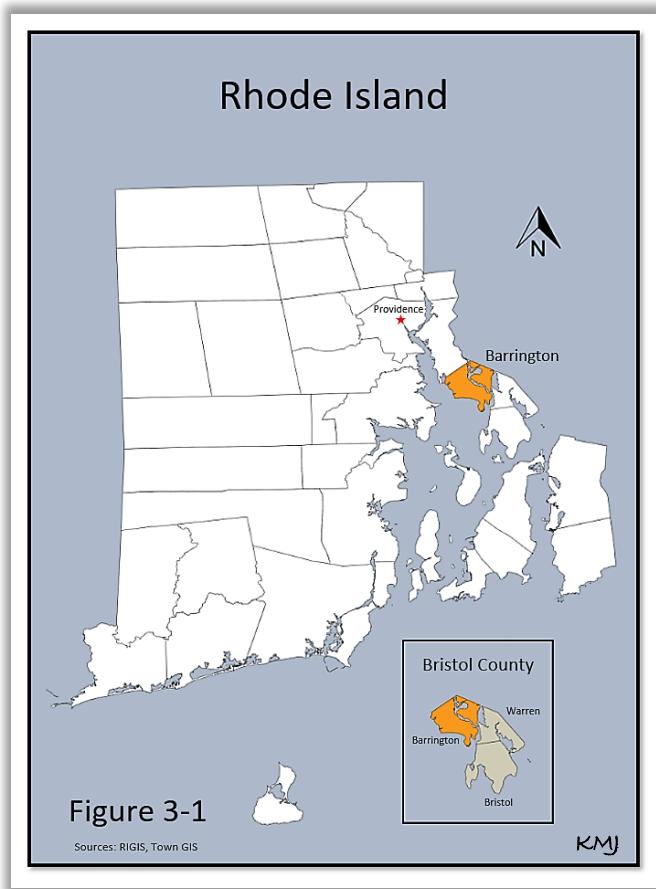
A brief community profile has been included in this Section which is augmented by community asset information in Section 4 and the community capability assessment in Section 5.

3.1 WELCOME TO BARRINGTON

Barrington, a quaint New England town, is located within the smallest County in Rhode Island. When the RI General Assembly established Barrington as an independent town in 1770 it was primarily a farming community with a few hundred residents. While the town remained largely agricultural into the early 20th century, manufacturing was introduced in Barrington in the mid-1800s, maintaining a modest presence into the 1900s. Manufacturing facilities – none of which are still in operation – included brickmaking at what is now Brickyard Pond, and mills in West Barrington (Mason).

With the construction of the Providence, Warren & Bristol Railroad in the mid-1800s and the addition of trolley service around 1900, commuting from suburban Barrington to work in the state capital became more feasible (Mason). The town's population began to soar, increasing from approximately 1,135 in 1900 to 8,250 in 1950, to around 17,100 today (*Rhode Island Population; US Census Bureau. QuickFacts*).

With this 15-fold increase in population since 1900, Barrington has changed from a primarily agricultural community with a small industrial base to a residential commuter suburb of Providence. The existing built environment was influenced by Barrington's past: the densest residential neighborhoods are in the vicinity of the former manufacturing sites (West Barrington and Maple Avenue) and within proximity to the old railroad, now the East Bay Bike Path; and areas with the lowest density were where farming once was prevalent (such as Rumstick Point) or is still a significant land use (the George Street area in northern Barrington near the Massachusetts line).

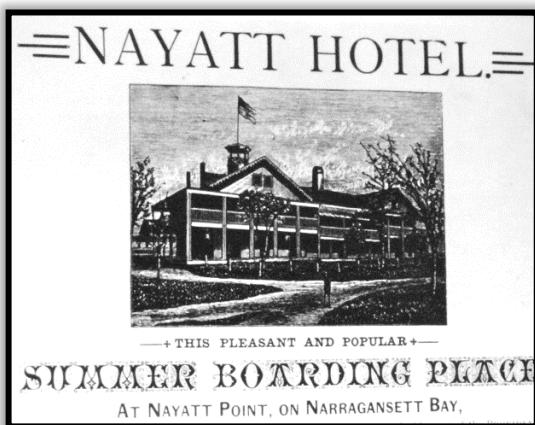


Barrington's neighborhoods have "distinct identities shaped by the town's extensive shoreline and its agricultural and industrial heritage. The impact of the railroad is evident in mix of houses and lot sizes within the early railroad suburb that developed around the former Drownville Station. Land carved into 5,000-square-foot lots and smaller formed the dense development patterns in West Barrington, where houses were built for workers from the former Brickyards and Lace Works. A majority of the land, though, was divided into large agricultural plats that formed the basis of the primary road system and the pattern of subdivisions that eventually replaced these farmlands. The stone walls on the edges of the large lots in the upscale Rumstick Road neighborhoods had marked the borders of farm fields years ago. The Roberta, Thurston and Country Club Plats,

developed over a relatively short period of time during the 1950s and 1960s, are examples of the suburban model of houses on quarter-acre and half-acre lots. While each neighborhood in Barrington has maintained a unique scale and character, almost all of them share a common characteristic: most of the land has been developed to the extent allowed by zoning. In other words, built out" (Town of Barrington RI. *Comprehensive*, 5).

The Town boasts 19.6 miles of coastline and a substantial amount of conserved open space; the beauty of which is embraced by residents and visitors. However, the extensive coastline coupled with low-lying lands makes Barrington particularly vulnerable to flooding, coastal erosion, sea level rise, and wind damage from hurricanes. Nature has played a part in shaping and re-shaping the character of Barrington.

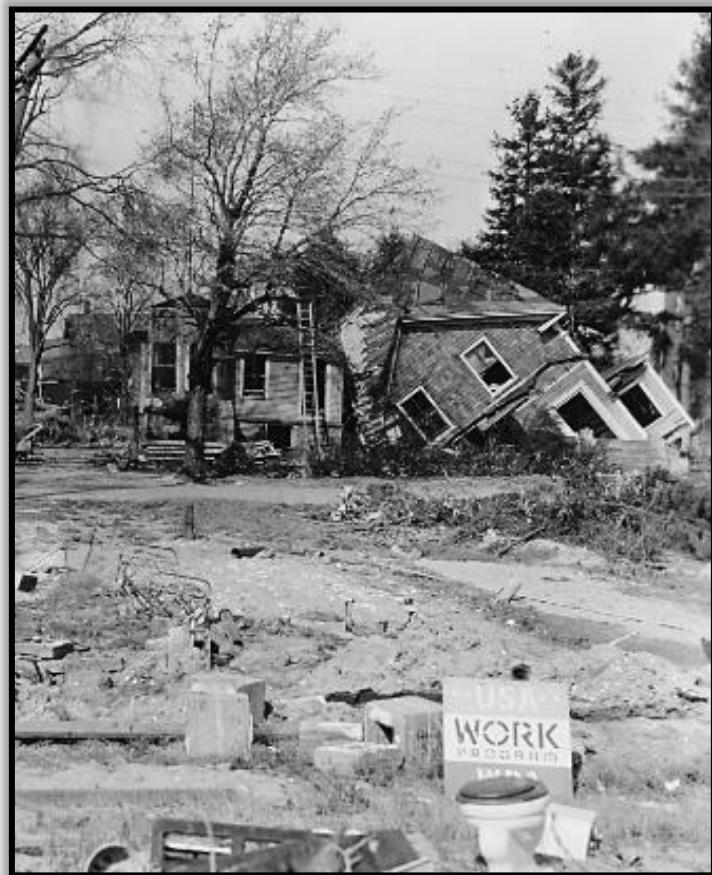
Figure 3-2
Historic Advertisement for Nayatt Hotel
 Image Credit: Barrington Patch



In a presentation at the Barrington Public Library in 2012, historian and educator Jean MacIntyre discussed how the Hurricane of 1938 changed Barrington. "Before the hurricane, the trains brought thousands of summer residents and visitors to Drownville (Alfred Drown neighborhood) and West Barrington and Nayatt Point to take advantage of the boating, swimming and fishing on Barrington's waters" (Rupp, William. *Hurricane*).

At the time there were several hotels in Barrington to support the influx of tourist, including the Nayatt Hotel on Nayatt Point, The Gables, and the Mathewson Hotel on the Barrington River. Then came the Hurricane of 1938, hitting land in Long Island and slamming into Rhode Island on a moon tide. The destruction of property and loss of lives changed Barrington. Houses built on the edge of the water in Bay Spring disappeared and Barrington soon declined as a summer "hotspot" (Rupp, William. *Hurricane*).

Figure 3-3 Aftermath of 1938 Hurricane
 Homes destroyed on Annawamscut Road
 Image Credit: RI Secretary of State Digital Archives



Barrington had a population of just 6,231 in 1940, two years after the Hurricane of 1938 left widespread damage throughout town (*Rhode Island Population*).

3.2 GOVERNMENT

The State of Rhode Island has 39 municipalities which are grouped into 5 counties. The Town of Barrington is part of Bristol County along with Warren and Bristol. While these three communities work cooperatively with one another, Rhode Island counties do not have governmental structure. Instead, local governance is provided by each of the eight cities and thirty-one towns.

3.2.1 Municipal Government

The Town of Barrington operates under a charter form of government, which provides for a five-member Town Council that is elected at large, for staggered four-year terms, at the regular biennial elections. They are responsible for enacting local legislation, and appointing a Town Manager who executes the laws and oversees the administration of the Town government. Town Department staff work hard to meet the needs of the citizens and to maintain a quality of life that residents have come to expect.

The Town provides the following major public services:

- Public Safety - The Town provides fire prevention and suppression, emergency medical rescue, police patrol, investigations, community education, animal control and waterways management. The Public Safety Building is located at 100 Federal Road.
- Public Works - The Department of Public Works, located at 84 Upland Way, provides a full range of services including street maintenance, snow removal, maintenance of the storm drainage and sewer collection system, and maintenance of Town property.
- Wastewater - Barrington's sanitary sewerage is treated by the City of East Providence. The Town pays the City of East Providence a fee based on the amount of sewerage treated at the wastewater facility. Residents are billed annually by the Town of Barrington for sewer usage based on water consumption.
- Public Water - Bristol County Water Authority, which is headquartered in Warren, supplies residents of Bristol County with water. Customers are billed directly by this agency. Barrington appoints three directors to sit on the Water Authority Board, which oversees the Authority's budget.

There is an abiding pride in Barrington and its heritage, evident through participation on Barrington's numerous board and commissions. A list of Town Boards and Commissions is provided below. Notification of board meetings are posted on the **Upcoming Meetings Calendar** on the homepage of the Town's website.

Town Boards and Commissions

◊ Town Council	◊ Hazard Mitigation and Flood Management Plan
◊ Board of Assessment Review	◊ Housing Board of Trustees
◊ Board of Canvassers	◊ Juvenile Hearing Board
◊ Bristol County Water Authority	◊ Library Board of Trustees
◊ Budget Forecasting Committee	◊ Open Space Committee
◊ Building Board of Review	◊ Park and Recreation Commission
◊ Cemetery Commission	◊ Planning Board
◊ Committee on Appropriations	◊ Resilience and Energy Committee
◊ Conservation Commission	◊ Senior Services Advisory Board
◊ Diversity, Equity and Inclusion Committee (DEI)	◊ Technical Review Committee
◊ Economic Development Commission	◊ Zoning Board of Review/Appeals
◊ Emergency Management Committee	◊ 25 Watson Ad-Hoc Development Committee
◊ Harbor Commission	

3.2.2 School Department

The Barrington School Committee is composed of five members of the community who are elected at large for staggered four-year terms at the regular biennial elections. The Committee also has a nonvoting Student Representative, who reflects the opinions and concerns of students. The School Committee meetings are open to the public and generally take place on the first and third Thursday of every month during the academic year and as needed during the summer.

The School Committee directs the general administration of the Barrington School Department. They determine and control all policies affecting the administration, maintenance, and operation of the public schools in Town, which consist of four elementary schools, one middle school, and one high school. The Committee appoints a Superintendent as its chief administrative agent, submits a detailed budget of expenditures, and determines the allocation of the amount appropriated.

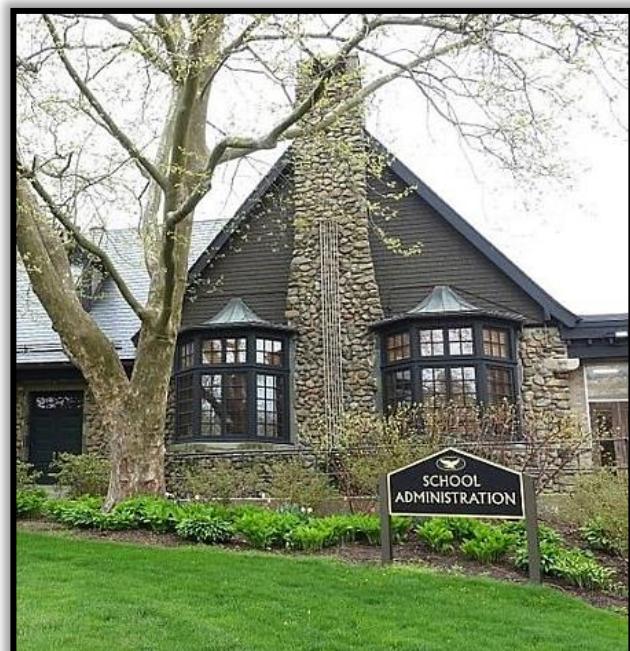


Figure 3-4
Front of Town Hall
 Image Credit:
 Wikipedia/Kenneth C.
 Zirkel

Figure 3-5
South Side Town
Hall (School
Administration
Entrance)
 Image Credit:
 Wikimedia
 Commons/Daderot

Barrington Town Hall

"The majestic building was designed by the Providence architectural firm of Stone, Carpenter, and Wilson. Many of the stones in the facade work were harvested from local farmers' fields. Back when it was built, the town hall cost just shy of \$15,000 to construct. In its early years, the incredible building housed the town's clerk, treasurer, tax collector, and council meeting rooms. It was also home to a high school classroom, auditorium, and a public library. On the lower level, the police department and its jail cell could be found. Today the town hall houses mainly offices including the school administration, tax assessor, and town clerk. This high school was moved in 1917 and the library left the premises in the mid-1980s for a larger space" (Clunan).



3.2.3 Budget

The annual Town and School budgets run from July 1st to June 30th. Both the Town and School budgets, including the capital budget (based on a recommendation by the Planning Board), are first developed by the Town Manager and School Superintendent, and then submitted to the Town Council and School Committee respectfully, for approval. The budgets then are forwarded to the Committee on Appropriations, which may make further revisions before making their final budget recommendation, which is voted on by Town residents at the Financial Town Meeting, generally held in May of each year.

3.3 GEOGRAPHY

Barrington is a coastal community located on the east side of Narragansett Bay in Bristol County, Rhode Island (**Figure 3.8**). The town has 19.6 miles of coastline — of which 11.5 miles are tidal shoreline — and occupies two peninsulas, bound by Narragansett Bay to the west and the Palmer and Warren Rivers to the east. Barrington's coastline meanders along Narragansett Bay, the Providence River as well as three tidal rivers — the Barrington, Warren, and Palmer Rivers — connected to the Bay. The town also has inland water bodies, most notably Brickyard Pond and Echo Lake, as well as other smaller ponds fed by creeks and streams. Overall, Barrington contains approximately 7.2 square miles of water, or 46.7 percent of the 15.4 square miles within Barrington (US Census Bureau. *QuickFacts*).

The Barrington River separates the two peninsulas, and Central Bridge ("White Church Bridge") and the Barrington River Bridge connect the two land masses. No location in Barrington is more than two miles from coastal waters. Barrington's western land mass is connected to East Providence along its northern municipal boundary. The western area includes the "Village Center" business district located in the vicinity of County Road and Maple Avenue. Barrington's eastern land mass, which includes the Hampden Meadows neighborhood, is connected to Swansea, Massachusetts along its northern municipal boundary.

3.4 POPULATION AND DEMOGRAPHICS

According to the census, both in 2010 and 2020 Barrington was ranked 21st in population among the 39 cities and towns in Rhode Island. The Town added 843 people, showing a growth of 5.2%. Based on the 2020 census, Barrington's 17,153 residents were categorized demographically as follows: 91.7 percent White, 3.9 percent two or more races, 3.3 percent Asian, 0.8 percent Black or African American, and 0.2 percent American Indian and Alaska Native. Although the demographic trend is similar to the other two Bristol County communities, Barrington is slightly more diverse. The State is more diverse with a lower population of White (83.6 percent). In addition, there are 618 people of Hispanic or Latino origin in Barrington, or 3.6 percent of the total population, which is almost double the number from 2010. Hispanics make up about 16.3 percent of the state's population.

According to the 2020 Census:

The Town's 2020 census population (17,153) is nearly a third of Bristol County's (50,793) but represents only 1.6 percent of the state's population (1,097,379). **Figure 3-6** shows the age distribution based on the 2020 Census. There has been an increase in the percentage of people 65 years and older from 14.7 percent in 2000 to 16.5 percent in 2020,

Barrington households have historically had income levels higher than both the surrounding county and the state. Five-year estimates from the 2016-2020 American Community Survey, listed Barrington's median household income (in 2020 dollars) as \$125,317, compared to \$70,305 statewide (US Census Bureau. *QuickFacts*).

Most of Barrington's 6566 housing units are owner occupied (5457 units). Renter occupied is roughly 11% (737 units).

Five-year estimates from the 2016-2020 American Community Survey indicated the percentage of people in Barrington age 25 and older who have a high school or higher degree is 97.6 percent; those with a bachelor's degree or higher is 72 percent.

(US Census Bureau. *QuickFacts*; US Census Bureau. *American*)

Figure 3-6 Barrington Age Distribution
(Neighborhood Scout)

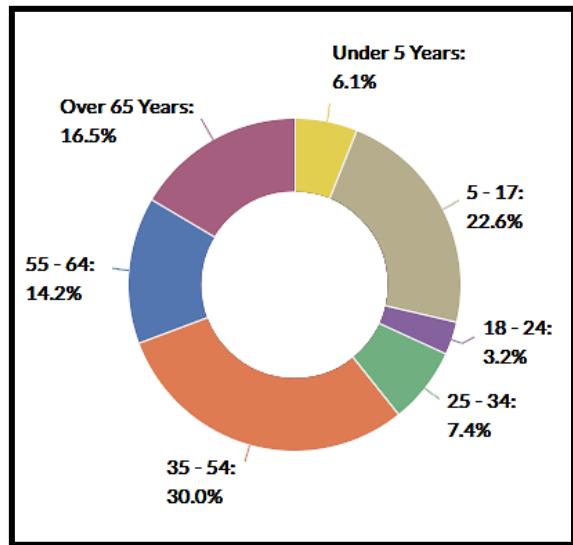
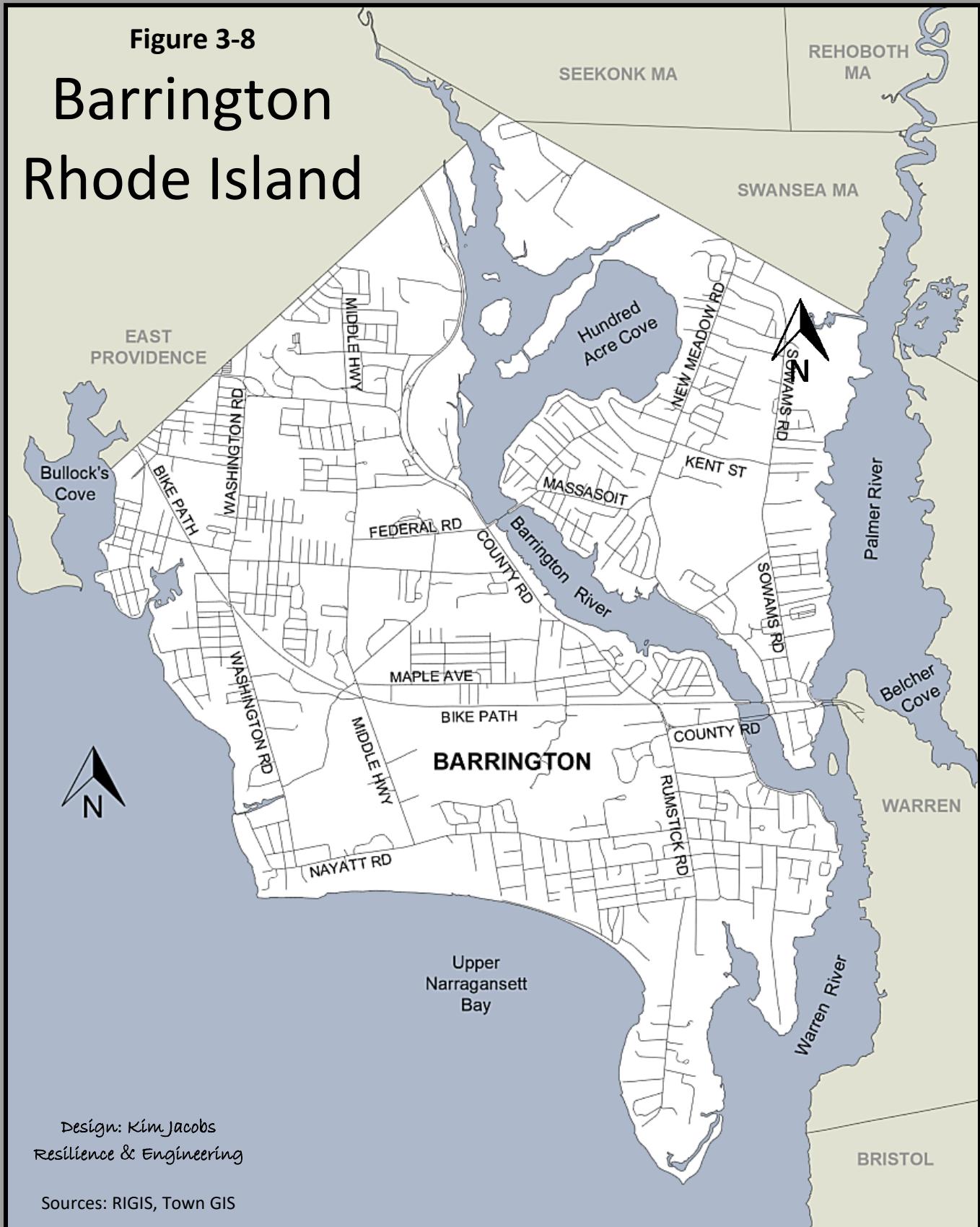


Figure 3-7
Barrington
Summer
Concert Series

Image Credit:
RI Blogger



Figure 3-8
Barrington
Rhode Island



SECTION 4

Risk Assessment

Subsections

- 4.1 CLIMATE CHANGE - SLR
 - 4.1.1 Climate Change
 - 4.1.2 Sea Level Rise
- 4.2 HAZARD IDENTIFICATION
 - 4.2.1 Disaster Declaration History
 - 4.2.2 Hazard Ranking - Vulnerability Summary
- 4.3 HAZARD PROFILES
 - 4.3.1 Flood-Related Hazards
 - 4.3.1.1 Inland Flooding
 - 4.3.1.2 Coastal Flooding/ Storm Surge
 - 4.3.1.3 Coastal Erosion
 - 4.3.2 Wind-Related Hazards
 - 4.3.2.1 High Winds
 - 4.3.2.2 Tornadoes
 - 4.3.2.3 Tropical Cyclones
 - 4.3.3 Winter-Related Hazards
 - 4.3.4 Infectious Diseases
 - 4.3.4.1 Ticks & Mosquitoes
 - 4.3.4.2 Flu & COVID-19
- 4.3.5 Other Hazards
 - 4.3.5.1 Earthquakes
 - 4.3.5.2 Extreme Heat
 - 4.3.5.3 Drought
 - 4.3.5.4 Brush Fires (Wildland Fires)
- 4.4 VULNERABILITY ANALYSIS
 - 4.4.1 Critical Facilities
 - 4.4.2 Built Environment/ Infrastructure
 - 4.4.2.1 FEMA Flood Zones
 - 4.4.2.2 Flooding, Storm Surge, and Sea Level Rise
 - 4.4.3 Natural Environment
 - 4.4.3.1 Freshwater and Saltwater Resources
 - 4.4.3.2 Wetlands and Floodplains
 - 4.4.3.3 Open Space
 - 4.4.4 Local Economy
 - 4.4.4.1 Flood-Related Hazards
 - 4.4.5 People
 - 4.4.6 Future Development Trends

4 Risk Assessment

Hazard Mitigation Plan: The Town of Barrington has successfully met the following requirement ➔

44 CFR Subsection D §201.6(c)(2): [The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

CRS - Flood Management Plan: The Town of Barrington has successfully met the following Mitigation Strategy requirements based on the 10-step planning process for CRS Activity 510 ➔
Assess the Hazard (Step 4); and Assess the Problem (Step 5)

This *Risk Assessment* evaluates the potential impacts of hazards to the people, economy, and built and natural environments of Barrington, creating a basis for the Mitigation Strategy. As described in FEMA's Local Hazard Mitigation Planning Handbook and illustrated in **Figure 4-1**, the degree of risk can be measured by the overlap between hazards and community assets; the larger the overlap the greater the risk.

This Risk Assessment presented in this Section is organized as follows, with the goal of identifying this overlap:

4.1 Climate Change - Sea Level Rise:

Recognizes how climate change and sea level rise may exacerbate natural hazards

4.2 Hazard Identification:

Identifies the hazards with the highest likelihood of negatively impacting Barrington

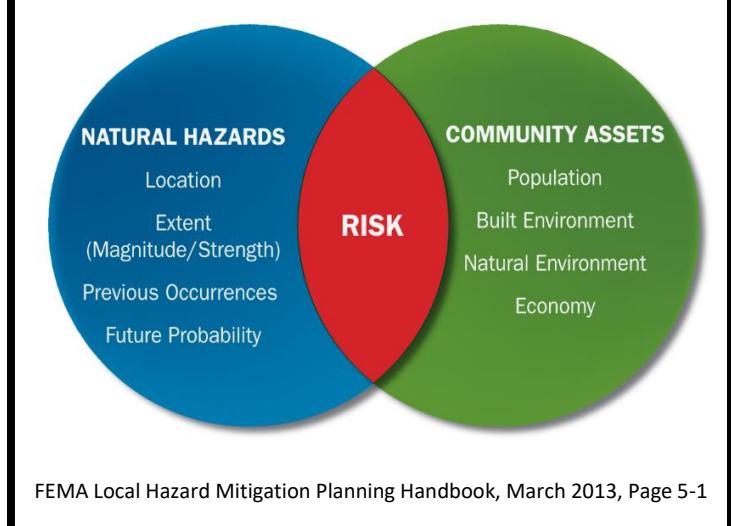
4.3 Hazard Profiles:

Describes the potential threat of each identified hazard and provides an overview of previous occurrences and the likelihood of future occurrences

4.4 Vulnerability Analysis:

Identifies community assets and analyzes the potential impact the identified hazards might have on them

Figure 4-1 Degree of Risk—Risk Assessment



During the Risk Assessment process, natural hazards were identified, profiled, and analyzed using best practices. In support of this process data and documentation from numerous sources including the following were reviewed: the Town's 2017 Hazard Mitigation Plan and other key Barrington plans and documents; the 2019 Rhode Island State Hazard Mitigation Plan (RI-SHMP); information from FEMA, EPA, NASA, CDC, RIEMA, RIDSP, RIDEM, RIDOH, CRMC, URI-Coastal Institute, URI-Climate Change Collaborative, and IPPC; plans from adjacent and similar communities; information from the National Oceanic and Atmospheric Administration (NOAA) including the National Climatic Data Center (NCDC) and the National Weather Service (NWS); and other relevant articles, documents, and websites on natural hazards. A complete list of the plan integration and references used in developing the *HM&FMP* is provided in **Appendix 5-1** and the **Bibliography and Works Cited**.

4.1 CLIMATE CHANGE – SEA LEVEL RISE

For the foreseeable future, climate change will have a significant impact locally, nationally, and globally. In this *2022 Hazard Mitigation & Flood Management Plan*, climate change is recognized as a present threat and an ongoing amplifier to the identified natural hazards. As such, each hazard profile in **Section 4-3** addresses associated climate change impacts. That information will assist the Steering Committee in determining an action strategy that will help to reduce or mitigate existing and future impacts.

This Section will provide a general overview of climate change including sea level rise (SLR) projections.

4.1.1 Climate Change

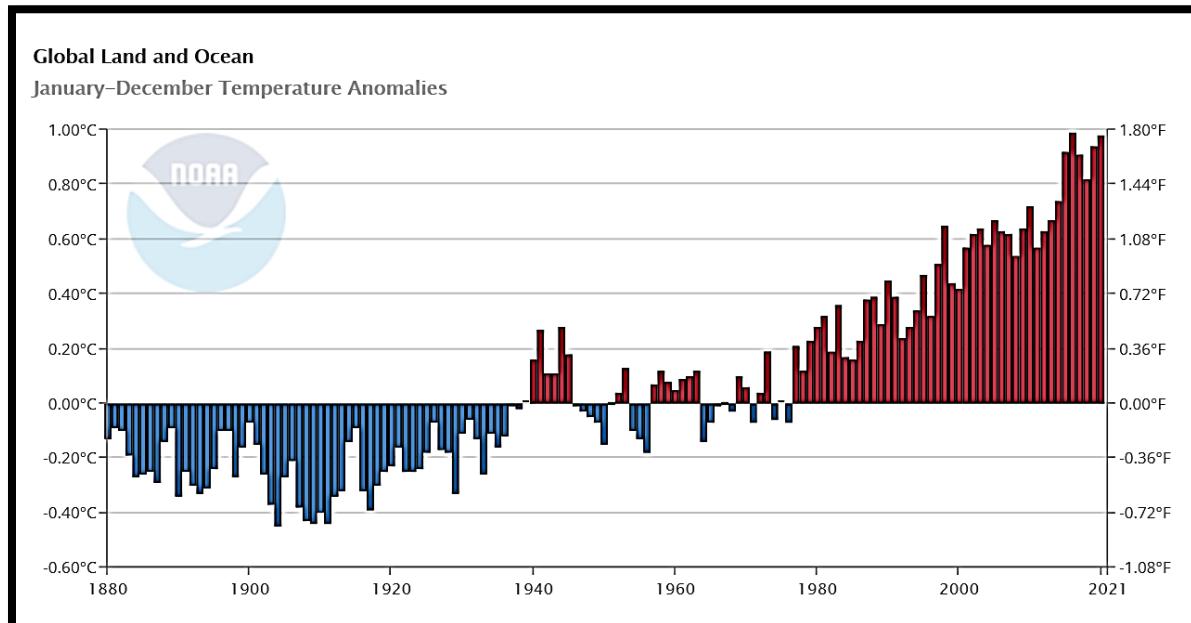
What is meant by Climate Change?

As pointed out by National Geographic, “Climate is sometimes mistaken for weather. But climate is different from weather because it is measured over a long period of time, whereas weather can change from day to day, or from year to year. The climate of an area includes seasonal temperature and rainfall averages, and wind patterns. Different places have different climates... Climate change is the long-term alteration of temperature and typical weather patterns in a place” (National Geographic. *Climate*).

Over geologic time, the earth has warmed and cooled periodically. This slow-paced change in climate may be attributed to natural internal processes or external forces such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC. *Annex I*).

In contrast, as depicted in **Figure 4-2**, over the past century the rapid warming of the earth is cause for concern. Across every region of the Earth’s climate system, scientists are observing changes. According to the 2021 Intergovernmental Panel on Climate Change (IPCC) Report, “Many of the changes observed in the climate are unprecedented in thousands, if not hundreds of thousands of years, and some of the changes already set in motion—such as continued sea level rise—are irreversible over hundreds to thousands of years” (IPCC. *Climate Change widespread*).

Figure 4-2 Global Temperatures are Rising (NOAA|NCEI)



Data gathered by NASA and NOAA indicate that the planet's average surface temperature has risen about 2.0 degrees Fahrenheit since the late 19th century, with **most of the warming happening over the past four decades**. NASA Goddard Institute for Space Studies (GISS) Director Gavin Schmidt stated that, "Despite colder than average temperatures in any one part of the world, temperatures over the planet as a whole continue the rapid warming trend we've seen over the last 40 years" (NASA | NOAA. *Long-term warming*).

The rapid warming of the earth has been largely driven by the accumulation of human-caused pollutants in the atmosphere. These pollutants, known as greenhouse gases, include carbon dioxide, methane, nitrous oxide, water vapor, and synthetic fluorinated gases. Normally the sunlight and solar radiation that bounces off the earth's surface would escape into space, but the accumulation of these pollutants, which can last for years to centuries in the atmosphere, trap the heat inside the earth's atmosphere and cause the planet to get hotter. The impact of these heat-trapping pollutants in the atmosphere, creating global warming and influencing rapid climate change, is called the greenhouse effect (NRDC. *Global Warming*).

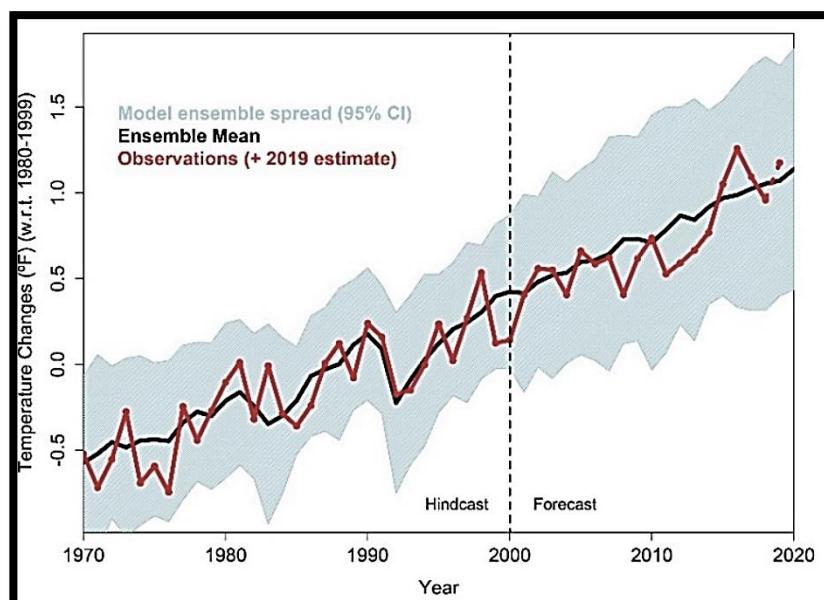
How is Climate Change predicted?

Scientists use climate models, which are complex mathematical computer simulations, to recreate the Earth's past and current climate or predict future climate trends. The foundation of the models requires an accurate representation of the Earth's atmosphere, sun, oceans, ice, and land surface. By solving the relevant mathematical equations, climate models can calculate properties such as atmospheric temperature, pressure, wind, and humidity. Because global warming has widespread effects, global temperature trends are among the most significant predictions.

As climate models are based on solid physics and the best understanding of the Earth's system, and are verified against real world observations, scientists are confident that climate models accurately represent our climate system. To this point, the University of California, Berkely, conducted a systematic evaluation of the performance of 17 climate models from 1970 to 2007 to determine how reliable they have been. The study looked at how accurately the models predicted temperature changes. The results, depicted in **Figure 4-3**, show that most of the past climate model projections closely matched observations. As public confidence in climate projections is critical, a recognition that even the less sophisticated climate models of 15 plus years ago produced reasonably accurate future temperature trends, should bolster public confidence in climate change predictions (Buis, Alan. *Study Confirms*).

Figure 4-3 Forecast Evaluation for Models Run in 2004 (Buis, Alan. *Study Confirms*)

Models that were used in the IPCC 4th Assessment Report can be evaluated by comparing their approximately 20-year predictions with what actually happened. In this figure, the multi-model ensemble and the average of all the models are plotted alongside the NASA Goddard Institute for Space Studies (GISS) Surface Temperature Index (GISTEMP). Climate drivers were known for the 'hindcast' period (before 2000) and forecast for the period beyond. The temperatures are plotted with respect to a 1980-1999 baseline. Credit: Gavin Schmidt



What are some global impacts of Climate Change?

The impacts of a rapidly changing climate are already present. No longer viewed as a future possibility, the effects of climate change, including sea level rise (SLR), are scientifically recognized as exacerbating the impact of other natural hazards.

According to the 2021 IPCC Report, climate change “is not just about temperature. Climate change is bringing multiple different changes in different regions – which will all increase with further warming. These include changes to wetness and dryness, to winds, snow and ice, coastal areas and oceans.

For example:

- Climate change is intensifying the water cycle. This brings more intense rainfall and associated flooding, as well as more intense drought in many regions.
- Climate change is affecting rainfall patterns. In high latitudes, precipitation is likely to increase, while it is projected to decrease over large parts of the subtropics. Changes to monsoon precipitation are expected, which will vary by region.
- Coastal areas will see continued sea level rise throughout the 21st century, contributing to more frequent and severe coastal flooding in low-lying areas and coastal erosion. Extreme sea level events that previously occurred once in 100 years could happen every year by the end of this century.
- Further warming will amplify permafrost thawing, and the loss of seasonal snow cover, melting of glaciers and ice sheets, and loss of summer Arctic Sea ice.
- Changes to the ocean, including warming, more frequent marine heatwaves, ocean acidification, and reduced oxygen levels have been clearly linked to human influence. These changes affect both ocean ecosystems and the people that rely on them, and they will continue throughout at least the rest of this century.
- For cities, some aspects of climate change may be amplified, including heat (since urban areas are usually warmer than their surroundings), flooding from heavy precipitation events and sea level rise in coastal cities” (IPCC. *Climate Change widespread*).

Science is still discovering the breadth and scope of climate change impacts. As recognized by NOAA, it is a complex issue wherein, “The impacts of climate change on different sectors of society are interrelated. Drought can harm food production and human health. Flooding can lead to disease spread and damages to ecosystems and infrastructure. Human health issues can increase mortality, impact food availability, and limit worker productivity... [Further] long-standing socioeconomic inequities can make underserved groups, who often have the highest exposure to hazards and the fewest resources to respond, more vulnerable” (NOAA. *Climate change impacts*).

Intergovernmental Panel on Climate Change (IPCC)

The Intergovernmental Panel on Climate Change (IPCC) is an intergovernmental body of the United Nations responsible for advancing knowledge on human-induced climate change. It was established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), and later endorsed by the United Nations General Assembly. The IPCC is comprised of 195 member states; headquartered in Geneva, Switzerland; and has issued 6 Climate Change Assessment Reports.

First Assessment Report (1990)

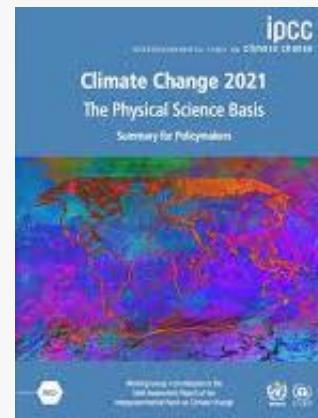
Second Assessment Report (1995)

Third Assessment Report (2001)

Fourth Assessment Report (2007)

Fifth Assessment Report (2014)

Sixth Assessment Report (2021)



Wikipedia. *Intergovernmental*

What are some local impacts of Climate Change?

According to an article by the URI Climate Change Collaborative, "In New England, temperatures are expected to increase by a few degrees by the end of the century. While summers may be 3°F to 7°F warmer, winters will likely be 5°F to 8°F warmer. Likewise, we will continue to see a shift in the seasons. Summer weather potentially will persist longer and with more days over 100°F. Winters will be warmer with more rain and less snow. Wet days will be wetter but droughts will be more frequent. The average annual temperature of Narragansett Bay has warmed approximately 3.6°F (with winters even greater) since the 1960s, and the Bay is expected to continue warming throughout the century. Rates of sea level rise have been increasing as well" (URI Climate Change Collaborative. *Climate*).

According to CRMC, potential effects of climate change and sea level rise include increased vulnerability to storm surges, risk to infrastructure, higher water tables, more extreme high tides, worsening coastal erosion and net loss of coastal marshes.

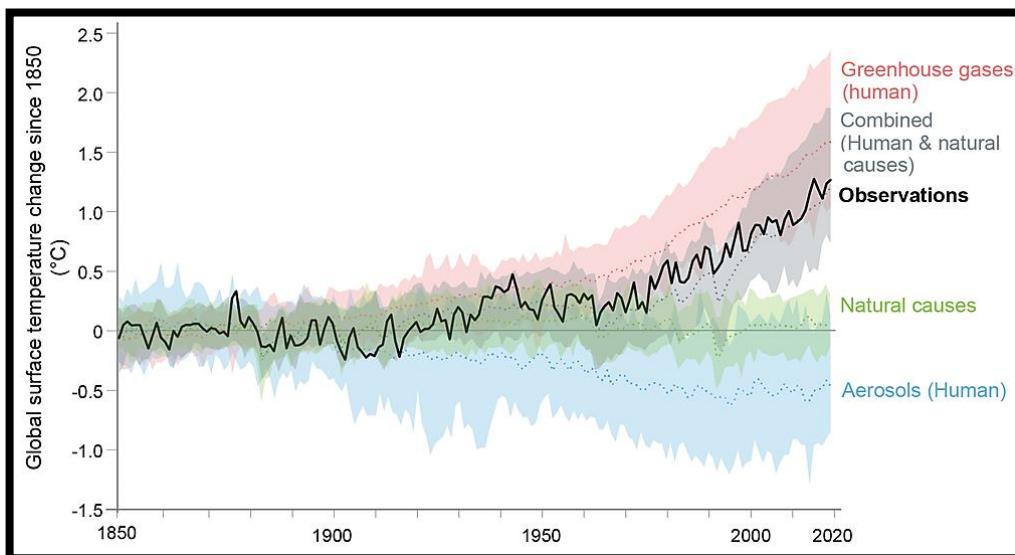
In general, Rhode Island communities may experience the following climate change impacts:

- Warmer air and water temperatures; shorter winters and longer summers
- More extreme weather events including intense precipitation causing increased extent of flood damage to property and infrastructure and greater vulnerability to storm surges in lower elevations
- Higher water tables resulting in subsurface issues such as wet basements
- A significant increase in incidence of extreme high tide levels
- Saltwater intrusion into aquifers contaminating water supplies
- More coastal lands becoming susceptible to erosion due to increased intensity and frequency of storms
- A net loss of coastal marshes that become inundated at a greater rate, resulting in a loss of salt marsh vegetation and an alteration of habitat types

What can be done to slow Climate Change?

As stated on NASA's Global Climate Change website, "A consensus on climate change and its human cause exists... Multiple studies published in peer-reviewed scientific journals show that **97 percent or more** of actively publishing climate scientists agree: Climate-warming trends over the past century are extremely likely due to human activities. In addition, most of the leading scientific organizations worldwide have issued public statements endorsing this position" (NASA. *Scientific Consensus*).

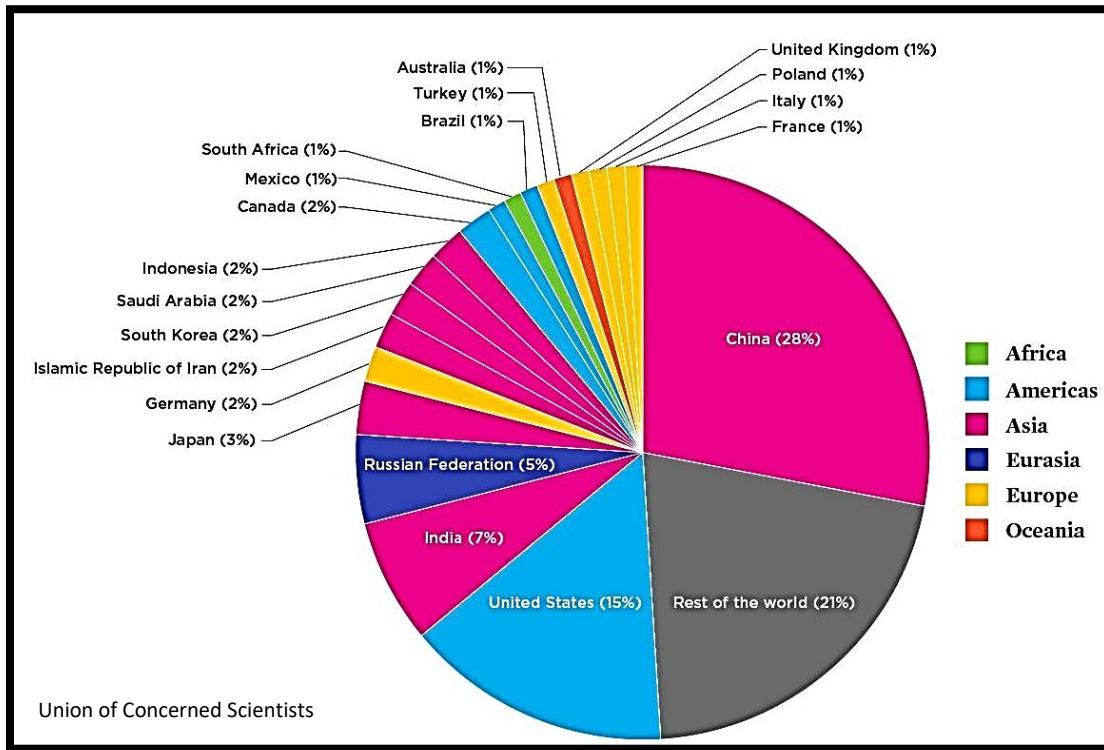
Figure 4-4 How do we know humans are causing climate change? (IPCC)



As depicted in **Figure 4-4**, from IPCC's Sixth Assessment Report, rapid climate change is primarily caused by humans producing large amounts of greenhouse gas emissions (Kopp, Robert).

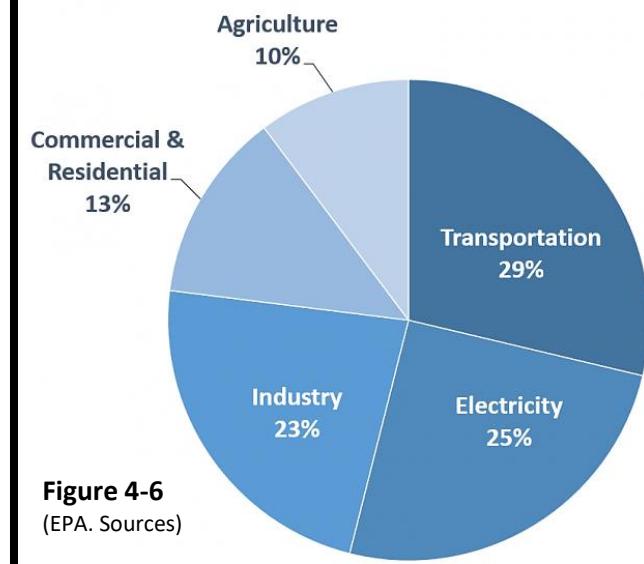
Scientists around the world are engaged in climate change because it is a global problem. However, as depicted in **Figure 4-5**, in general, developed countries are contributing to global warming at a much higher rate. The Union of Concerned Scientists rank the annual carbon dioxide emissions from the 20 countries with the highest CO₂ emissions. In 2018, the top 5 countries, China (10.06GT), USA (5.41GT), India (2.65GT), Russian Federaon (1.71GT), and Japan (1.16GT), produced approximately 58% of the total worldwide CO₂ emissions (Union of Concerned Scien st).

Figure 4-5 Share of CO₂ Emissions by Country (2020)



The primary human action contributing to climate change is the burning of fossil fuels, like natural gas, oil, and coal, which produce large quantities of carbon dioxide, sulfur oxides, nitrogen oxides, and fine particulates consisting primarily of soot and ash. In addition to burning fossil fuels, other actions such as deforestation and livestock farming also contribute to the greenhouse effect. With respect to the United States CO₂ emissions, the EPA tracks total U.S. emissions on an annual basis. As shown in **Figure 4-6**, in 2019 the country's largest source of carbon pollution was in the transportation sector, closely followed by electricity production.

Total U.S. Greenhouse Gas Emissions by Economic Sector in 2019



The EPA has provided the following overview of the primary sources of greenhouse gas emissions in the United States for 2019 (EPA. *Sources*):

- **Transportation** (29 percent) – The transportation sector generates the largest share of greenhouse gas emissions. Greenhouse gas emissions from transportation primarily come from burning fossil fuel for cars, trucks, ships, trains, and planes. Over 90 percent of the fuel used for transportation is petroleum based - primarily gasoline and diesel.
- **Electricity production** (25 percent) – Electricity production generates the second largest share of greenhouse gas emissions. Approximately 62 percent of electricity in the U.S. comes from burning fossil fuels, mostly coal and natural gas.
- **Industry** (23 percent) – Greenhouse gas emissions from industry primarily come from burning fossil fuels for energy, as well as from certain chemical reactions necessary to produce goods from raw materials.
- **Commercial and Residential** (13 percent) – Greenhouse gas emissions from businesses and homes arise primarily from fossil fuels burned for heat, the use of certain products that contain greenhouse gases, and the handling of waste.
- **Agriculture** (10 percent) – Greenhouse gas emissions from agriculture come from livestock such as cows, agricultural soils, and rice production.
- **Land Use and Forestry** (12 percent) – Land areas can act as a sink (absorbing CO₂ from the atmosphere) or a source of greenhouse gas emissions. In the United States, since 1990, managed forests and other lands are a net sink, i.e., they have absorbed more CO₂ from the atmosphere than they emit.

Understanding what is contributing to the greenhouse effect provides an opportunity to take proactive measures. “According to the World Economic Forum’s Global Risks Report 2021, the failure to mitigate and adapt to climate change is ‘the most impactful’ risk facing communities worldwide - ahead of even weapons of mass destruction and water crises. Blame its cascading effects: As climate change transforms global ecosystems, it affects everything from the places we live to the water we drink to the air we breathe” (Denchak).

The good news is that we understand the key steps that need to be taken to curb global climate change. Doing so will require more aggressive cuts in emissions. As part of the 2015 Paris Climate Agreement, countries around the globe have formally committed to lower their emissions by setting new standards and turning to alternative green energy sources. However, as noted by the Natural Resources Defense Council (NRDC), “The not-so-good news is that we’re not working fast enough. To avoid the worst impacts of climate change, scientists tell us that we need to reduce global carbon emissions by as much as 40 percent by 2030. For that to happen, the global community must take immediate, concrete steps: to decarbonize electricity generation by equitably transitioning from fossil fuel-based production to renewable energy sources like wind and solar; to electrify our cars and trucks; and to maximize energy efficiency in our buildings, appliances, and industries” (NRDC. *Global Warming*).

The State of Rhode Island and the Town of Barrington are committed to move toward carbon neutrality, a state of net-zero carbon dioxide emissions. On January 17, 2020 Governor Raimondo signed an Executive Order mandating the State to move toward 100% renewable energy by 2030 – which at the time was the most ambitious ten-year renewable energy target of any state in the nation (Clarcq). At Barrington’s February 1, 2021 Town Council Meeting, the Council unanimously adopted a **Resilient Future Resolution**, drafted by the Resilience & Energy Committee. Amongst other things, the Resolution states that the “Town Council will place energy efficiency, carbon emission reduction, and renewable energy choices among its top priorities” (Town of Barrington. *Resilient Future*).

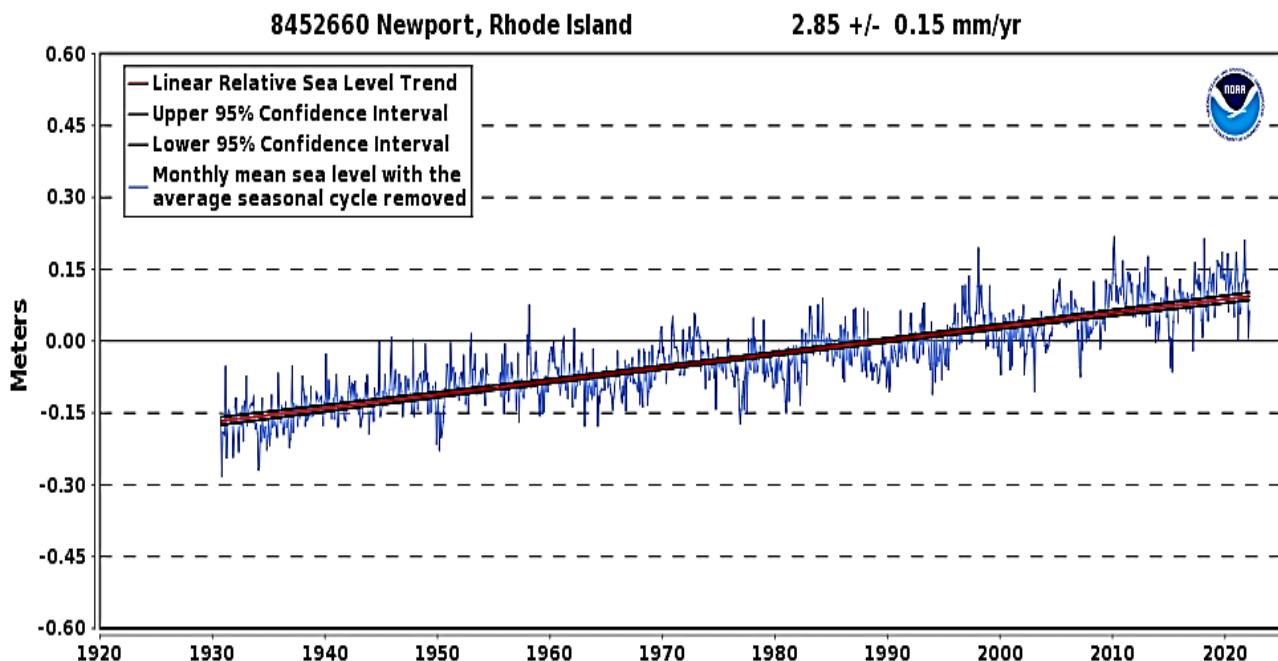
4.1.2 Sea Level Rise (SLR)

Greenhouse gas emission released to the atmosphere increase surface warming, which in turn, warms ocean waters and accelerates the melting of glacial ice. Both the melting of land ice and the expansion of warm seawater increase the overall Global Mean Sea Level (GMSL). Although the rate of sea level rise is accelerating, it is not expected to be globally uniform, due to a number of factors including prevailing winds and powerful ocean currents (CRMC. *Sea Level and Climate*).

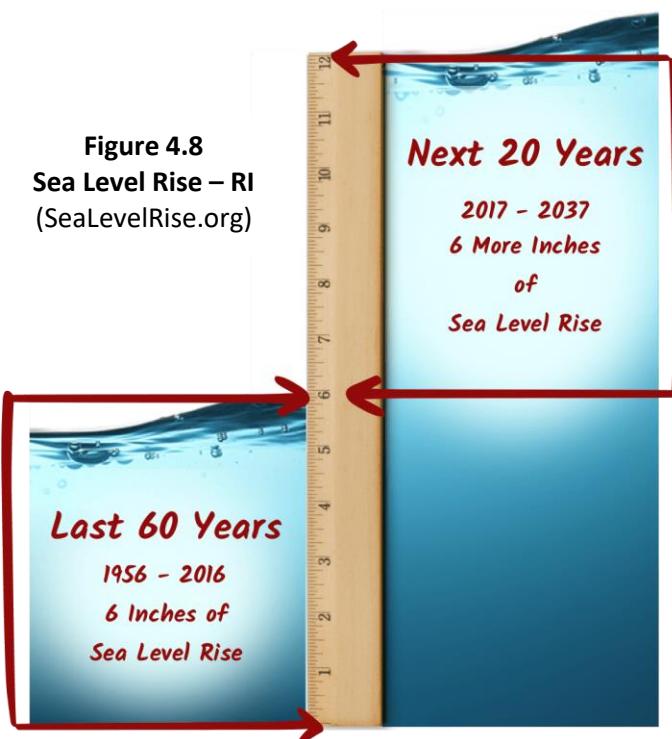
As the average water level of the oceans rise, previously dry land will be permanently inundated. Findings suggest that for about 2000 years prior to the 20th century, there was little change in the global average sea level. During the 20th century the rate of change accelerated with global sea level rise averaging 0.06 inches per year from 1880 to 2013 and roughly twice as fast (0.12 to 0.14 inches per year) from 2013 onward (EPA. *Climate Change Indicators: Sea Level*).

Since the 1930s, NOAA has maintained two stations in Rhode Island, one in Newport and the other in Providence, that measure sea level rise. Recordings from the Newport Tide Gage (Figure 4.7) indicate a rate of 10.8 inches of relative sea level rise over the last century (CRMC. *Shoreline Change SAMP*, 1-4). Because greenhouse gas emissions continue to increase, it is expected that this trend will accelerate in the coming decades.

**Figure 4.7 Relative Sea Level Trend
8452660 Newport, Rhode Island (NOAA. Tides)**

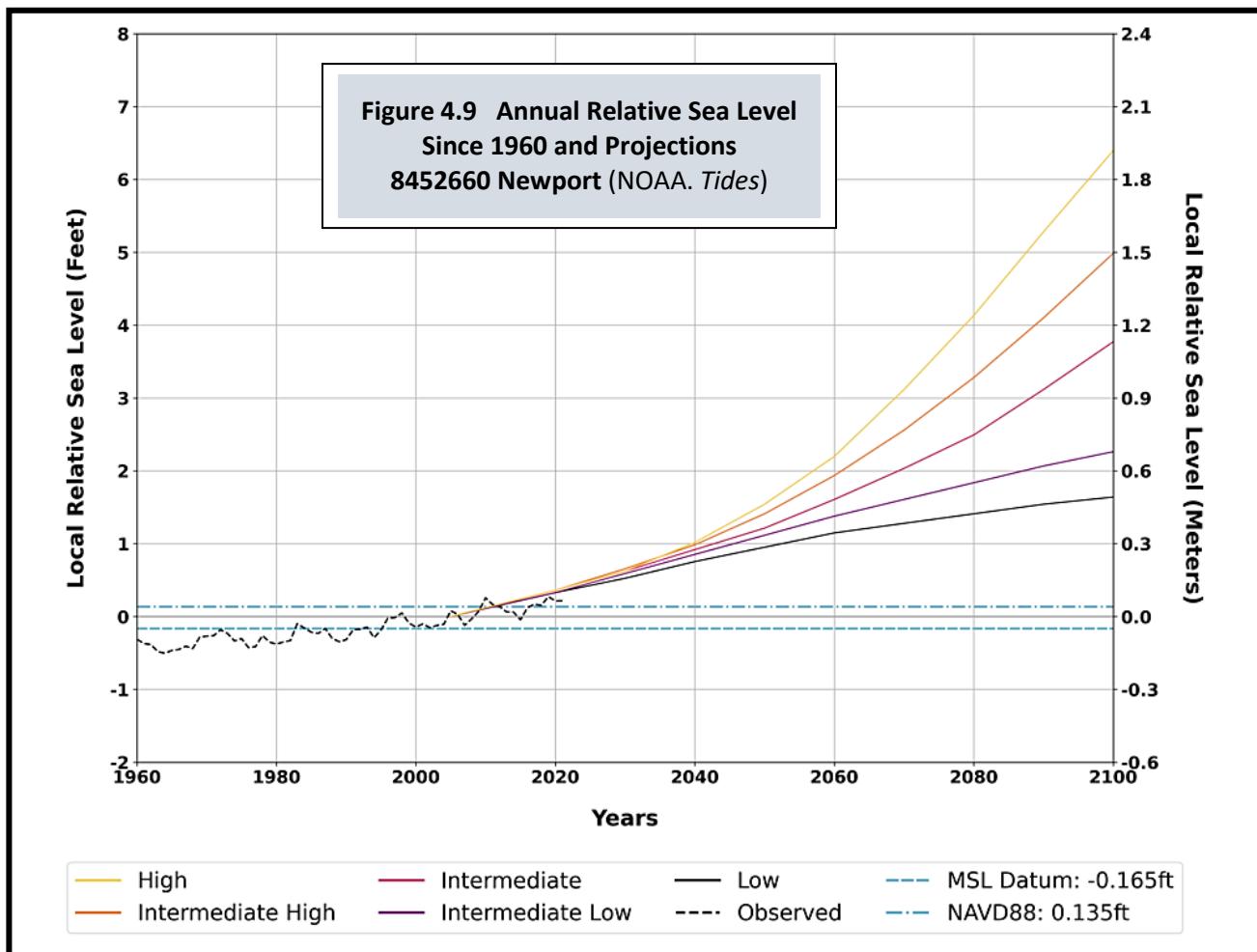


The relative sea level trend is 2.85 millimeters/year with a 95% confidence interval of +/- 0.15 mm/year based on monthly mean sea level data from 1930 to 2021 which is equivalent to a change of 0.94 feet in 100 years.



In the last decade, the speed at which Rhode Island sea level is rising has increased, and is now rising by as much as 1 inch every 8 years. As illustrated in **Figure 4.8**, it took around 60 years for the sea level to rise approximately 6 inches. Scientists forecast that in the 20-year period from 2017-2037, the sea will rise by another 6 inches (SeaLevelRise.org. *The Future*).

According to NOAA, sea levels in the Northeast Region will rise significantly faster than the global average. The annual relative sea level since 1960 is shown in **Figure 4.9**, as well as NOAA's most recent best through worst case regional SLR projections up to 2100.



In February 2022 NOAA released their **Sea Level Rise Technical Report** which updates their 2017 SLR projections and provides additional information on tide, wind, and storm-driven extreme water levels along current and future coastal flood risk. The 2022 SLR Technical Report “provides the most up-to-date sea level rise projections for all U.S. states and territories by decade for the next 100 years and beyond, based on a combination of tide gauge and satellite observations and all the model ensembles from the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). NOAA’s 2022 SLR Technical Report projects sea levels along the coastline will rise an additional 10-12 inches by 2050 with specific amounts varying regionally, mainly due to land height changes” (NOAA. *U.S. coastline*).

The Rhode Island Coastal Resources Management Council (CRMC) adopted NOAA’s “worst-case” high curve projection to guide planning in Rhode Island (CRMC. *Shoreline Change SAMP*, 2-5). As shown in **Table 4-1**, the current worst-case sea level rise projections for Rhode Island based on the NOAA high curve, are lower than projected in 2017. Although this is welcome news, the projected levels remain a threat to Rhode Island’s coastline. As noted by CRMC, “While the 2022 NOAA high curve projections appear to have decreased for 2050, there is far more certainty with these future sea level rise projections based on multiple lines of evidence, and the CRMC and RI must remain vigilant in its planning for coastal adaptation and resiliency” (CRMC. *Statement*).

Table 4.1 Sea Level Rise Projections for Rhode Island

NOAA Worst-case projections for Rhode Island based on high curve	2030	2050	2080	2100
2022 SLR Projections	0.71 feet	1.60 feet	4.19 feet	6.47 feet
2017 SLR Projections	1.67 feet	3.25 feet	6.69 feet	9.60 feet

CRMC Shoreline Change SAMP page 2-5; NASA. *Interagency*

The impacts of SLR are already being experienced through:

- increased frequency of low-level inundation
- exacerbated flood elevations during storm events
- increased rates of coastal erosion
- increased saltwater intrusion into groundwater

The impact of sea level rise is extensive and must be considered in long-term land use, development, and critical infrastructure planning. The RI Emergency Management Agency’s (RIEMA) Risk Assessment states that, “Sea level rise will result in wide scale systematic changes in the terrestrial and marine environments. Future increases in relative sea level will displace coastal populations, threaten infrastructure, intensify coastal flooding and ultimately lead to the loss of recreation areas, public space, and coastal wetlands. Coastal infrastructure will become increasingly susceptible to complications from rising sea levels, as the upward trend continues. Residential and commercial structures, roads, and bridges will be more prone to flooding. SLR will also reduce the effectiveness and integrity of existing seawalls and revetments, designed for historically lower water levels. Higher sea levels will result in changes in surface water and groundwater characteristics. Salt intrusion into aquifers will contaminate drinking water supplies and higher water tables will compromise wastewater treatment systems in the coastal zone” (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-171 & 172).

4.2 HAZARD IDENTIFICATION

In accordance with the planning guidelines outlined in Section 322 of the Disaster Mitigation Act of 2000 (DMA 2000), this *Plan* addresses only **natural hazards**, and does not consider man-made hazards (e.g., structural fires, hazardous materials, chemical spills, or weapons of mass destruction). The Rhode Island State Hazard Mitigation Plan (RI-SHMP) defines a natural hazard as “an event or physical condition that has the potential to cause fatalities, injuries, property and infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss” (*RIEMA. State of Rhode Island Hazard Mitigation Plan*, 3-1).

CRS CREDIT:		NFIP/CRS	
Mitigation Planning Element	CRS Planning Step	Max Pts	Est Pts
Phase II – Risk Assessment	4. Assess the Hazard	35	35
CRS Coordinator's Manual – Activity 510: Floodplain Management Planning			

In an effort to determined what natural hazards should be addressed in this *Plan* the Steering Committee reviewed the hazards included in the Town’s 2017 Hazard Mitigation Plan for continued relevance; 2019 Rhode Island State Hazard Mitigation Plan (RI-SHMP); plans from neighboring communities, and documentation/research from various sources related to previous hazards that have impacted Barrington. An overview of RI disaster declarations, from the 1950’s forward, that were reviewed as part of the hazard identification process, has been included in **Table 4-2**.

The Committee also discussed the group of hazards identified by the State as not having a high risk to Rhode Island. Due to Barrington’s topography and subsurface conditions, the Steering Committee concurred with the State’s assessment and determined that the Town’s exposure to the following hazards was unlikely, and will therefore not be addressed in this update: *Avalanches, Expansive Soils, Land Subsidence, Landslides, Volcanoes, and Tsunamis*. In addition, the Committee determined that urban fires caused by lightning strikes or as an earthquake byproduct are unlikely to occur or cause substantial damage in Barrington.

As Town resources are limited, it is important that staff time and funding be devoted to hazards with a higher likelihood of occurring or potentially having a greater impact on the community. While there is always the possibility for an unexpected natural hazard to occur, it should be recognized that the intent of this *Plan* is to understand what natural hazards have a higher probability of impacting Barrington over the ensuing 5-year period. The Steering Committee determined that in addition to the hazards addressed in the Town’s 2017 HMP, the following hazards should also be considered: Extreme Cold, Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses, and Vector-borne Diseases Transmitted by Ticks and Mosquitoes. Effectively, the Town will address all of the natural hazards identified by the State of Rhode Island in their most current Hazard Mitigation Plan. The hazards that are addressed in this *Plan* have been grouped into the following categories:

- 4.3.1 Flood-Related Hazards** (Inland Flooding/Dam Failure, Coastal Flooding/Storm Surge, Coastal Erosion)
- 4.3.2 Wind-Related Hazards** (High Winds – Thunderstorms/Lightening/Hail, Tornadoes, Tropical Cyclones)
- 4.3.3 Winter-Related Hazards** (Heavy Snow, Ice, Extreme Cold)
- 4.3.4 Infectious Disease** (Vector-borne Diseases Transmitted by Ticks and Mosquitoes, Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses)
- 4.3.5 Other Hazards** (Earthquakes, Extreme Heat, Drought, Brush Fires)

4.2.1 Disaster Declaration History

To assist in identifying the likelihood and potential severity of future hazards, the Steering Committee reviewed past events that triggered a State or Federal Disaster Declaration for Rhode Island. Disaster declarations are issued when the severity of an event overwhelms and exhausts a local government's or state government's resources. A summary of Federal and State Disaster Declarations for Rhode Island, adapted from the RI-SHMP and supplemented from FEMA's Declared Disaster website, is shown in **Table 4-2**. The majority of the emergency declarations and major disaster declarations were issued as the result of hurricanes and winter weather-related events.

Table 4-2 Disaster and Emergency Declarations in Rhode Island, 1954 – 2021

Disaster Number	Declaration Type *	Declaration Date	Description	Individual Assistance Total	Public Assistance Total	Hazard Mitigation Grant Program Total
3563	EM	8/21/2021	Hurricane Henri		Not currently available	
4505	DR	3/30/2020	Covid-19 Pandemic		Not currently available	
3440	EM	3/13/2020	Covid-19 Pandemic		Not currently available	
4212	DR	4/3/2015	Severe Winter Storm Juno and Snowstorm	N/A	\$8,423,229	\$1,327,144
4107	DR	3/22/2013	Severe Winter Storm and Snowstorm	N/A	\$7,057,671	\$1,070,561
4089	DR	11/3/2012	Hurricane Sandy	\$421,341	\$6,519,140	\$1,525,853
4027	DR	9/3/2011	Tropical Storm Irene / Hurricane Irene	N/A	\$9,260,898	\$1,608,921
3334	EM	8/27/2011	Hurricane Irene	N/A	N/A	N/A
3311	EM	3/30/2010	Severe Storms and Flooding	N/A	N/A	N/A
1894	DR	3/29/2010	Severe Storms and Flooding	\$37,033,311	\$17,043,832	\$11,033,039
1704	DR	5/25/2007	Severe Storms and Island/Coastal Flooding	N/A	\$605,080	\$86,280
3255	EM	9/19/2005	Hurricane Katrina Evacuation	N/A	\$1,110,010	N/A
3203	EM	2/17/2005	Record Snow	N/A	\$6,273,609	N/A
3182	EM	3/27/2003	Snowstorm	N/A	\$2,002,984	N/A
3123	EM	11/19/1996	Major water main break	N/A	N/A	N/A
1091	DR	1/24/1996	Blizzard	N/A	N/A	N/A
3102	EM	3/16/1993	Blizzards, High Winds, and Record Snowfall	N/A	N/A	N/A
3094	EM	9/16/1992	Water Contamination	N/A	N/A	N/A
913	DR	8/26/1991	Hurricane Bob	N/A	N/A	N/A
748	DR	10/15/1985	Hurricane Gloria	N/A	N/A	N/A
548	DR	2/16/1978	Snow, Ice	N/A	N/A	N/A
3058	DR	2/7/1978	Blizzards and Snowstorms	N/A	N/A	N/A
39	DR	8/20/1955	Hurricane, Flood	N/A	N/A	N/A
23	DR	9/2/1954	Hurricane	N/A	N/A	N/A

* Please Note: DR = Major Disaster Declaration; EM = Emergency Disaster Declaration
State of Rhode Island Hazard Mitigation Plan and FEMA Declared Disaster Website

In support of the Risk Assessment process, **Table 4-3** was created from data in the RI-SHMP which was obtained from NOAA's National Centers for Environmental Information (NCEI) Storm Events Data for Bristol County. Over the past several decades, wind, winter storms, thunderstorms, and flooding have been the most prevalent disasters faced by Bristol County. While the total property damages are believed to be underrepresented due to unreported or difficult to quantify losses, it is clear that damages associated with flooding are the most extensive (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-11 and 3-12).

Table 4-3 Overview of Hazard Events and Related Property Damage in Bristol County Rhode Island

Hazard	Flood	Hurricane	Wind	Tornado	Winter Storm	Drought	Extreme Cold	Extreme Heat	Thunder storm
Years of Record	1996-2018	1996-2018	1955-2018	1950-2018	1996-2018	1996-2018	1996-2018	1996-2018	1955-2018
NCEI Total Number of Events	25	1	66	2	58	4	0	0	48
NCEI Total Reported Property Damages	\$6,234,000	\$10,000	\$110,500	\$45,000	\$135,000	---	---	---	\$315,000
NCEI Total Annualized Reported Damages	\$271,043		\$1,726		\$5,869	---	---	---	\$4,921



Figure 4-10 Hurricane Carol Hits Rhode Island (1954)

Photo Credit: Rhode Island Historical Society

4.2.2 Hazard Ranking – Vulnerability Summary

To assist the Steering Committee in comparing and prioritizing the hazards in terms of their potential impact on the Town, a standard methodology was used based on three semi-quantitative factors (probability of occurrence, likely range of impact, and likely magnitude of impact). From personal experience, review of draft hazard profiles, and input from the community via the **Public Opinion Survey**, the Steering Committee members ranked the hazards. In the Committee's overall ranking (**Table 4-4**) each of the three semi-quantitative factors were given equal weight. The full ranking and criteria have been provided in **Appendix 4-1**. The results of this exercise assisted the Committee in determining if any hazards should be excluded from further consideration and which ones should be more heavily weighted in terms of the Town's mitigation strategy. The hazards ranked the highest by the Committee are: Tropical Cyclones (Tropical Storms and Hurricanes); Coastal Flooding/Storm Surge; High Winds; Heavy Snow; Ice or Extreme Cold; Coastal Erosion; and Inland Flooding. In the Public Opinion Poll, the top two hazards residents were extremely concerned about were Flood-Related and Wind-Related Hazards.

Although a **Bibliography and Works Cited** section has been included, in addition to the **RI State Hazard Mitigation Plan (RI-SHMP)**, some of the key resources used in profiling the hazards include:

FLOOD-RELATED HAZARDS

- Review of historical disaster declarations and NOAA|NCEI Storm Events Database
- Review of Flood Insurance Rate Maps (FIRMs), National Flood Insurance Program (NFIP) policies and claims, and repetitive loss (RL) and severe repetitive loss (SRL) properties
- The National Hurricane Center (NHC) and the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model
- U.S. Army Corps of Engineers (USACE) National Inventory of Dams database
- RIDEM Dam hazard rating
- Rhode Island Sea Level Rise Committee
- Rhode Island Sea Grant College Program data

WIND-RELATED HAZARDS

- Review of historical disaster declarations and NOAA|NCEI Storm Events Database
- American Society of Civil Engineers (ASCE) Minimum Design Loads for Buildings and Other Structures
- NWS Hurricane Data

WINTER STORM-RELATED HAZARDS

- Review of historical disaster declarations and NOAA|NCEI Storm Events Database
- American Society of Civil Engineers (ASCE) Minimum Design Loads for Buildings and Other Structures
- NWS weather station data average annual snowfall

INFECTIOUS DISEASE

- Review of historical disaster declarations
- Input from the State Interagency Hazard Mitigation Committee (SIHMC)
- Centers for Disease Control and Prevention (CDC)
- World Health Organization

OTHER HAZARDS

- Review of historical disaster declarations and NOAA|NCEI Storm Events Database
- American Society of Civil Engineers (ASCE) Minimum Design Loads for Buildings and Other Structures
- NWS weather station data average annual rainfall (drought conditions)
- Review of historical data from United States Geological Survey (USGS) and Weston Observatory
- Peak ground acceleration (PGA) data
- U.S. Drought Monitor and Drought Impact Reporter
- Rhode Island Department of Health
- Rhode Island Division of Forest Environment data
- SILVIS Lab Wildland-Urban Interface (WUI) data
- Input from the State Interagency Hazard Mitigation Committee (SIHMC)

Table 4-4 Vulnerability Summary: Committee Hazard Ranking (Probability/Range/Magnitude)

Hazard	Overall Ranking	Risk Category
Tropical Cyclones: Tropical Storms and Hurricanes	2.47	High
Coastal Flooding/Storm Surge	2.42	
High Winds	2.42	
Heavy Snow	2.37	
Ice or Extreme Cold	2.14	
Coastal Erosion	2.00	
Inland Flooding	2.00	
Thunderstorms, Hail, or Lightening	1.93	Medium
Extreme Heat	1.61	
Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses	1.56	
Vector-borne Diseases Transmitted by Ticks and Mosquitoes	1.26	
Tornadoes	1.03	Low
Drought	0.91	
Brushfires	0.67	
Dam Failure	0.33	
Earthquake	0.22	

4.3 HAZARD PROFILES

Hazard Mitigation Plan: The Town of Barrington has successfully met the following requirement ➔

44 CFR Subsection D §201.6(c)(2)(i): [The risk assessment shall include] A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

As indicated in **Table 4-4**, based on Committee input, the four lowest ranked hazards were determined to be Drought, Brush fires, Dam Failure, and Earthquakes. Although these hazards are not currently considered a significant threat to Barrington, it was determined prudent to include them because our rapidly changing climate may influence their significance in future years. That being said, in terms of the Town's ensuing 5-year mitigation strategy, those four hazards will have a lower standing.

The identified hazards are profiled in the following sub-sections:

- 4.3.1 Flood-Related Hazards** (Inland Flooding/Dam Failure, Coastal Flooding/Storm Surge, Coastal Erosion)
- 4.3.2 Wind-Related Hazards** (High Winds – Thunderstorms/Lightening/Hail, Tornadoes, Tropical Cyclones)
- 4.3.3 Winter-Related Hazards** (Heavy Snow, Ice, Extreme Cold)
- 4.3.4 Infectious Disease** (Vector-borne Diseases Transmitted by Ticks and Mosquitoes, Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses)
- 4.3.5 Other Hazards** (Earthquakes, Extreme Heat, Drought, Brush Fires)

Each profile includes a description and extent (strength or magnitude of impact); is locally defined (geographic areas affected); identifies previous occurrences; addresses climate change impacts; and discusses the probability of future events. The 2018 State Hazard Mitigation Plan defines probabilities for likelihood of hazard occurrence: Highly likely = 90% annual probability; Likely = 50%-89.9% annual probability; Potential = 1%-49.9% annual probability; Unlikely = less than 1% annual probability.



FLOOD-RELATED HAZARDS

4.3.1 Flood-Related Hazards

Flooding, the accumulation of a substantial amount of water in areas that are typically dry, generally results from heavy rainfall, storm surges, and melting snow. FEMA defines a flood 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” (FEMA. *Glossary*).

Barrington is a low-lying community containing approximately 7.2 square miles of water, including lakes, rivers, watercourses, inlets, and coves. Barrington’s extensive inland water as well as coastal exposure make it particularly susceptible to flooding.

The RI Geographic Information System (RIGIS) has made available FEMA’s Digital Flood Insurance Rate Map (D-FIRM) database for the State, which the Town has used in developing this *Plan*. The most current D-FIRMs for Barrington are from July 7, 2014. The Flood Insurance Rate Maps show FEMA designated flood zones according to varying levels of flood risk. High risk areas in Barrington are designated as Zones AE and VE. The first letter (A or V) represents the flood zone, and the second letter (E) indicates that base flood elevations have been provided. The term AE is used on new format FIRMs instead of A1-A30 Zones (FEMA. *Unit 3, 3-29*).

FEMA considers the A and V Zones as the **Special Flood Hazard Area (SFHA)**. **Zone A**, or the 100-year floodplain, identifies areas with a one percent or greater chance of flooding in any given year. **Zone V**, the Velocity Zone, identifies coastal areas with a one percent or greater chance of flooding in any given year plus the additional hazard of storm-induced waves, or velocity action. Both the A and V Zones have a 26% chance of flooding over the life of a 30-year mortgage (FEMA. *Unit 3, 3-4 & 3-5*).

The flood hazard mapping depicted in **Figure 4-11**, serves as the basis for NFIP regulations and flood insurance requirements. Based on GIS data, over 40% of Barrington’s land area is within the Special Flood Hazard Area: approximately 6 percent within Zone VE and 36 percent within Zone AE. **Figure 4-11** is also included at a larger scale in **Appendix 4-2**.

The location of flood events generally varies based on the type of flooding. In this Section, flood-hazards will be discussed in terms of the following three categories:

4.3.1.1 Inland Flooding (Riverine Flooding, Shallow Flooding, and Dam Failure)

4.3.1.2 Coastal Flooding/Storm Surge

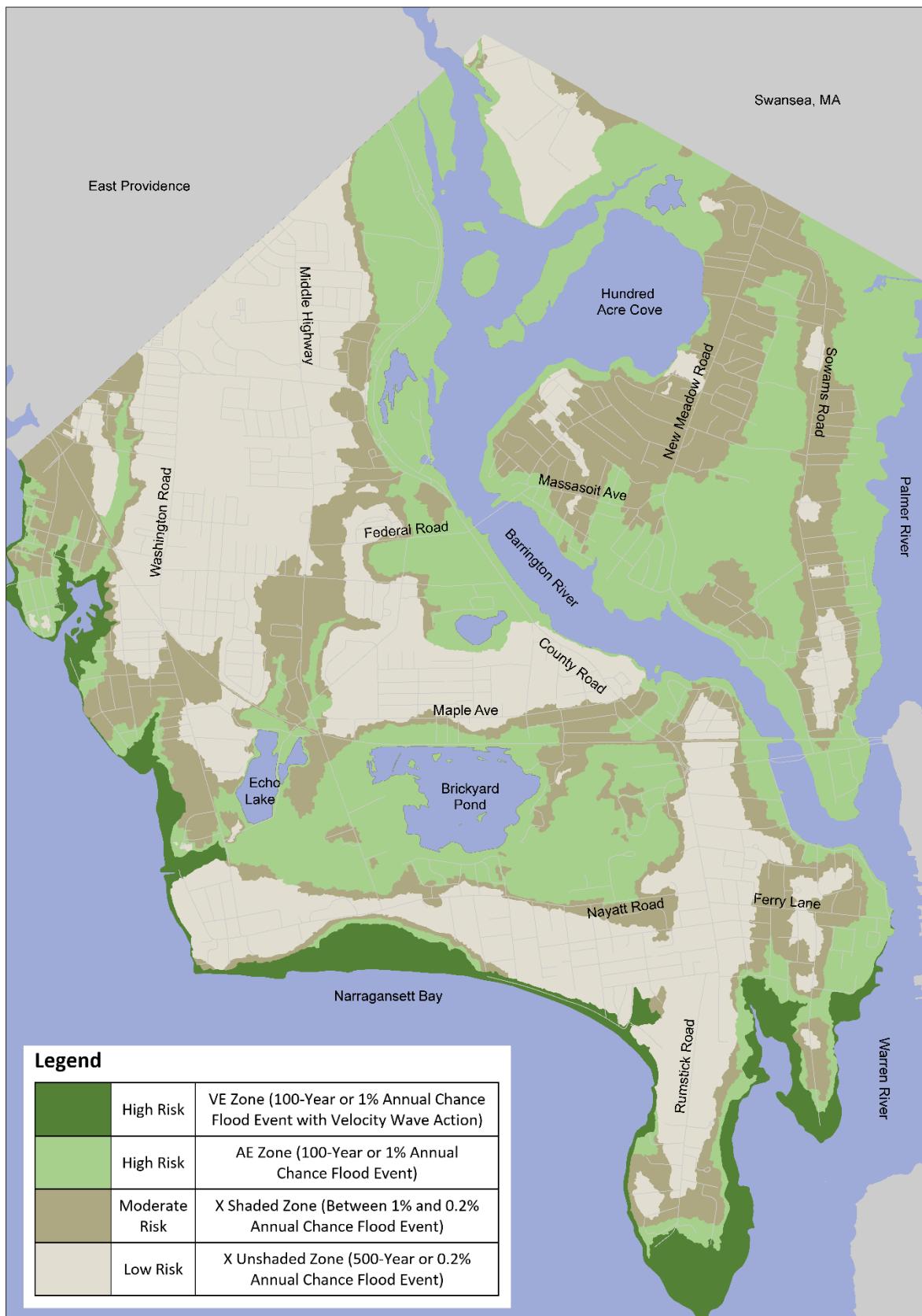
4.3.1.3 Coastal Erosion

Flooding

According to FEMA, between 2010 and 2018 the annual cost of flood damage in the United States was approximately \$17 billion and was four times more than was recorded in the 1980s (FEMA. *TESTIMONY, 5*)

Figure 4-11

Flood Zones



0 0.5 1
Miles



2022 Hazard Mitigation & Flood Management Plan

Prepared By: Kim Jacobs and Cam Evans

Town of Barrington - June 2022 - Sources: RI GIS, Town GIS

FEMA Flood Insurance Rate Map Zone Definitions

High Risk: Zone V (1% annual chance): Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplain that has additional hazards associated with storm waves. Mandatory flood insurance purchase requirements apply. For areas within the V Zone where detailed hydraulic analyses has been performed and Base Flood Elevations (BFEs) identified, it is classified as VE replacing the old format V1-V30.

High Risk: Zone A (1% annual chance): Zone A is the flood insurance rate zone that corresponds to the 100-year floodplain that is determined in the Flood Insurance Study (FIS) by approximate methods. Mandatory flood insurance purchase requirements apply. For areas within the A Zone where detailed hydraulic analyses has been performed and Base Flood Elevations (BFEs) identified, additional classifications (AE replacing the old format A1-30; AH; AO; AR; or A99) are made.

Moderate Risk: Zone X (shaded) (between 1% and 0.2% annual chance): Zone X (shaded) is the flood insurance rate zone that is considered moderate risk. Flood Zone X (shaded) indicates an area where the annual flood risk is between 1 percent (100-year floodplain) and 0.2 percent (500-year floodplain). The Zone X (shaded) is determined in the Flood Insurance Study (FIS) by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs (base flood elevations) or depths are shown within this zone. These areas can also be labeled Zone B.

Low Risk: Zone X (unshaded) (0.2% annual chance): The areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood (500-year floodplain), are labeled Zone C or Zone X (unshaded).



4.3.1.1 Inland Flooding (Riverine Flooding, Shallow Flooding, Dam Failure)

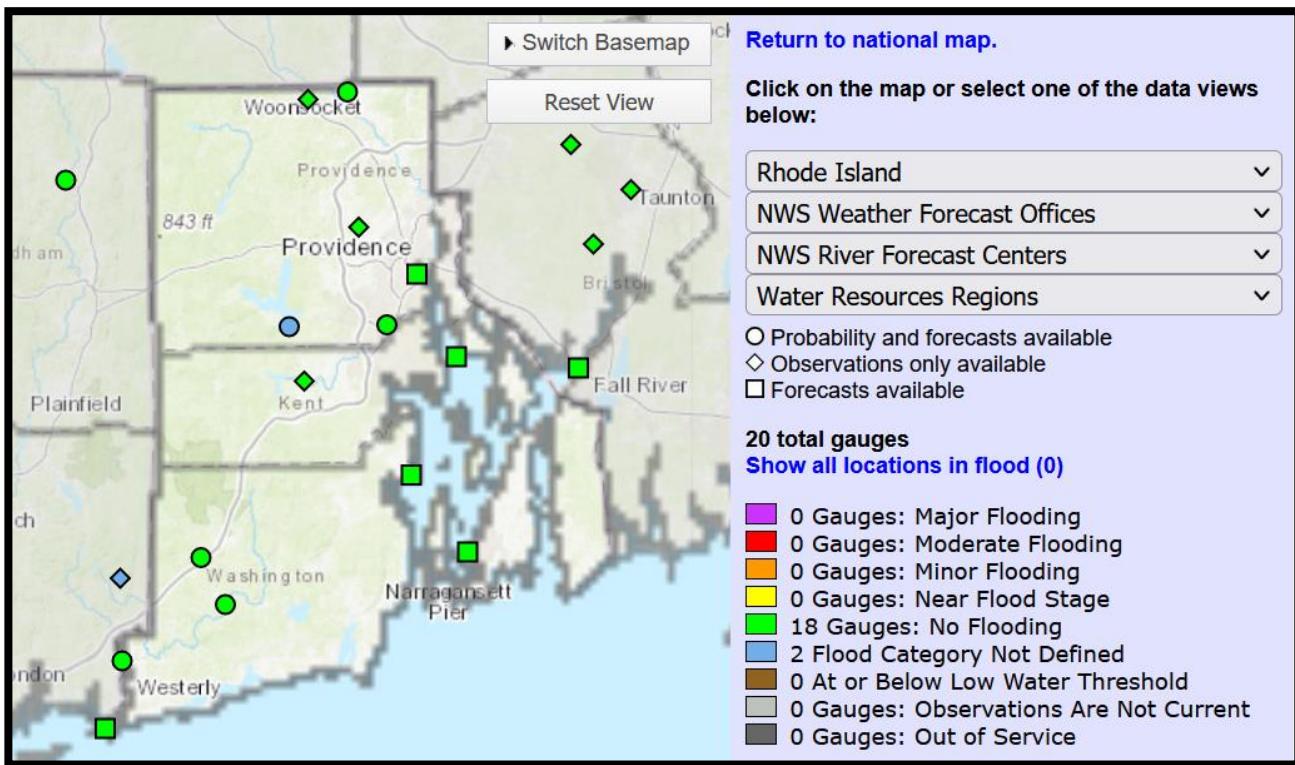
Description and Extent

Flooding directly impacts Barrington residents in many of the low-lying areas of Town. Significant inland flooding can lead to extensive damage to structures and personal property; disrupt potable water, stormwater, and sewer system operations; and flooded roadways can cause dangerous conditions for motorists. Additionally, flood water can carry toxic material or contaminants spreading pollution which can negatively impact ecosystems. Further, standing water following a flooding event can provide a conducive environment for breeding mosquitos.

Floods are measured by stream gauges, installed in bodies of water located near populated areas, designed to determine the risk of flooding. The most commonly used stream gauge is the Automated Local Evaluation in Real-Time (ALERT) which continuously sends water level data through a satellite or phone telemetry. The United States Geological Survey (USGS) installs, operates, and collects stream gauge data from thousands of sites around the country. **Figure 4-12** shows the location of National Weather Service (NWS) flood gauges in and near Rhode Island. The data is sent to and analyzed by the NWS River and Flood program who is responsible for issuing flood warnings to local, state, and federal decision-makers. It is then up to the decision-makers what action should be taken (Restoration Master).

As Barrington's creeks and streams are part of small basins, flooding may be more difficult to predict and therefore unlikely to provide useful warning time. Streams and small rivers are also susceptible to flooding from more localized weather systems that may cause intense rainfall over only a small area.

Figure 4-12 Rhode Island: NWS Observed Gauge Map (NOAA|NWS)



The types of flooding that present a risk within inland (non-coastal) areas in Barrington include riverine flooding, shallow flooding, and dam failure.

❖ **Riverine Flooding (overbank flooding, flash floods)**

Riverine flooding is defined as flooding that occurs along a channel. Overbank flooding is the overflow of water from a river or stream into the adjacent floodplain due to an increase in the volume of water within a channel. By their very nature, floodplains are the low, flat, periodically flooded lands adjacent to rivers, lakes and oceans and subject to geomorphic (land-shaping) and hydrologic (water flow) processes. It is only during and after major flood events that the connections between a river and its floodplain become more apparent. These areas form a complex physical and biological system that not only supports a variety of natural resources but also provides natural flood and erosion control. In addition, a floodplain is a natural filtering system, with water percolating back into the ground and replenishing groundwater (FEMA. *Unit 1, 1-7*).

As defined by FEMA, and shown in **Figure 4-11**, floodplains in Barrington include VE, AE and X (shaded) and X (unshaded) zones. The VE and AE zones (also referred to as the Special Flood Hazard Area) comprise the area inundated by a 100-year flood, the X zone (shaded) is the area between the 100- and 500-year floodplains, and the X zone (unshaded) is the area inundated by the 500-year flood.

Flash floods result from severe storms that drop significant rainfall over a short period of time. Steep slopes and narrow stream valleys increase a community's vulnerability to flash floods and resultant damage, as do areas with poor drainage. The construction of impervious surfaces such as asphalt roads, parking lots, driveways, sidewalks, and expansive roofs, accelerates the potential for flash flooding because these surfaces do not allow natural absorption by open ground. As a result, storm drains are often overwhelmed, and water rushes to "low spots" such as basements and underpasses. Another potential source is the result of dam failure or the release of ice-jam flooding (FEMA. *Unit 1, 1-8*).

❖ **Shallow Flooding (sheet flow, ponding)**

Shallow flooding occurs in flat areas where a lack of channels means water cannot drain away easily. Urbanization exacerbates the accumulation of floodwater due to increased impervious surfaces, and is of particular concern in areas that have a high groundwater table, where development has occurred within floodplains, or with marginal urban drainage systems. Often urban drainage systems, which include swales, ditches, storm sewers, retention ponds, and other facilities constructed to store or carry runoff to a receiving waterbody, are insufficient in size or due to lack of maintenance to accommodate heavy rainfall. Two categories of shallow flooding are (FEMA. *Unit 1, 1-11 & 1-12*):

- ◊ **Sheet flow** – A lack or insufficiency of defined channels creates conditions where floodwater spreads over a large area at a roughly uniform depth.
- ◊ **Ponding** – This condition occurs when stormwater runoff collects in depressions and cannot drain out; the water remains until it infiltrates into the soil, evaporates or is pumped out. (This does not include stormwater retention ponds specifically designed to collect stormwater and retain the water until it infiltrates into the soil; typically, within a matter of hours).

❖ **Dam Failure (Special Flood Hazard)**

NOAA defines a dam as “any artificial barrier that diverts or impounds water” and dam failure as a “catastrophic event characterized by the sudden, rapid, and uncontrolled release of impounded water” (NWS. *National Weather Service Glossary*). The RI-SHMP indicates that the most common cause of dam failure is overtopping which can occur due to prolonged periods of rainfall and flooding. Dam failures can create the most damaging flash flood events because generally there is little or no warning time, limiting the opportunity to prepare and evacuate.

Inventoried dams in Rhode Island are classified by size and hazard rating by the Rhode Island Department of Environmental Management (RIDEM). The size classification provides a relative description of small, medium, or large dams, based on the storage capacity and height of the impounded water. The hazard classification relates to the probable consequences of failure or poor operation of the dam.

The Rhode Island Department of Environmental Management’s 2020 Annual Dam Safety Report (RIDEM. *2020 Annual Report*) lists two inventoried dams in Barrington: (Echo Lake Dam (Mussachuck Creek Tributary) and New Meadow Neck Dam (Unnamed Tributary). The hazard classifications (High Hazard, Significant Hazard, and Low Hazard) are defined in the Rules and Regulations for Dam Safety (250-RICR-130-05-1). Both of the State’s inventoried dams for Barrington are classified in the 2020 Annual Dam Safety Report as *Low Hazard* dams. A *Low Hazard* dam indicates a dam that presents minimal threat to a community as the failure or mis-operation has been determined to result in no probable loss of human life and low economic losses. Should either of Barrington’s dams fail, they are not anticipated to create a flash flood of significance.

Location

❖ **Riverine Flooding (overbank flooding, flash floods)**

Barrington is predominately a low-lying community, lacking steep slopes and narrow stream valleys that exacerbate flash floods. Riverine flooding is more likely to result from an event with a slower speed of onset that causes stream and creek banks to overtop. Areas bordering rivers may also be affected by large discharges caused by heavy rainfall over upstream areas. Large amounts of impervious surfaces in the more urban areas of Town increase runoff amounts and decrease the lag time between the onset of rainfall and stream flooding. Man-made channels and incorrectly sized culverts may also constrict stream flow and increase flow velocities (FEMA. *Unit 1, 1-7*).

Although the Town lacks any significant non-tidal rivers, there are creeks and streams that represent a risk of riverine flooding for inland neighborhoods that are removed from the coast. These include:

- **Annawamscutt Brook:** The brook flows south from Riverside in East Providence, through the Riverside Plaza shopping center, into Barrington through a neighborhood of single-family houses and Haines Park, underneath Bay Spring Avenue via a culvert, and past Barrington Cove Apartments where it ends at Allin's Cove.
- **Mussachuck Creek:** The creek flows westerly for about a mile from Brickyard Pond to Narragansett Bay. It flows through culverts under Middle Highway and Washington Road and under a small bridge near the Bay constructed as a private driveway across the creek.
- **Hampden Meadows Greenbelt streams and drainage channels:** This conservation area features significant freshwater wetlands in addition to manmade drainage channels; the main channel flows north-south, and near the Greenbrier Drive/New Meadow Road intersection flows through a culvert into the Barrington River.
- **An unnamed creek/stream originates from Barrington River/Osamequin Nature Preserve and connects to Upper Echo Lake (Little Echo):** This waterway flows through a forested wetland to the west of the St. Andrews School campus, then proceeds underneath Federal Road via a culvert where it crosses to the west of the Public Safety Building, and continues on behind Atlantic Crossing and to the south of the Middle School.

Rivers in the Town of Barrington

The **Runnins River** is approximately 9 miles long, originating in MA and flowing into RI.

The **Barrington River** is a tidal extension of Runnins River which flows approximately 4 miles. The river begins at Hundred Acre Cove which is fed to the north by Runnins River. The river then flows southeast to Barrington where it converges with the Warren River to its confluence with the Narragansett Bay. There are no dams along the river's length.

The **Palmer River** originates in MA and flows approximately 11 miles. The main branch flows between Barrington and Warren for its last few miles. At its mouth, it converges with the Barrington River to form the Warren River.

Wikipedia. *List of Rivers in Rhode Island*

❖ **Shallow Flooding (sheet flow, ponding)**

New development is subject to the State's stormwater regulations, requiring bioretention basins, swales, dry wells, and/or other measures to capture and treat stormwater from streets, rooftops and other impervious surfaces. However, as development in most areas of Town predate such requirements, the majority of stormwater runoff flows overland, some of which is handled by catch basins and roadside ditches. Much of the runoff is conveyed to wetlands and creeks and eventually reaches inland waterbodies such as Brickyard Pond, Echo Lake, and O'Bannon Pond at Haines Park, as well as coastal waters such as the Barrington and Palmer Rivers, and Narragansett Bay.

❖ **Dam Failure (Special Flood Hazard)**

Both of the State's inventoried dams for Barrington are classified as low hazard and should they fail, not anticipated to create a significant flash flood. Although the State identifies a dam near Kent Street (**New Meadow Neck Dam**), the Town disagrees with this assessment. A shallow basin was created in this area years ago to hold water as a skating pond. The water in the basin is from the water table rather than supplied by an adjacent brook or channel.

The **Echo Lake Dam** (which is more like a small pond) adjacent South Lake Drive is located upstream from a large open space (RI Country Club golf course). It is an earthen and controls flow from Echo Lake into Mussachuck Creek.

In addition to the State inventoried dams, there is a small private **unnamed dam on Annawamscutt Brook** behind Barrington Cove Apartments on Bay Spring Avenue. This dam opens out into Allin's Cove and the Providence River. It is considered a low risk with a potential collapse being dissipated via Allin's Cove.

Previous Occurrences

❖ **Riverine and Shallow Flooding (overbank flooding, flash floods, sheet flow, ponding)**

As shown in **Table 4-5**, which was created from the NCEI Storm Events Database, Barrington regularly experiences storms and heavy rains that result in localized street and stream flooding.

One of the most significant recent floods impacting Barrington occurred in March 2010. Storms with periods of heavy rain created significant flooding throughout Rhode Island and resulted in a Presidential Major Disaster Declaration for the State. Property damage for Bristol County was estimated as \$5,910,000. The heavy, extended rains during this period, inundated areas of Barrington, requiring the Fire Department to pump out flooded basements across Town. As it has done several times in the past, the Rhode Island Department of Transportation (RIDOT) closed the intersection of Middle Highway and Maple Avenue for several days due to flooding from Volpe Pond and associated wetlands. No significant riverine flooding events have been recorded or identified by Town of Barrington officials since 2010. No significant urban flooding events have been recorded or identified by Town of Barrington officials since 2016.

❖ **Dam Failure (Special Flood Hazard)**

No documentation or other evidence has been found identifying a past occurrence of dam failure in Barrington.

Table 4-5 Inland and Urban Flooding Events - Bristol County 1990-2020 (NOAA|NCEI. *Storm Events Database*)

Date	Key Event Information (no deaths or injuries reported for any of these events)	Property Damage
01/12/1996 (flash flood); 07/13/1996; 09/18/1996; 10/08/1996; 10/20/1996; 12/07/1996; 11/01/1997; 02/18/1998; 02/23/1998; 03/08/1998; 04/01/1998 05/09/1998; 06/13/1998; 01/03/1999; 01/15/1999; 05/23/1999; 09/10/1999; 09/16/1999; 03/11/2000; 06/06/2000; 03/30/2001; 09/15/2002; 03/29/2003	<p>Note: these dates have been identified on the NCEI database as heavy rain events but are NOT listed as flood events. This does not necessarily mean that local flooding didn't occur, but rather that it was not recorded as part of this database.</p>	-----
03/28/2005	General Overview: Heavy rain – 3 to 4" Bristol County: Flooding in poor drainage areas occurred in Warren and Bristol	-----
06/07/2006	General Overview: Heavy rain – 2 to 4" Bristol County: Chestnut Street and Hope Avenue in Bristol were closed due to flooding	5.00K
03/02/2007	General Overview: Heavy rain – 2 to 3" Bristol County: Several roads in Warren and Bristol were closed due to flooding	5.00K

Table 4-5 Continued

Date	Key Event Information (no deaths or injuries reported for any of these events)	Property Damage
02/13/2008	General Overview: Heavy rain – 2 to 4"; small stream, poor drainage, and minor river flooding; some minor wind damage especially along the coast Bristol County: Several backyards were under six inches of water	-----
12/12/2008	General Overview: Heavy rain – 3 to 5"; small stream and some street flooding Bristol County: Silver Creek in Bristol overflowed its banks flooding and causing closure of portions of Route 114 and other roads in the vicinity	3.00K
03/14/2010	General Overview: Heavy rain – 3 to 10"; major flooding in RI; strong winds downed trees and wires Bristol County: Several streets throughout Bristol were closed due to flooding	-----
03/30/2010	General Overview: This event followed a heavy rainfall and record flooding event in mid-March as well as a second lesser rain event about a week prior; flooding resulted in millions of dollars of damage across RI, with numerous homes, businesses, and people affected; a federal disaster declaration for the entire state of RI encompassed both the mid-March storm and this storm Bristol County: 7 to 8" of rain fell in Bristol County, resulting in many basements and roads flooded throughout the County	5.910M
08/10/2012	General Overview: Heavy rain, thunderstorms, and strong winds Bristol County: Several streets in downtown Warren were flooded over the curbs; Route 114 on the Warren/Barrington line flooded with one and a half feet of water	-----
06/07/2013	General Overview: Tropical Storm Andrea - Heavy rain – 3 to 5"; tropical system Bristol County: Several streets in Bristol were closed due to flooding	-----
08/09/2013	General Overview: Heavy rain – 2 to 2.25"; thunderstorms; high atmospheric moisture content resulted in torrential downpours across much of the region, which led to flash flooding in some areas Bristol County: Route 114 in Warren was closed due to flooding	-----
09/03/2013	General Overview: Heavy rain and thunderstorms; damaging winds in some areas Bristol County: Main Street Warren was flooded and impassable	-----
07/15/2015	General Overview: Heavy rain and thunderstorms; some flooding and flash flooding Bristol County: In Barrington, Prospect Street and Simmons Road at Massasoit Avenue as well as several other streets were flooded and impassable; a number of roads in Warren and Bristol were also flooded	-----
07/28/2015	General Overview: Heavy rain and thunderstorms; damaging winds in some areas Bristol County: In Barrington, New Meadow Road at Route 114 was flooded with six inches of water; in Warren, up to one foot of water flooded Crescent, Kelly, and Water Streets and Columbus Way; and in Bristol Annawamscutt Drive at Metacom Avenue/Route 136 was closed due to flooding	-----
07/15/2016	General Overview: Heavy rain and thunderstorms; damaging winds in some areas Bristol County: Chester Avenue in Bristol was flooded and impassable.	-----

Climate Change Impacts

In their 2017 Climate Science Special Report, the U.S. Global Change Research Program states that, "Changes in the characteristics of extreme events are particularly important for human safety, infrastructure, agriculture, water quality and quantity, and natural ecosystems. Heavy rainfall is increasing in intensity and frequency across the United States and globally and is expected to continue to increase. The largest observed changes in the United States have occurred in the Northeast" (USGCRP, Executive Summary).

As reported by Climate Central, "More than 70% of the planet's surface is water, and as the world warms, more water evaporates from oceans, lakes, and soils. Every 1°F rise also allows the atmosphere to hold 4% more water vapor" (Climate Central. *POURING*). Climate warming, predicted to increase the intensity and frequency of storm events translates to increases in flooding. The problem will be exacerbated as winters become wetter saturating the ground prior to heavier rainfall periods. Increased construction within floodplains, destroying these natural protective systems, will also yield greater risks from flooding. Curbing humanity's greenhouse gas emissions would limit the increase in downpours. Scenarios modeled in the 2017 Climate Science Special Report suggest that, "If greenhouse emissions continue unchecked, the frequency of a once-in-five-years rain event could increase two-to-threelfold by late century" (Climate Central. *POURING*).

Figure 4-13 Observed Change in Heavy Precipitation
(US Climate Resilience Toolkit)

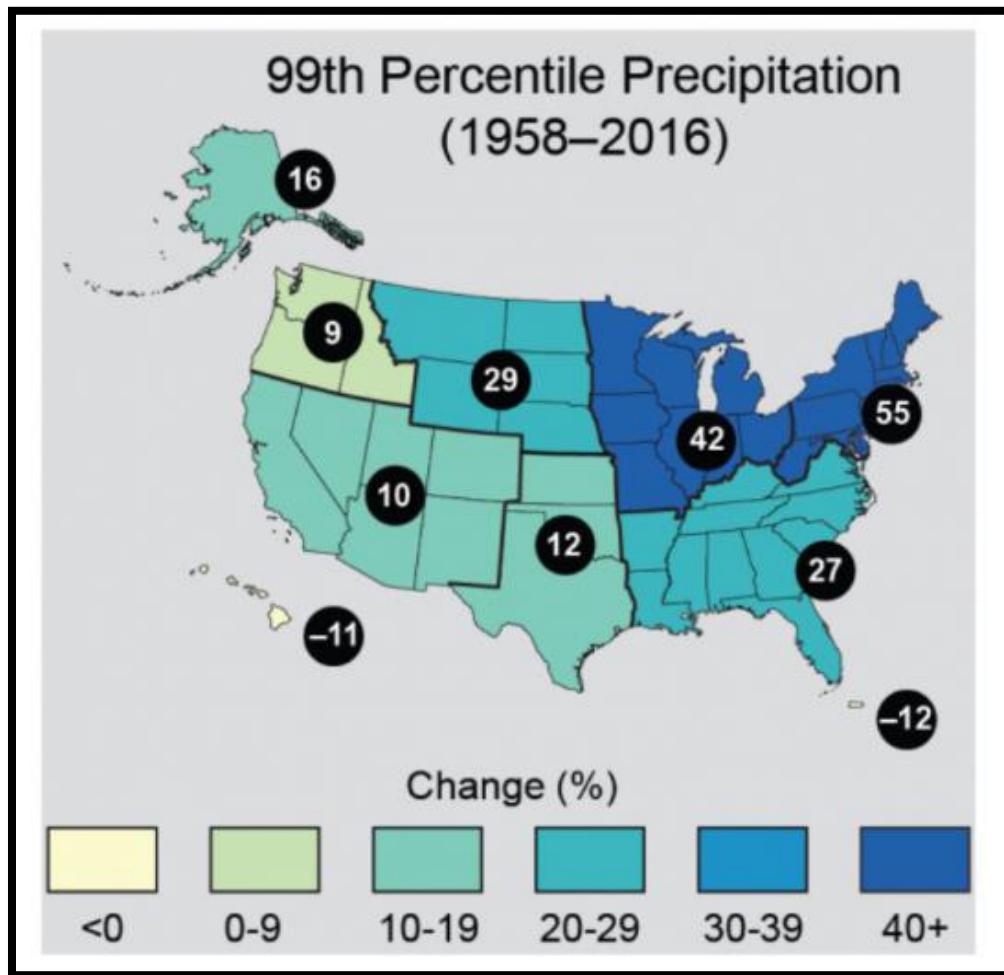


Figure 4-13 “Shows the percent increases in the amount of precipitation falling in daily events that exceed the 99th percentile of all non-zero precipitation days (top 1 percent of all daily precipitation events) from 1958 to 2016 for each region of the United States. The number in each black circle is the percent change over the entire period (1958–2016)” (US Climate Resilience Toolkit).

Probability of Future Events

❖ **Riverine and Shallow Flooding (overbank flooding, flash floods, sheet flow, ponding)**

Barrington’s lack of steep slopes and narrow stream valleys mean the probability of flash floods is low. However, the likelihood of overbank flooding and flooding from sheet flow is high based on previous occurrences and climate change projections. The Town has been acv e to mi ate the ee cts of these types of ood events by construc ng culverts under repe v e ood roads, removing pavement associated with end-of-road retro ts, and working to maintain well-func o ning storm drains.

❖ **Dam Failure (Special Flood Hazard)**

The dams in Barrington are considered low hazard and stable. Should a breach occur it is projected as a minimal threat.



4.3.1.2 Coastal Flooding/Storm Surge

Description and Extent

Coastal flooding occurs when surges of waves inundate the shores of bays, tidally influenced rivers, streams, and inlets. These conditions are produced by hurricanes (tropical storms) during the summer and fall as well as Nor'easters and other large coastal storms (extra-tropical storms) during the fall, winter, and spring.

According to the National Hurricane Center, storm surge is an abnormal rise of coastal water generated by a storm, over and above the predicted astronomical tides. The rise in water level occurs primarily due to winds pushing water toward the shore and can cause extreme flooding in coastal areas particularly when storm surge coincides with normal high tide. Coastal flooding and storm surge can cause damage to coastal structures and property and erode beach material carrying debris out to sea. In the future, as sea levels continue to rise, the inundation area subject to coastal flooding and storm surge will continue to increase (NOAA|NHC. *Storm Surge*).

The magnitude of storm surge within a coastal basin is governed by both the meteorological parameters of the storm event and the physical characteristics of the basin. Rather than characterize the extent of storm surge itself, it is more functional to characterize the extent of the event causing the surge. As outlined in the RI-SHMP (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-216), the meteorological aspects of storm surge include:

- Hurricane size – measured by the radius of the maximum winds (measured from the center of the hurricane to the location of the highest wind speeds within the storm; this radius may vary from as little as 4 miles to as much as 50 miles)
- Hurricane intensity – measured by sea level pressure and maximum surface wind speeds at the storm center
- Hurricane path, or forward track of the storm
- Hurricane forward speed

Storm surge may push sea water up coastal rivers and inlets, blocking the downstream flow of inland runoff; inundate large swaths of developed and forested land with saltwater or freshwater; damage coastal habitats; damage natural and manmade structures; erode beach material; carry debris out to sea; strand residents in flooded areas and hamper rescue efforts by cutting off escape routes; and pose a serious threat of death by drowning.

NOAA tracks coastal flooding from tidal gauges, such as the one in Providence, which continuously measure water levels. The data collected measures the height of the tides, tracks long-term local relative sea level rise (SLR), and is used to detect coastal floods. Warnings of coastal storms usually occur several days before impact allowing areas vulnerable to storm surge to prepare and evacuate if necessary.

Location

Coastal flooding is a particular concern to Barrington because of its extensive coastline. With the exception of a few elevated shoreline areas, most of Barrington's coast is low-lying and therefore vulnerable to flooding. The areas most susceptible to storm surge are those in the Velocity Zone (**Figure 4-11**) and those impacted by a Category 1 or higher hurricane (**Figure 4-15**). The coastal VE zone extends along much of the western and southern coast, where the Town is in close proximity to Narragansett Bay and the Warren River.

The Town also has extensive areas within the A Zone (100-year) associated with the coastal waters along the Barrington River, Hundred Acre Cove, Palmer River, and Warren River. **Table 4-6** provides an estimate of the number of structures (excluding accessory buildings) within the Special Flood Hazard Area (SFHA) which is comprised of A and V Zones. The SFHA has a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. The V Zone has the additional hazards associated with storm waves.

Table 4-6 Estimated Number of Structures in the A and V Flood Zones – Barrington

Use	Residential Single Family		Residential Multi-Family; Senior Housing		Commercial		Marina		Institutional		Schools	
Zone	AE	VE	AE	VE	AE	VE	AE	VE	AE	VE	AE	VE
Principal Structure	678	98	22	0	4	1	4	0	1	0	1	0

Town of Barrington GIS Data/RIGIS

As water depth over a given surface increases with storm surge, larger waves can be generated. Storm surge heights in Barrington have ranged from a few feet higher than normal tides during nor'easters to more than 10 feet during the 1938 hurricane. **Figure 4-14** shows the impact of storm surge on several areas of Barrington and **Figure 4-15** depicts the areas of Barrington susceptible to storm surge from Category 1-4 hurricanes (modeling for Category 5 is not available). **Figure 4-15** is also included at a larger scale in **Appendix 4-2**.

Figure 4-14 Storm Surge Flooding from Hurricane Sandy (October 2012)



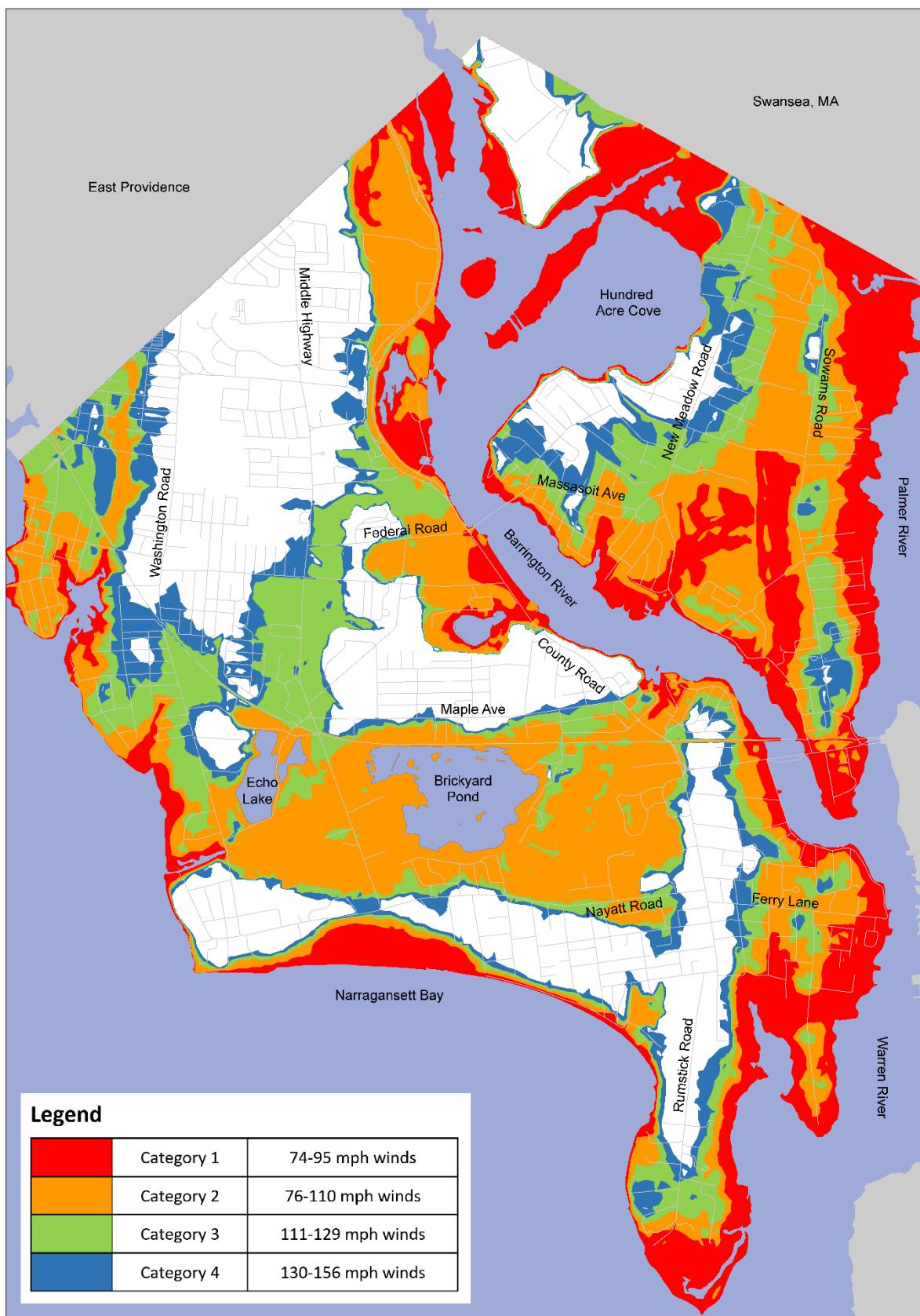
Along Mathewson Road - Photo Credit: Barrington Patch



Along Willow Way - Photo Credit: Barrington Patch

Figure 4-15

Hurricane Surge Inundation Areas



0 0.5 1
Miles



2022 Hazard Mitigation & Flood Management Plan

Prepared By: Kim Jacobs and Cam Evans

Town of Barrington - June 2022 - Sources: RIGIS, Town GIS

Previous Occurrences

As shown in **Table 4-7**, which was created from the NCEI Storm Events Database, incidents of coastal flooding since 1990 include both minor and significant coastal flooding. The impacts from storm surge are further identified in **Table 4-12**, which lists hurricanes that have impacted the region. The two hurricanes with the largest storm surge in Rhode Island were the Hurricane of 1938 (15 feet) and Hurricane Carol of 1954 (14 feet). Both of these resulted in widespread destruction in the community.

Table 4-7 Coastal Flooding/Storm Surge Events - Bristol County 1990-2020 (NOAA | NCEI. Storm Events Database)

Date	Key Event Information (no deaths or injuries reported for any of these events)	Property Damage
01/10/1997	General Overview: 40 to 50 mph gusts resulted in a storm tidal surge which reached 2 to 4 feet on Narragansett and Mount Hope Bays; overall, the flooding was considered minor and there was no structural damage or road washouts Bristol County: The Palmer River flooded some streets n Warren	----
10/28/2006	General Overview: About 10,200 customers were left without power throughout the state due to downed trees and power lines; rainfall totals of 2 to 4" produced some street flooding Bristol County: Moderate coastal flooding was reported on Smith Street in Bristol, which was covered with two feet of water	2.00K
04/15-16/2007	General Overview: An unusually strong and slow-moving coastal storm for mid-April with damaging winds in excess of 60 mph; significant coastal flooding through several high tide cycles; rainfall totals of 3 to 5", combined with wet antecedent conditions, resulted in widespread river, stream, and urban flooding; widespread reports of downed trees and power lines	25.00K
03/08/2008	General Overview: rainfall totals of 2 to 3" resulted in area flooding; in coastal areas, high astronomical tides combined with rough seas and storm surge produced minor coastal flooding Bristol County: Coastal flooding occurred in Barrington with street flooding; and Bristol experienced water lapping over the seawall	----
08/28/2011	General Overview: Storm Surge associated with Tropical Storm Irene - Southern New England sustained significant amounts of rain, storm surge, inland and coastal flooding, and wind damage; despite the relatively low wind speeds, sustained winds over a 6 to 12-hour duration resulted in widespread tree damage and power outages to roughly half a million customers throughout RI Bristol County: A storm surge between 3.16 and 4.78 feet impacted Mathewson Road in Barrington with two feet of water; other low-lying coastal areas of Barrington experienced street flooding; at least one house in Barrington had flood damage, resulting in an insurance claim; and the Forestville section of Bristol was evacuated due to the storm surge	----
10/29/2012	General Overview: Superstorm Sandy - In Southern New England, Rhode Island was hardest hit; 70 to 80+ mph along the southeast Rhode Island coast; nearly the entire Rhode Island shoreline experienced moderate to major coastal flooding; numerous power outages occurred Bristol County: Coastal flooding during Monday morning's high tide resulted in the collapse of a 30-foot section of seawall undermining of Poppasquash Road in Bristol	220.00K
08/22/2021	General Overview: Tropical Storm Henri - Although the storm made landfall in Westerly, RI, based on NOAA's NCEI storm events database, Bristol County did not experience storm surge from Tropical Storm Henri when it reached Rhode Island.	----

Repetitive Loss: The National Flood Insurance Program (NFIP) documents 13 Repetitive Loss (RL) properties in Barrington as of May 2022. There are currently 11 residential and 2 commercial RL properties. A Repetitive Loss property is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP. Additional information on FEMA Flood Zones, Repetitive Loss Properties, and the National Flood Insurance Program is provided in **Section 4.4.2.1**.



Figure 4-16 Coastal Flooding along King Philip Avenue During a King Tide (September 2015)
Photo Credit: Tim Faulkner | EcoRI News

Climate Change Impacts

As highlighted by Climate Central in **Figure 4-17**, coastal floods driven by climate-linked sea level rise, are increasing. The EPA recognizes that, "Climate change threatens coastal areas, which are already stressed by human activity, pollution, invasive species, and storms" (EPA. *Climate Impacts on Coastal Areas*). Sea level rise will impact development along the coast and could erode and inundate coastal ecosystems and eliminate wetlands. As the sea level rises, high tide flooding will become more destructive. "Coastal areas are also vulnerable to increases in the intensity of storm surge and heavy precipitation. Storm surges flood low-lying areas, damage property, disrupt transportation systems, destroy habitat, and threaten human health and safety" (EPA. *Climate Impacts on Coastal Areas*). Additional general information associated with the impacts of sea level rise (SLR) is provided in **Section 4.1.2**. The URI Coastal Institute has mapped Barrington's impact from SLR under a number of modeled scenarios. These will be further discussed in detail in **Section 4-4** with a number of the maps provided in **Appendix 4-4**.

"According to the National Climate Assessment, coastal flooding in the northeast has increased due to a rise in sea level of around one foot since 1900. And in the future, if we continue to emit greenhouse gases, global sea levels are expected to rise one to four feet by 2100. Specifically in the coastal Northeast, due to the natural sinking of land, sea levels are likely to rise even **higher** than the global average. A sea level rise of two feet would more than triple the frequency of coastal flooding across the Northeast, without any change in storms" (Di Liberto).

Coastal Floods Are Increasing

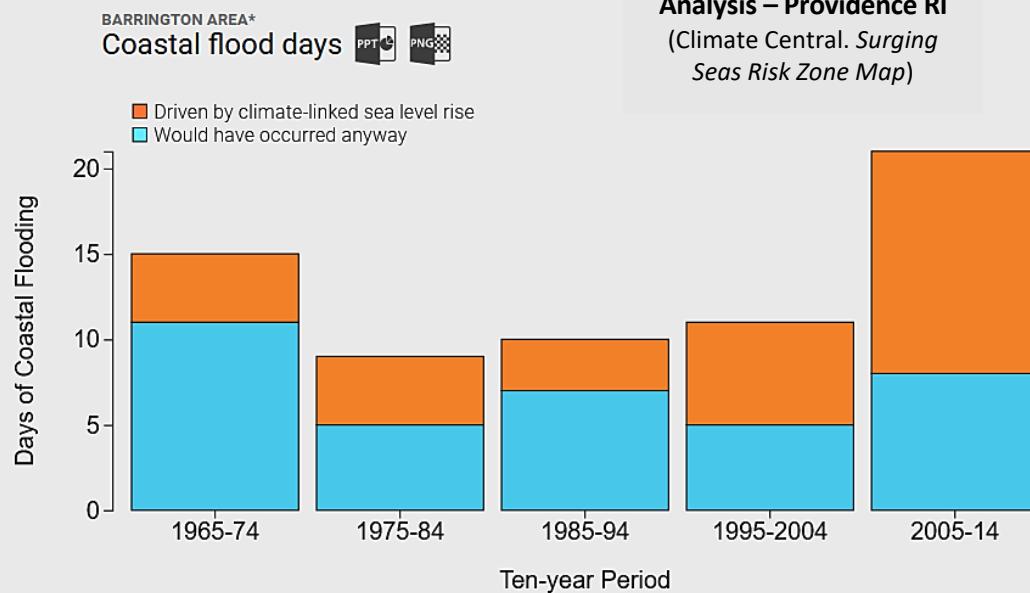


Figure 4-17 Coastal Flood Analysis – Providence RI
(Climate Central. *Surging Seas Risk Zone Map*)

* At Providence water level station, 7 miles from BARRINGTON. This is the nearest station analyzed for these statistics. [②](#)

- Humans are causing climate change, which is causing global sea level to rise.
- This graph shows just how much more flooding has come from this rise, plus the floods that would have taken place anyway.
- Flood definition: water level exceeds a local threshold set by the National Weather Service for "minor" flooding, based on observed impacts such as flooding roads.
- Findings come from a 2016 [Climate Central study covered by the New York Times](#).

Probability of Future Events

Flooding is the most prevalent and frequent natural hazard that impacts Rhode Island. As a low-lying community with roughly 20 miles of shoreline, coastal flooding is highly probable and may have serious consequences for the Town of Barrington. FEMA has determined that properties in A or V Zones have a 26% chance of flooding over the life of a 30-year mortgage (FEMA. *Unit 3, 3-4 & 3-5*).

Climate change and sea level rise will further exacerbate the impacts from flooding. Long term, even in the absence of a storm event, the projected rise in sea level alone would have a dramatic impact on the base flood elevations throughout the Town. As sea levels continue to rise, the inundation area subject to coastal flooding and storm surge will continue to increase.

As a low-lying community with 20 miles of coastline exposure to Narragansett Bay, coastal flooding is highly probable and may have serious consequences for the Town of Barrington.

If areas of undeveloped coastal wetland along the shoreline remain undeveloped, they will continue to help minimize the effects of localized flooding until SLR engulfs the land. Barrington has areas of undeveloped coastal wetland along Rumstick Point, between Nayatt Point and the Town Beach, and along Mussachuck Creek. These areas may help minimize the effects of localized flooding.



4.3.1.3 Coastal Erosion

Description and Extent

Coastal erosion is the wearing away and removal of beach resulting in loss of sand and material stability. Shorelines continuously undergo change in response to wave and current patterns, tides, storm events, coastal flooding, sea level rise, and human influences. With respect to human influences, shoreline vulnerability to coastal erosion increases with development along the coast as it impedes the natural dynamic coastal system (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-110).

While measurable coastal erosion may occur during a storm event, for planning purposes the extent is assessed over extended periods of time. Comparing aerial photographs provides insight into coastal erosion trends. According to coastal geologist Janet Freedman formerly with CRMC, the average coastal erosion rate is 1.6 feet per year in Rhode Island (Sullivan). Extreme high tides, or King Tides, occur several times a year, inundating low-lying shoreline areas such as the area west of Barrington Beach. Such events threaten to worsen erosion if coupled with wave energy produced by storms.

In 2018 the State adopted the RI Shoreline Change Special Area Management Plan (Beach SAMP) which is an outstanding tool to plan for climate change, including coastal erosion, increased storm events, and flooding from sea level rise. In addition to STORMTOOLS, an online mapping tool that shows storm surge and sea level rise scenarios for the entire Rhode Island coastline, the SAMP also provides shoreline change maps showing the extent of coastal erosion over time. The links to access the shoreline change maps for Barrington have been included under *Previous Occurrences*.

A report prepared for FEMA by the Heinz Center in 2000, stated that “Over the next 60 years, erosion may claim one out of four houses within 500 feet of the U.S. shoreline” (Heinz Center, 150). Sea wall failure and coastal erosion are related issues increasingly impacting neighborhoods along the Barrington coast. Rising sea levels have led to increased rates of erosion along beaches and coastlines and the undermining of protective walls, some of which are many decades old. Sea walls protect the structures behind them and their failure can lead to

increased property damage from storms. Similarly, intact beaches with dunes dissipate wave energy, protecting buildings behind them. As beaches erode, this protection is lost. Rather than sea walls, the top choice for new shoreline protection projects are beaches, marshes, or other natural improvements that more closely mimic coastlines because these do a better job dissipating/absorbing wave energy.

FEMA's post hazard event management practices indicate that reconstruction or repair funding for coastal protection structures will only be made available where the damage can be directly attributed to the storm event. Therefore, in order to receive this funding, the Town must maintain records of maintenance and repair activities that demonstrate the status of each structure. The Town's aerial imagery will be beneficial in qualifying future storm damage claims.

Location

All of Barrington's coastline, including revetments along several sections, is susceptible to the impacts of coastal erosion. The Town maintains revetments at Latham Park/Shore Drive in the Bay Spring neighborhood. Sections of the Latham Park structure were rebuilt in 2014. Additionally, the Town has completed periodic repairs to the sea wall along Mathewson Road at the Barrington River. If undermined by coastal erosion, these shoreline structures will fail to protect adjacent roadways and other infrastructure, and upland public and private properties.

While storm tides can cause abrupt changes, many areas are being continually impacted by the regular movement of the tides. In addition, coastal salt marshes that have nowhere to migrate will be lost as the coastline moves inland.

Previous Occurrences

Over time, sea level rise coupled with severe coastal storms, has caused erosion along Barrington's shores. Coastal erosion has narrowed beaches; compromised coastal salt marshes; and undermined revetments, road beds, public infrastructure, and coastal homes.

The Coastal Resources Management Council (CRMC) has documented shoreline change and average erosion rates for coastal areas throughout Rhode Island. Although coastal erosion does not occur linearly over time, the maps depict an average annual historic rate of change. This rate of change is recognized solely as a planning tool and used to guide CRMC regulatory decisions related to coastal activities, including setbacks from coastal features. The Town of Barrington Shoreline Change Maps produced by CRMC, documenting the erosion from 1939 to 2003 in the following eight areas, are provided below:

- [Barrington Annawomscutt](#)
- [Barrington Barrington Beach](#)
- [Barrington Barrington River](#)
- [Barrington Hundred Acre Cove](#)
- [Barrington N Barrington River](#)
- [Barrington Nyatt Point](#)
- [Barrington Palmer River](#)
- [Barrington Rumstick Neck](#)

Approximately 11 acres of coastal wetlands were degraded at the mouth of Allin's Cove. A significant restoration project was completed in 2006 to stabilize this area and for halting erosion along Byway Road. Another area experiencing significant coastal erosion is along Mussachuck Beach (**Figure 4-18**). In an EastBayRI article posted on June 6, 2019, longtime Barrington resident Will Barbeau stated "the heavy erosion seen at Mussachuck Beach is not unique to Barrington's coastline. He said it's everywhere, and will likely continue to deteriorate - a clear manifestation of climate change, global warming and sea level rise" (EastBayRI. *Coastal*).

Figure 4-18 Resident Will Barbeau Discusses Coastal Erosion along Mussachuck Beach

Photo Credit: Richard W. Dionne Jr. | EastBayRI



Climate Change Impacts

Climate change is expected to continue intensifying storms and produce rising sea levels. To assist communities to predict the potential impact to Rhode Island shorelines, CRMC, in partnership with the University of Rhode Island, developed the Shoreline Change Special Area Management Plan (Beach SAMP). As recognized in the SAMP, “In Rhode Island, coastal erosion is of particular concern because it is characterized by a storm-driven coastline...Studies of shoreline change in Rhode Island have documented an average annualized rate of shoreline change of 0.57 meters/year (1.9 feet/year), though these annualized rates should be used with caution because coastal erosion is not a gradual process, but rather the result of abrupt changes due to storms” (CRMC. *Shoreline Change SAMP*, 2-14). CRMC further indicates that, “Scientists’ understanding of coastal erosion and other coastal processes is rapidly evolving, particularly with regard to how processes are changing due to changing climate trends and what may happen in the future” (CRMC. *Shoreline Change SAMP*, 2-14).

Probability of Future Events

The likelihood of continued coastal erosion is high and will be accelerated with sea level rise and more frequent and intense storms.



WIND-RELATED HAZARDS

4.3.2 Wind-Related Hazards

Wind is the natural movement of air caused by a difference in pressure from one place to another. Local wind systems are created by the immediate geographic features in a given area, such as mountains, valleys, or large bodies of water. Wind effects can include blowing debris, interruptions in elevated power and communications utilities, and intensification of the effects of other hazards related to winter weather and severe storms (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-132). In this Section, wind-related hazards will be discussed in terms of the following three categories:

4.3.2.1 High Winds (Thunderstorms/Lightening/Hail)

4.3.2.2 Tornadoes

4.3.2.3 Tropical Cyclones (Tropical Depressions/Storms and Hurricanes)

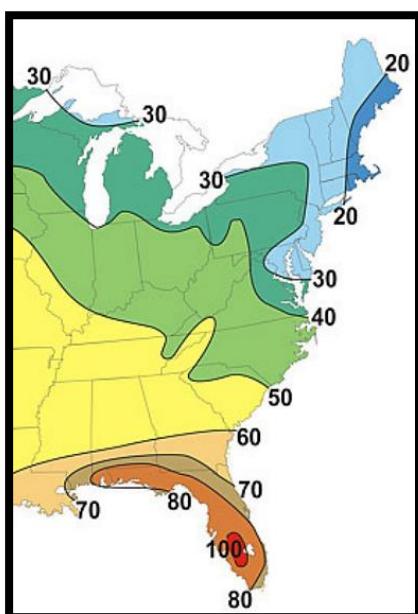


4.3.2.1 High Winds (Thunderstorms, Lightening, Hail)

Description and Extent

The wind is air moving from an area of high pressure to an area of low pressure. There are several types of damaging winds, and high winds can accompany various types of storms including thunderstorms, nor'easters, and tropical cyclones (which includes tropical depressions, tropical storms, and hurricanes).

Figure 4-19 Average Annual Number of Thunderstorms (NOAA|NWS)



Thunderstorms can have destructive winds which are classified as severe and warrant a warning to be issued when they exceed 58 mph. However, as thunderstorms can form within 30 minutes, the opportunity for warnings to be issued and heeded is limited. As illustrated in **Figure 4-19**, on average 20 thunderstorms occur annually in Rhode Island. However, according to NOAA, only about 10% of thunderstorms are categorized as severe (NOAA|NWS. *Introduction to Thunderstorms*).

In addition to high winds, thunderstorms can have lightning, rain, or hail. Hail is a showery precipitation in the form of irregular pellets or balls of ice more than 5mm in diameter which primarily occurs during the summer months in Rhode Island. Hail can damage cars and buildings, as well as devastate farm fields during the growing season. The National Weather Service (NWS) classifies hail by diameter size and relates it to everyday objects as shown in **Figure 4-20**.

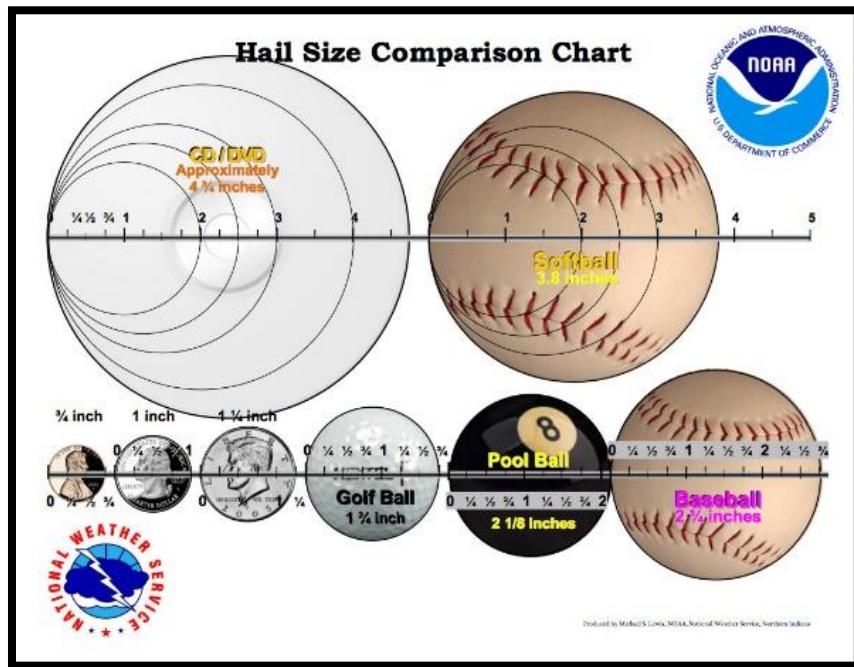


Figure 4-20 Hail Size Comparison Chart (NOAA|NWS)

The term nor'easter is used for storms, mainly affecting the northeastern part of the United States, wherein the strongest winds are traveling from a northeasterly direction. Nor'easters are associated with gale force winds ranging from 40 to 54 miles per hour, and wind gusts approaching hurricane force. The maximum sustained surface wind speed for a tropical depression is less than 39 mph, and ranges from 39-73 mph for a tropical storm. Hurricane wind speeds are the most ferocious ranging from a low end of 74 mph with a Category One Hurricane to greater than 157 mph with a Category Five Hurricane (Storm Solutions). Thunderstorms and tropical cyclones will be further discussed in this Section and nor'easters will be discussed in **Section 4.3.3 Winter-Related Hazards**

Types of Damaging Winds (NOAA|NSSL. *Severe Weather 101 - Damaging Winds*)

- **Straight-line wind:** is a term used to define any thunderstorm wind that is not associated with rotation, and is used mainly to differentiate from tornadic winds.
- **Downdraft:** is a small-scale column of air that rapidly sinks toward the ground.
- **Macroburst:** is an outward burst of strong winds at or near the surface with horizontal dimensions larger than 4 km (2.5 mi) and occurs when a strong downdraft reaches the surface. To visualize this process, imagine the way water comes out of a faucet and hits the bottom of a sink. The column of water is the downdraft and the outward spray at the bottom of the sink is the macroburst. Macroburst winds may begin over a smaller area and then spread out over a wider area, sometimes producing damage similar to a tornado. Although usually associated with thunderstorms, macrobursts can occur with showers too weak to produce thunder.
- **Microburst:** is a small concentrated downburst that produces an outward burst of strong winds at or near the surface. Microbursts are small — less than 4 km across — and short-lived, lasting only five to 10 minutes, with maximum winds speeds sometimes exceeding 100 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.

High winds can cause damage to structures, property, vehicles, utility lines, vegetation, and the shoreline, as well as bodily injury from flying debris or structures collapsing. Loss of power can disrupt daily routines and businesses, spoil refrigerated food, and if occurring in conjunction with freezing temperatures, a lack of heat in households can lead to dangerous health conditions and the potential for pipes to freeze and burst. Additionally, high winds may exacerbate fire conditions by drying out the ground cover, propelling fuel around the region, and increasing the ferocity of existing fires. (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-132).

Although anemometers, which measure wind speed and wind pressure can be found at almost all-weather stations, the Beaufort Wind Scale (**Table 4-8**), created in 1805, is still used today as a standardized scale for characterizing observed wind conditions.

Table 4-8 Beaufort Wind Scale (NOAA)

Beaufort Number	Wind Speed (mph)	Description
0	< 1	Calm
1	1-3	Light Air
2	4-7	Light Breeze
3	8-12	Gentle Breeze
4	13-18	Moderate Breeze
5	19-24	Fresh Breeze
6	25-31	Strong Breeze
7	32-38	Moderate Gale
8	39-46	Fresh Gale
9	47-54	Strong Gale
10	55-63	Whole Gale
11	64-72	Storm
12	> 73	Hurricane Force

FEMA has produced a Wind Zone Map (**Figure 4-21**) based on historic tornado and hurricane data, that depicts maximum wind speeds and is applicable in designing structures to withstand these forces. Rhode Island is included in Wind Zone II (160 mph) which identifies the maximum speed for the design of safe rooms.

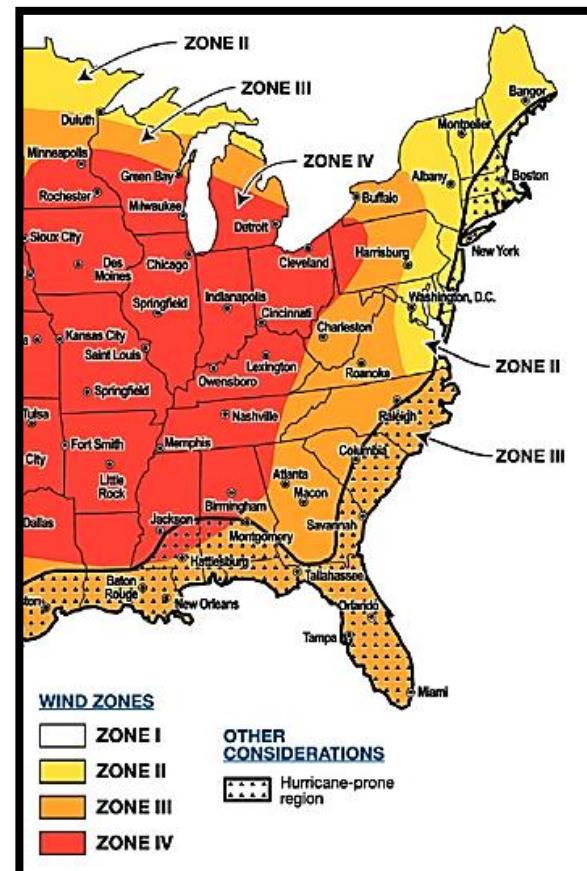


Figure 4-21 Wind Zone Map (FEMA)

Location

Severe wind - including wind produced by tropical weather systems, nor'easters, and severe thunderstorms - poses a threat to all of Barrington.

Previous Occurrences

As shown in **Table 4-9**, the National Climatic Data Center (NCDC) has recorded 66 high wind-related events in Bristol County between 1955 and 2018, which have caused roughly \$110, 500 in total property damages.

Thunderstorms during this same period have been fewer in number but have caused greater damage. On August 4, 2015, a severe thunderstorm (67 mph gust at TF Green Airport) passed through the area. It produced wind damage along an east-west path that felled trees, dropped limbs that damaged police cruisers at the Public Safety Building (**Figure 4-22**), destroyed the bus shelter at Barrington Congregational Church, and left several areas in Town without power.



Figure 4-22 Damaged Police Vehicles (August 2015)

Photo Credit: Town of Barrington

Most of the damaging wind events that occur in Barrington will be associated with another hazard category (tropical storm, hurricane, tornado, or nor'easter). in 2012, Hurricane Sandy (also referred to as Superstorm Sandy), had wind speeds of 63 knots and caused an estimated \$220,000 in damages throughout Bristol County.

Hailstorms, which can be associated with thunderstorms, have been infrequent in Barrington, but one was experienced in 2013 with quarter sized hail.

Table 4-9 NCEI Reported Events for Bristol County, RI

Type	Number of Events	Annualized Events	Property Damages	Annualized Damages
High Wind Events (1955-2018)	66	1.03	\$110,500	\$1,726
Thunderstorms (1955 – 2018)	48	0.75	\$315,000	\$4,922

RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-136 & 3-199

Climate Change Impacts

In November 2019, *Scientific American* published an article titled *The World's Winds Are Speeding Up*. It discussed the recent findings from a study published in the *Nature Climate Change* journal. For several decades, starting in the 1970s, global winds had been decreasing. The study found that, "winds across much of North America, Europe and Asia have been growing faster since about 2010. In less than a decade, the global average wind speed has increased from about 7 mph to about 7.4 mph. Using models to investigate the factors that influence the behavior of global winds, the researchers found that big climate patterns - which affect temperatures in certain parts of the world - have a major influence on wind speeds" (Harvey). While it is widely agreed that temperatures all over the Earth are steadily rising as a result of human-caused climate change, the study speculates that within that larger, long-term warming pattern, there will be natural cycles - which could last decades at a time - that oscillate between warmer and cooler periods. The shifting between these cycles may trigger shifts from slower to faster wind speeds. Continued research is needed to determine how the overall warming trend from climate change will impact long-term wind speeds (Harvey).

Probability of Future Events

Based on historical occurrences and climate change projections, Barrington can expect an event characterized as *High Wind* roughly once or twice a year and some of those will include thunderstorms. There is a low probability of hail associated with the thunderstorms.



4.3.2.2 Tornadoes

Description and Extent

According to NOAA, "Exactly how and why tornadoes form is not completely understood" (NOAA. *Tornadoes*). However, as illustrated in **Figure 4-23**, scientist do know that tornadoes develop from thunderstorms when cold air overrides a layer of warm air, causing the warm air to rise rapidly. They are vertical funnels of violently rotating air extending between a cloud and the surface of the earth. Wind speeds can reach up to 250 mph and create damage paths in excess of one mile wide and 50 miles long. Most tornadoes move southwest to northeast, but tornadoes have been known to move in any direction (National Geographic. *Tornadoes*).

NOAA has observed that the tornado season nationally lasts from March to August, with peak tornado activity normally occurring in April, May, and June. Historically, the highest concentrations of tornadoes have been in the Central U.S. and portions of the Gulf Coast states (NOAA|NSSL. *Severe Weather 101 – Tornadoes*).

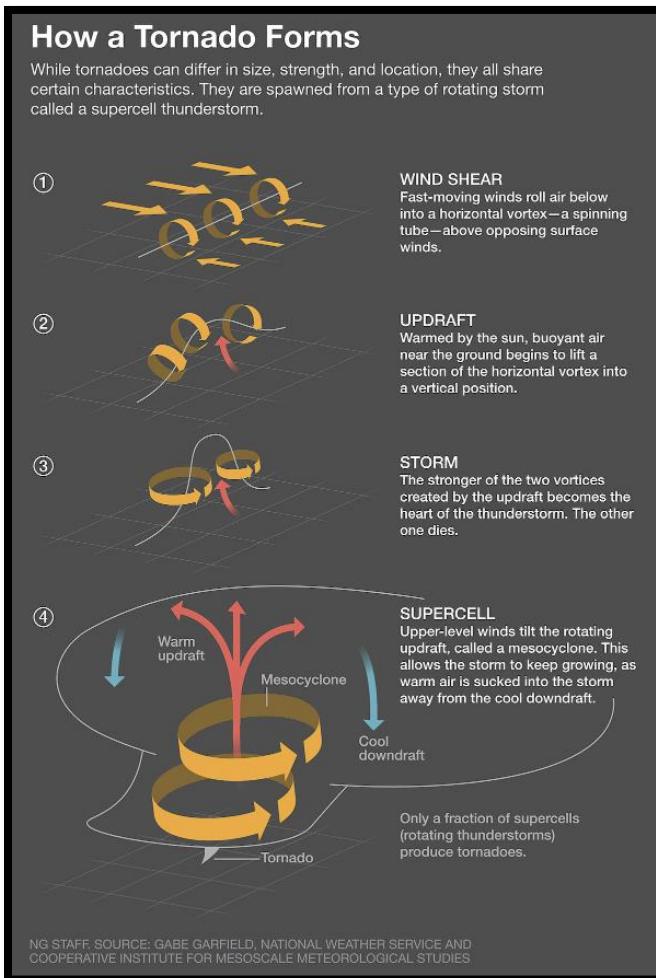


Figure 4-23
How a Tornado Forms
(National Geographic)

NOAA's Storm Prediction Center issues tornado and severe thunderstorm watches. A tornado watch does not indicate an imminent tornado; rather, a tornado watch is an advisory for citizens to be alert and prepared to go to safe shelter should a tornado develop or if a tornado warning is issued. Local National Weather Service offices are responsible for issuing tornado warnings. Tornado warnings indicate that a tornado has been spotted, or that Doppler radar detects a thunderstorm circulation capable of spawning a tornado (NOAA. *Severe Weather Definitions*).

Tornadoes can be devastatingly destructive to everything in their path, including homes, property, and infrastructure, particularly electrical utilities and communications. In addition to lost revenues, downed power lines present a threat to personal safety. Further, downed wires and lightning strikes have been known to spark fires. A structure's tornado vulnerability is based in large part on building construction and standards. In general, mobile homes and wood-framed structures are more vulnerable to damage from a tornado than steel framed structures. Other factors, such as location and condition/maintenance of trees, also play a significant role in determining vulnerability.

Human vulnerability is based on the availability, reception, and understanding of early warnings of tornadoes, and access to substantial shelter. Once warned of an impending tornado hazard, seeking shelter indoors on the lowest floor of a substantial building away from windows is recommended as the best protection against bodily harm. According to NOAA, approximately 60 deaths a year are related to tornados. Wildlife can also be killed or disrupted if their habitat is impacted.

The Fujita scale is used to characterize tornadoes based on the damage they produce and relating that damage to the fastest quarter-mile wind at the height of a damaged structure. The 2007 Enhanced Fujita Scale, shown in **Table 4-10**, improves upon the original scale by including more damage indicators, taking into account construction quality and variability, and providing a more definitive correlation between damage and wind speed (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-207).

Table 4-10 Fujita Scale and Enhanced Fujita Scale (RI-SHMP)

Fujita Scale			Enhanced Fujita Scale	
F Number	Fastest ¼ mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85
1	73-112	79-117	1	86-110
2	113-157	118-161	2	111-135
3	158-207	162-209	3	136-165
4	208-260	210-261	4	166-200
5	261-318	262-317	5	Over 200

Location

Though Rhode Island is not a region that is highly susceptible to tornados, it is possible for one to occur anywhere in the region. All areas of Barrington are considered equally exposed to a tornado.

Previous Occurrences

New England does not frequently suffer destruction from tornados, with the region's most serious tornado event occurring in Worcester Massachusetts on July 9, 1953. In that event, 90 people were killed and 1,300 injured. A tornado is reported in southern New England, on average, once every two to three years (NASA - Earth).

Based on data since 1950, 20 tornadoes have touched down in Rhode Island with 23 associated injuries, no fatalities, and damage estimated at \$3.6 million. Two of those impacted Bristol County; one on September 14, 1972 (F0 Scale) and the second on July 23, 2008 (EF1 Scale). The July 2008 tornado began just off of Rumstick Point in Barrington (**Figure 4-24**) and then moved easterly to Warren at Hanley Farm Road. It continued eastward across the Kickemuit River in the Tiverton Highlands section of Warren, crossed over the Cole River and continued to Ocean Grove, Swansea. The tornado's path was over 3 miles long and 40 yards wide, with winds reaching speeds of 65-75 mph. Most of the damage in Barrington had a rating of EF0 on the Enhanced Fujita Scale, but one section of Warren received EF1 damage with wind speeds estimated at 90 mph. Total damage across jurisdictions was estimated at \$45,000 and no injuries were reported (Western Mass News). NOAA/NCEI Storm Events Database does not list any tornadoes occurring in Bristol County after 2008.



Figure 4-24 Funnel Cloud

Photo Credit:

Nicholas Caisse | Boston.com

Climate Change Impacts

According to the Center for Climate and Energy Solutions (C2ES), “The link between tornadoes and climate change is currently unclear. Current data on tornadoes is inconsistent because measuring the presence of tornadoes relies on eyewitness accounts and a wealth of damage assessments rather than quantitative data. Additionally, it is difficult to identify long-term trends in tornado records, which only date back to the 1950s in the U.S” (C2ES. *Tornadoes*). Additionally, tornadoes are considered too geographically small to be accurately modeled. That being said, multiple studies do suggest that, “the conditions that produce the most severe thunderstorms from which tornadoes may form are more likely as the world warms” (C2ES. *Tornadoes*).

Probability of Future Events

Although tornadoes are a rare occurrence in Rhode Island, a risk does exist, particularly during peak hurricane season (mid-August through October). The RI-SHMP indicates that, “As a whole, Rhode Island has less than 1% probability of a tornado incident occurring in a given year” (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-210).

NOAA’s Storm Prediction Center constantly monitors changing weather conditions and is able to provide short-term tornado predictions, but unfortunately, there is no long-term forecasting system that can accurately predict the likelihood of a tornado event. Because of predictive limitations, it is important for the community to be signed up for CodeRED Emergency notifications. Broadcasting tornado warnings through an extensive communication network is currently the best means for mitigating tornado hazards.



4.3.2.3 Tropical Cyclones (Tropical Depressions/Storms and Hurricanes)

Description and Extent

"Tropical cyclones, a general term for tropical storms and hurricanes, are low pressure systems that usually form over the tropics. These storms are referred to as "cyclones" due to their rotation. Tropical cyclones rotate counterclockwise and 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, down trees and power lines, and inflict structural damage. There are three categories of tropical cyclones:

- **Tropical Depression:** maximum sustained surface wind speed is less than 39 mph
- **Tropical Storm:** maximum sustained surface wind speed from 39-73 mph
- **Hurricane:** maximum sustained surface wind speed exceeds 73 mph

Most Atlantic tropical cyclones begin as atmospheric easterly waves that propagate off the coast of Africa. These low-pressure depressions move over warm, tropical water, crossing the tropical North Atlantic and Caribbean Sea. When a storm starts to move toward the 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" (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-215).

According to NOAA, the Atlantic hurricane season runs from June 1 to November 30, with the peak between mid-August and late October (NOAA|NHC. *Tropical*). In Rhode Island hurricanes occur most often in September.

Hurricanes are categorized according to the Saffir-Simpson Scale depicted in **Table 4-11**, with ratings determined by wind speed and central barometric pressure. Hurricane categories range from one (1) through five (5), with Category 5 being the strongest (winds greater than 157 mph) (NOAA|NHC. *Saffir-Simpson*).

A hurricane watch is issued when hurricane conditions could occur within the next 48 hours. A hurricane warning indicates that sustained winds of at least 74 mph are expected within 36 hours or less. The reliability of predicting the path of hurricanes and wind speed has helped allow communities to better prepare for these storms which lessens the amount of damage to people and property (NOAA|NHC. *NHC Issuance*).

Although the Saffir-Simpson Scale is widely accepted, in a 2018 publication through the Yale School of Forestry and Environmental Studies, it postulated that because storm surge is a complex interaction between storm meteorology, storm track, and the topography of the impacted shoreline, there is no statistical relationship between the Saffir-Simpson classification of a tropical storm and the resulting storm surge. This is an important distinction because lower category hurricanes may end up causing an unexpected level of destruction due to associated storm surge. This was the case in 2018 when Florence was downgraded from a Category 4 to a Category 1 hurricane. Meteorologists warned that the flood and surge potential were still major threats, but many Carolinians chose not to evacuate after Florence was downgraded, resulting in trapping and stranding tens of thousands of people (Young).

If strong winds and high storm surge occur concurrently, the damages to property and public infrastructure, and the risks to public safety, may present a situation that is overwhelming to responders.

Table 4-11 Saffir-Simpson Scale of Hurricane Intensity (NOAA|NHC)

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

Hurricanes can damage structures, property, and infrastructure, as well as disrupt transportation routes and pose threats to public safety. While strong winds from hurricanes can pose a threat to life and property, the greatest threat posed by hurricanes in Rhode Island is generally heavy rainfall and flooding caused by storm surge. When coupled with normal tides, storm surge can raise the mean water level 15 feet or more. Hurricanes also have the potential to cause coastal erosion. As storms erode the shoreline, they put adjacent properties at greater risk. A home constructed in the V-zone may be destroyed as the beach erodes and the barrier or headland is washed over by high water in a storm.

Location

The RI-SHMP indicates that Rhode Island is particularly vulnerable to tropical cyclones (tropical depressions, tropical storms, and hurricanes) due to its geographic location and features such as Narragansett Bay, which can act as a funnel for hurricane surges (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-217).

Barrington's coastal location and low elevation town-wide, makes it particularly susceptible to hurricanes with the majority of properties vulnerable to some extent. Hurricane surge values for Category 1 through 4 hurricanes were developed by the National Hurricane Center using the SLOSH (Sea Lake and Overland Surge from Hurricanes) Model. The U.S. Army Corps of Engineers, New England District created a Hurricane Surge Inundation Areas (Worst Case) for Rhode Island GIS layer (2009) to assist emergency management officials in hurricane preparedness and operations. This GIS data was used to produce **Figure 4-15** which depicts Hurricane Surge Inundation areas for Barrington. Under modeled scenarios, even Category 1 and 2 hurricanes could produce storm surges that inundate large areas of Town, particularly in Hampden Meadows.

There remain a few areas of Town along the coastline, particularly the neighborhoods in the vicinity of Narragansett Avenue/Shore Drive and Willow Way/Appian Way, where many of the houses have not been substantially renovated and therefore may not meet current building codes. These homes may be more susceptible to wind damage

Previous Occurrences

As reported in the RI-SHMP, 37 hurricanes have tracked within 50 miles of Rhode Island since 1851. As shown in **Table 4-12**, over the past eighty years there are eleven documented tropical cyclones that have significantly impacted Rhode Island. **Figure 4-25**, illustrates the hurricane paths for three Category 3 hurricanes that directly impacted Rhode Island causing millions of dollars in damage and hundreds of deaths.

Figure 4-25
Hurricane Paths of Significant New England Hurricanes: 1938, 1954, 1991
(NOAA | NCDC)

Barrington's coastal location and low elevation make it susceptible to hurricane hazards and the Town's small size means that the majority of properties are vulnerable to hurricane impacts. Past occurrences of flooding and storm surge from hurricanes has caused significant damage to Barrington. The 1938 Hurricane (Category 3) and Hurricane Carol in 1954 (Category 3) were highly destructive. These hurricanes generated flood elevations of over 13 feet in Barrington (Vallee, David).

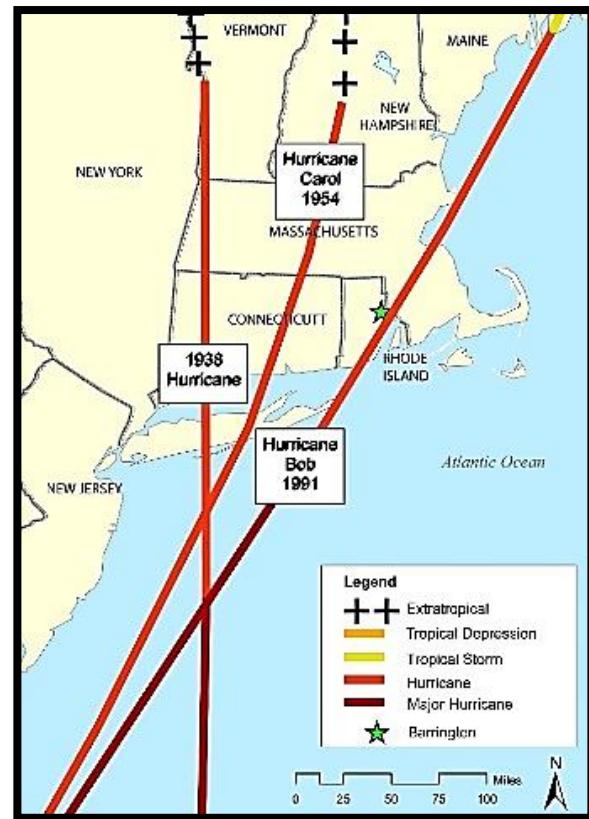


Table 4-12 Significant Tropical Cyclones Affecting Rhode Island Since 1938

Hurricane	Category	Wind Speed at Landfall	Damage to RI
Great New England Hurricane - 1938 (September 21, 1938)	Hurricane: 3	Sustained to 91 mph, gusts to 121	The Rhode Island coastline experienced widespread damage estimated at \$100 million, and 262 people lost their lives. Sustained winds of 95 mph recorded; tide 15 feet above mean sea level (at USGS gage in Westerly). Virtually all of the state was without power – with 10% of electric customers without power for 12 days.
Great Atlantic Hurricane - 1944 (September 14-15, 1944)	Hurricane: 3	Sustained to 49 mph, gusts to 90	Affected Rhode Island and southeastern Massachusetts; \$2 million in property damage with 701 homes and businesses destroyed and over 12,000 damaged; no loss of life.
Carol (August 31, 1954)	Hurricane: 3	Sustained to 100 mph, gusts to >125	Coastal communities were hit hard; downtown Providence had 13 feet of flooding; storm surge in upper bay was 14 feet; regionally \$90 million in damages; 19 fatalities in New England; and most of Rhode Island was without power with some customers not regaining power for 7 days.

Table 4-12 *Continued*

Hurricane	Category	Wind Speed at Landfall	Damage to RI
Edna (September 11, 1954)	Hurricane: 3	Sustained to 95 mph, gusts to 110	Inland flooding. Rivers rose several feet above flood stage. Knocked out electrical power.
Diane (August 17-20, 1955)	Tropical Storm	Gusty winds 25 to 45 mph	Damage to power lines was high, and at one point 82% of Rhode Island's homes were without electricity. Ample warning permitted people to return home from school and work early, and as a result, only two (2) lives were lost. Property damage amounted to \$170 million, most resulting from torrential rains, which caused serious river flooding.
Donna (September 12, 1960)	Hurricane: 2	Sustained to 95 mph, gusts to 130	Moderate storm surge, extensive beach erosion. Wind damage to trees and utility poles causing major power outages.
Esther (September 20-21, and 25 1961)	Hurricane: 3	Strong gales 35 to 50 mph	Heavy shore damage at Sakonnet Point in Little Compton and Misquamicut in Westerly.
Gloria (September 27, 1985)	Hurricane: 2	Sustained to 81 mph, gusts to 100	Minor coastal flooding and erosion. Scattered power outages.
Bob (August 19, 1991)	Hurricane: 2	Sustained to 100 mph, gusts to >105	Storm surge of 5 to 8 feet, extensive beach erosion; wind damage to trees and utility poles; and 60% of southeast RI lost power.
Irene (August 27, 2011)	Tropical Storm	Sustained to 44 mph	Irene knocked down trees and power lines, leaving up to half of Rhode Island residents without power. Gusts of wind up to 71 mph were reported, and storm surge (2 to 4 feet) in Narragansett Bay caused some coastal damage. However, the majority of damage was caused by wind.
Sandy (October 29, 2012)	Hurricane: 1	60 to 80+ mph gusts	Significant damage all along the coast; beaches along Westerly, including Misquamicut, were devastated; more than 122,000 people lost power; roughly \$40 million in support from disaster relief programs helped Rhode Island recover.
Henri (August 21, 2021)	Tropical Storm	60 to 70 mph gusts	Scattered power outages, tree damage and tree debris blocked roads.. Maximum storm surge 2.19 ft at low tide (NOAA Tides & Currents, Conimicut Light tide gauge).

RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-221 through 3-223; and NOAA (Vallee, David)

Climate Change Impacts

A recent publication by Yale Climate Connections suggest that some climate change models predict a global decrease while others an increase in the number of future cyclones. However, "There is a strong consensus in the tropical cyclone climate community that the incidence of high-category events will increase, and that storms will precipitate more" (Berardelli). An increase in the rainfall rates and destructive potential of future tropical cyclones is consistent with NOAA's findings. According to NOAA, due to wind intensity, 85% of all damage from hurricanes come from Category 3, 4, and 5 storms. Coupled with rising sea levels, these more intense hurricanes will amplify impacts to coastal communities (Knutson). The Intergovernmental Panel on Climate Change (IPCC) has also created long-term global climate models that indicate the probability of hurricanes becoming more intense, with stronger winds and heavier precipitation, through the 21st century.

Probability of Future Events

Based on climate change modeling from NOAA, the IPCC, and other sources, there is a high probability of hurricanes becoming more intense, with stronger winds and heavier precipitation, through the 21st century. According to the RI-SHMP, every year there is a 22.8 percent chance of a hurricane impacting Rhode Island (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-230). As their impact can be devastating, it is important for the Town to remain apprised of improvements in forecasting and understanding the impact from hurricanes.



WINTER-RELATED HAZARDS

4.3.3 Winter-Related Hazards

The winter-related hazards of heavy snow, ice, and extreme cold, detailed in this Section, can occur in combination or independently.

Description and Extent

❖ *Heavy Snow*

“A heavy snow is generally defined as having more than nine (9) inches of accumulation in less than 24 hours. Heavy snow can bring a community to a standstill by inhibiting transportation, knocking down trees and utility lines, and causing structural collapse in buildings and infrastructure not designed to withstand the weight of the snow. Repair and snow removal costs can be significant and surpass annual municipal salt and snow removal budgets, often before the end of the season” (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-180).

According to the National Severe Storms Laboratory (NOAA|NSSL. *Severe Weather 101 – Winter Weather*) key winter weather alerts include:

- **Blizzard Warning:** Issued when winds of 35 mph or greater are combined with blowing and drifting snow with visibilities of 1/4 mile or less. Seek indoor shelter immediately and stay indoors until the severe conditions end.
- **Winter Storm Warning:** Issued when a combination of hazardous winter weather in the form of heavy snow, heavy freezing rain, or heavy sleet is imminent or occurring. Winter Storm Warnings are usually issued 12 to 24 hours before the event is expected to begin.
- **Winter Storm Watch:** Issued 12-48 hours in advance of the onset of severe winter conditions. The watch may or may not be upgraded to a winter storm warning, depending on how the weather system moves or how it is developing.

In the northeastern United States, the term nor'easter is used to describe storm events that have northeasterly winds that blow in from the ocean. Nor'easters are a common winter occurrence in New England and often result in flooding, various degrees of wave and erosion-induced damage to structures and natural resources. The erosion of coastal features (such as beaches, dunes, and coastal bluffs) commonly results in greater potential for damage to shoreline development from future storms. The amount of coastal erosion caused by nor'easters depends on the intensity and the duration of the storm; the tidal phase at the time of the storm; the path of the storm; and the time interval between storms (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-215).

The storm radius of a nor'easter, traveling up the eastern United States coast, is often as large as 1,000 miles, and the horizontal storm speed is generally around 25 miles per hour (mph). 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 off shore, wreaking damage for days (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-215). Although these storms occur between October and April, they are most severe in the winter when the difference in temperature between the converging cold polar air and warmer air over the Atlantic Ocean is the greatest (NOAA|NHS. *What is*).

While the winds from nor'easters are not as powerful as hurricane winds, their wind gusts can approach hurricane force, which means nor'easters also have the potential to tear off roofs and topple structures. If a nor'easter hits the coast as a blizzard, the ensuing snowfall can collapse weak roofs, as well. The winds also produce storm surges that, because nor'easters are prolonged events, can continue through multiple high tides – the period when the threat of flooding is greatest along the extensive Barrington shoreline. Additionally, heavy snow accumulation and freezing temperatures can create dangerous driving conditions (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-215).

Other than characterizing a winter storm as an ice storm, snow squall, or blizzard, there is no universally accepted scale to measure them. However, the Northeast Snowfall Impact Scale (NESIS), developed by the NWS, is commonly used to characterize and rank significant Northeast snowstorms with 10 inches or greater accumulation. The NESIS index is unique in that in addition to meteorological measurements it uses population information which provides a framework for the storm's societal impacts, particularly in terms of transportation and economic impact. **Table 4-13** provides the NESIS values which are a function of the area affected, the amount of snow, and the number of people living in the path of the storm, as well as a descriptive adjective related to hazard impact (NOAA|NCDC. *The Northeast*).

Table 4-13 NESIS Index (NOAA|NCDC)

Category	NESIS Value	Description
1	1–2.49	Notable
2	2.5–3.99	Significant
3	4–5.99	Major
4	6–9.99	Crippling
5	10+	Extreme

❖ **Ice Storm**

The term ice storm is used to describe the weather phenomena involving rain or snow being converted to ice with accumulations that create hazardous conditions on the ground. Even small accumulations of ice can create hazards for motorists and pedestrians, and heavy accumulations of ice can bring down trees and utility poles.

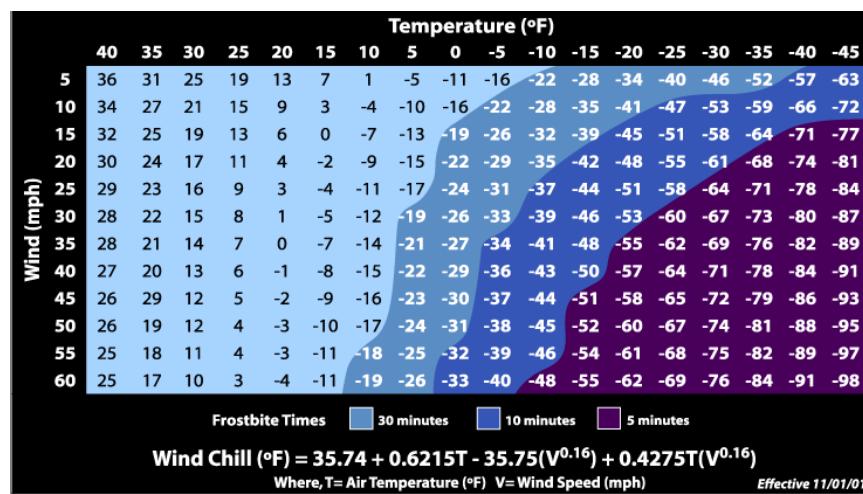
❖ **Extreme Cold**

What is considered an excessively cold temperature varies according to the normal climate of a region. Extreme cold for Rhode Island is characterized by temperatures well below zero degrees Fahrenheit for an extended period of time, and may accompany winter storms, be left in their wake, or can occur without storm activity (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-87). Extreme cold can lead to hypothermia and frostbite, which are both serious medical conditions. If extreme cold conditions are combined with low/no snow cover, the cold can better penetrate downward through the ground and potentially create problems for underground infrastructure as well. When utilities are affected and heaters do not work, water and sewer pipes can freeze and even rupture.

Rather than simply the outside temperature, extreme cold is typically measured in terms of the NWS Wind Chill Temperature (WCT) index shown in **Figure 4-26**. The index attempts to quantify the cooling effect of wind with the actual outside air temperature in order to provide a more realistic representation of how cold people and animals feel, based on the rate of heat loss from exposed skin (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-87).

Figure 4-26 Wind Chill Index Chart (NOAA|NWS)

"A wind chill index of -5°F indicates that the effects of wind and temperature on exposed flesh are the same as if the air temperature alone were five (5) degrees below zero (0), even though the actual temperature may be much higher. The NWS issues a wind chill advisory when wind chill temperatures are potentially hazardous and a wind chill warning when the situation can be life-threatening" (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-87).



Location

Barrington's coastal location makes it somewhat less prone to heavy snowfall than inland communities, but virtually any area of Town could be impacted by a severe winter storm. All areas of Barrington are considered exposed to winter-related hazards, with the shoreline areas more vulnerable to nor'easter wind gusts.

There remain a few areas of Town along the coastline, particularly the neighborhoods in the vicinity of Narragansett Avenue/Shore Drive and Willow Way/Appian Way, where many of the houses have not been substantially renovated and therefore may not meet current building codes. These homes may be more susceptible to roof collapse due to heavy snow loads.

Previous Occurrences

Barrington's coastal location makes it somewhat less prone to heavy snowfall than inland communities, but winter storms are a regular occurrence in Barrington, with snowfall ranging from a few inches to blizzard conditions, including sustained winds or frequent gusts of 35 mph or greater. These storms can create hazardous and disruptive conditions due to broken tree limbs, loss of power, school closings, business/civic service interruption, dangerous driving conditions with reduced visibility to less than a quarter mile, coastal erosion, and flooding conditions when the snow melts.

Figure 4-27 Blizzard of 1978 Providence, RI



Photo Credit: Providence Journal

Figure 4-28 Barrington Public Works Truck 8 (Winter Storm, February 2013)



Photo Credit: Town of Barrington

As shown in **Table 4-14**, the frequency of winter storms has varied over the past several decades, with Bristol County averaging just over 2 winter weather storm events annually. While most of the storms did not cause property damage, many resulted in traffic difficulties or school and commercial closings.

Over the past 100 years, the most significant nor'easter to impact Rhode Island was the Blizzard of 1978 (**Figure 4-27**). The snow accumulation was up to 4 feet and wind speeds exceeded 60mph. Throughout the state more than 10,000 people were stranded on roadways. Regrettably, 232 injuries and 26 deaths resulted from the storm, and damages totaled more than \$15 million (Strauss).

More recently, the state experienced a powerful nor'easter in February 2013 (**Figure 4-28**), known as Winter Storm Nemo. Isolated thunderstorms were common across the entire region during the height of the storm and Barrington received 2 to 2.5 feet of snow. The Providence Journal reported that almost 170 people sought treatment for storm-related heart attacks, falls, and other injuries and an additional 10 people were hospitalized with carbon monoxide poisoning (NOAA|NCEI. *Storm Events Database*). Governor Lincoln Chafee declared a state of emergency in Rhode Island and enacted a state travel ban that lasted nearly 24 hours (Rapoza). National Grid estimated more than 180,000 customers lost power. Rhode Island received \$1 million in reimbursements from the Federal Emergency Management System (FEMA) for snow removal costs from the storm (Cicilline).

Another significant nor'easter occurred in January 2015. The blizzard inundated Rhode Island with roughly 16 inches of snow, produced strong winds with gusts of 50 to 65 mph, caused several fatalities, and caused approximately \$8.4 million in damages statewide. The Governor declared a state wide travel ban beginning at midnight on January 27 and continuing through 8 pm on January 28, 2015. President Obama issued a Presidential Major Disaster Declaration for the State, allowing federal assistance for emergency work and repairs to facilities damaged by the storm (NOAA|NCEI. *Storm Events Database*).

Table 4-14 Significant Winter Storms for Bristol County 1996-2020 (NOAA|NCEI. *Storm Events Database*)

Hurricane	Category	Description	Damages
1/7/1996	Heavy Snow	Blizzard of 1996 – 1-2 feet	School and commercial closings; transportation difficulties
2/2/1996	Heavy Snow	6-8 inches	Transportation difficulties
3/2/1996	Heavy Snow	6-11 inches	Numerous automobile accidents
3/7/1996	Heavy Snow	7 inches	Heavy wet snow on power lines
4/9/1996	Heavy Snow	Up to 7 inches	Heavy wet snow on power lines; downed trees and power lines; power outages
1/11/1997	Heavy Snow	4-7 inches	Numerous automobile accidents
1/31/1997	Ice	Freezing rain	Numerous automobile accidents; 1 death
3/31/1997	Heavy Snow	1 foot; 60-70mph winds	Widespread power outages; transportation difficulties
4/1/1997	Heavy Snow	Near blizzard conditions; 19 inches	Heavy wet snow; downed trees and power lines; power outages; school closings
2/25/1999	Heavy Snow	8-13 inches	School closings; transportation difficulties
3/15/1999	Heavy Snow	7-12 inches	School and commercial closings; transportation difficulties
2/18/2000	Heavy Snow	3-8 inches	Treacherous driving conditions
1/20/2001	Heavy Snow	Up to 8 inches	Minor accidents
2/2001	Ice	Freezing rain	Minor transportation difficulties
12/5/2002	Heavy Snow	Average of 7 inches	

Table 4-14 *Continued*

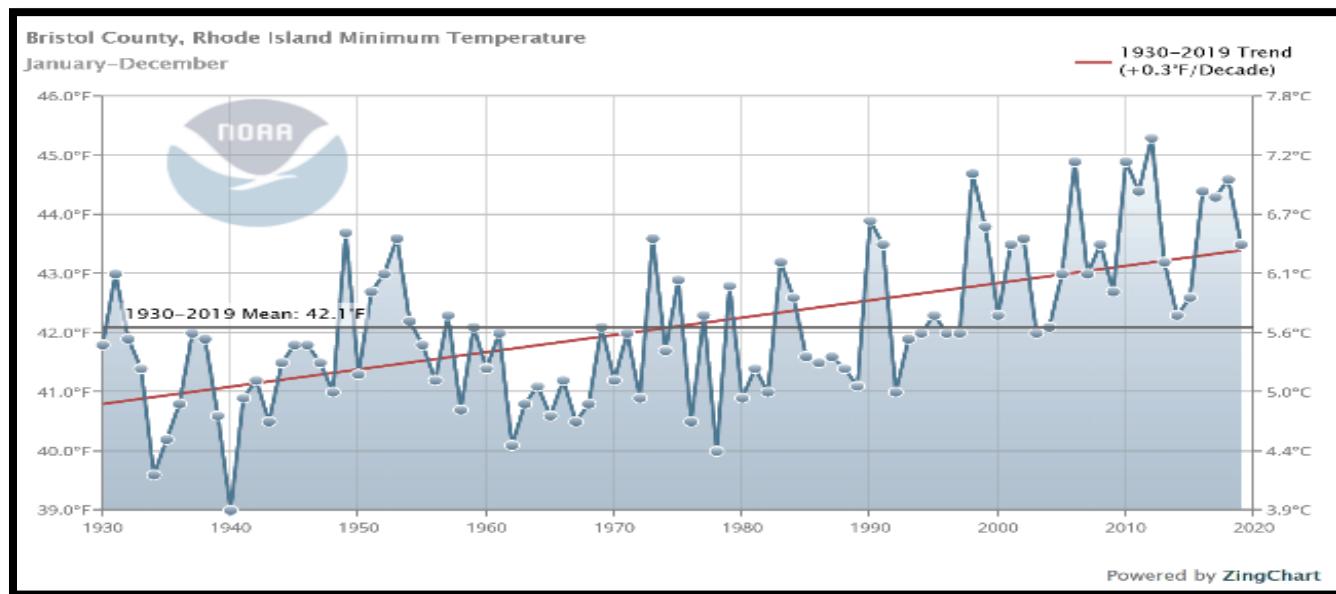
Hurricane	Category	Description	Damages
2/7/2003	Winter Storm	8-11 inches	Minor automobile accidents
2/17/2003	Winter Storm	16-17 inches	Occurred during school vacation so only minor transportation disruption
3/6/2003	Winter Storm	7-8 inches	Minor transportation disruption
12/5/2003	Winter Storm	10-20 inches	Major transportation disruption
12/26/2004	Winter Storm	7-8 inches; 50mph winds	Treacherous driving conditions
1/22/2005	Winter Storm	Major storm; near blizzard conditions; 21 inches; 60mph winds	Coastal flooding
2/24/2005	Heavy Snow	8 inches	
3/1/2005	Winter Storm	6 inches	
2/12/2006	Winter Storm	Blizzard-like conditions; 9-14 inches	
12/13/2007	Heavy Snow	12 inches	Major transportation disruption
12/19/2008	Heavy Snow	10-11 inches	
12/19/2009	Heavy Snow	18-21 inches	School and commercial closings; flights cancelled; roads unplowable
12/26/2010	Winter Storm	6-10 inches	
1/12/2011	Heavy Snow	7 inches	
1/26/2011	Heavy Snow	9-10 inches	
1/21/2012	Heavy Snow	9-10 inches	
2/8/2013	Blizzard	Blizzard conditions; 2-2.5 feet	
3/7/2013	Heavy Snow	6-7 inches	
1/2/2014	Heavy Snow	Bitter temperatures; strong winds; 6-9 inches	
1/21/2014	Heavy Snow	6 inches	
2/5/2014	Heavy Snow	6 inches	
2/15/2014	Heavy Snow	Strong winds; 6-8 inches	
1/26/2015	Blizzard	Blizzard conditions; 1.5-2 feet	School and commercial closings; flights cancelled
2/2/2015	Heavy Snow	Gusty winds; 6-7 inches	
2/8/2015	Heavy Snow	Extreme cold; 10-20 inches	
2/14/2015	Heavy Snow	Near blizzard conditions; 9-14 inches	Coastal flooding
3/5/2015	Heavy Snow	7-9 inches	
1/23/2016	Heavy Snow	High winds; 9 inches	
2/5/2016	Heavy Snow	3-11 inches	Heavy wet snow; downed tree limbs
4/4/2016	Heavy Snow	7-8 inches	
1/7/2017	Winter Storm	10-12 inches	
2/9/2017	Winter Storm	10-12 inches	
1/4/2018	Winter Storm	12-17 inches	
1/29/2018	Winter Storm	6-9 inches	
3/13/2018	Winter Storm	10-13 inches; 50mph wind gusts	
3/3/2019	Winter Storm	6-8 inches	
12/16/2020	Heavy Snow	5-8 inches; wind gusts 40-45mph	

Climate Change Impacts

In an article published in March 2018 on NOAA's Climate.gov website, it states that, "The National Climate Assessment notes that for the entire Northern Hemisphere, there has been an increase in both the number and strength of storms during colder months since 1950. And, in particular, extremely heavy snowstorms have increased in number over the last century in northern and eastern parts of the United States" (Di Liberto). However, the total amount of snowfall averaged across the Northern Hemisphere is in decline due to global warming (Di Liberto).

As illustrated in **Figure 4-29**, temperatures in Bristol County have been steadily climbing since the 1930s. A decrease in extreme cold days has already been documented and is expected to continue. For example, prior to 1980, there was at least 120 days annually with temperatures at or below freezing. This has not occurred since 2000 (Vallee and Giuliano).

Figure 4-29 Bristol County Annual Minimum Temperature 1930-2020 (NOAA|NCEI)



More research and better predictive models are needed to determine if despite a decline in total snowfall, the winter storms that Rhode Island and other areas experience will become more intense. Further, some studies that have been done suggest that although the total amount of snowfall may be decreasing, the overall precipitation rate is increasing. Coupled with sea level rise, more precipitation is problematic in terms of flooding hazards (Di Liberto).

Probability of Future Events

Winter weather events for the Town, as in most of the northeast, can be described as unpredictable. Days with below freezing temperatures may be followed by days with mild temperatures in the 40s or 50s. Based on history and climatic conditions, the RI-SHMP determined that there is between a 50% and 89.9% annual probability of extreme cold occurring in Rhode Island during the upcoming 5-year period. However, it is likely that the extreme cold temperatures will only occur for short periods of time. According to the RI-SHMP, an examination of NCEI data suggests that annually, all Rhode Island counties can expect to experience about one nor'easter and two to seven winter weather events of some significance (RIEMA. State of Rhode Island Hazard Mitigation Plan, 3-87, 3-88, 3-184).



INFECTIOUS DISEASES



4.3.4 Infectious Diseases

Profiles for the following natural hazards have been included in this Section.

4.3.4.1 Vector-borne Diseases Transmitted by Ticks and Mosquitoes

4.3.4.2 Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses



4.3.4.1 Vector-Borne Diseases Transmitted by Ticks and Mosquitoes

Description and Extent

Vector-borne diseases are infections transmitted to humans and other animals by blood-feeding arthropods, such as mosquitoes and ticks.

❖ **Mosquitoes**

Mosquitoes are carriers (vectors) for many diseases. There are 46 mosquito species in Rhode Island, including the species that carry West Nile Virus (WNV) and Eastern Equine Encephalitis (EEE) (RIDEM. *About Mosquitoes*). Female mosquitoes have a mouthpart made to pierce skin and siphon off blood which it requires to complete its egg production cycle. As the mosquito fills itself with blood, it injects saliva into the host's skin. If disease-causing organisms are present in the blood from one of the mosquito's victims, those organisms could then be injected into other victim's bloodstreams when the mosquito feeds again. Mosquitoes can spread disease from animal to animal, animal to man, and from person to person in this manner (Mayo Clinic. *Mosquito Bites*).

➤ **West Nile Virus (WNV)**

"West Nile virus (WNV) is the leading cause of mosquito-borne disease in the continental United States. It is most commonly spread to people by the bite of an infected mosquito. Cases of WNV occur during mosquito season, which starts in the summer and continues through fall. There are no vaccines to prevent or medications to treat WNV in people. Fortunately, most people infected with WNV do not feel sick. About 1 in 5 people who are infected develop a fever and other symptoms. About 1 out of 150 infected people develop a serious, sometimes fatal, illness. You can reduce your risk of WNV by using insect repellent and wearing long-sleeved shirts and long pants to prevent mosquito bites" (CDC. *West Nile Virus*).

➤ **Eastern Equine Encephalitis Virus (EEEV)**

The disease is rare, but the impacts of infection can be deadly. Nearly 30 percent of the people that contract the disease die. EEEV can cause brain infections including meningitis and encephalitis, and many survivors have ongoing neurologic problems. As of September 22, 2020, seven confirmed cases of EEE virus disease were reported to the CDC for the year, including Massachusetts (4), Michigan (1), and Wisconsin (2) (CDC. *Eastern Equine Encephalitis*).

❖ **Ticks**

Another type of blood-feeding arthropod, the tick, is also common in North America, and can spread disease in the same manner. According to RIDOH, “Ticks feed on small wild rodents, deer, pets, and humans. When a tick becomes infected and continues to feed on various hosts, the bacteria, virus, or parasite can be transmitted. Ticks that are located in the brush and on tall grasses come into contact with humans as we pass through these environments” (RIDOH. *Tick*). Not every tick is a carrier, but if you are bitten by an infected tick, the disease may be transmitted to you.

“Lyme disease, Anaplasmosis, and Babesiosis are the most frequently reported tick-borne diseases in Rhode Island” (RIDOH. *Tick*). In 2016, Rhode Island had their first case of Powassan virus, which is currently not treatable. Although the risk of being bitten is greater in the spring and summer when the nymphs are feeding, you may find ticks any time the temperature is above freezing (RIDOH. *Tick*).

“If you have become infected, symptoms can present themselves between a few days and a few months later, or may not appear at all. The type and severity of symptoms vary with the specific disease, but there are some common symptoms, which include tiredness, body/muscle aches, joint pain, fever, rash, stiff neck, and facial paralysis. Early diagnosis is helpful in successfully treating tick-borne diseases, so it is important to contact your healthcare provider if you are experiencing symptoms” (RIDOH. *Tick*).

➤ **Lyme Disease**

According to the EPA, Lyme disease is the most common vector-borne disease and is prevalent in Rhode Island which had the nation's fifth-highest rate of cases in 2018 (RI.gov Press Releases).

The CDC has determined that generally for the Lyme disease bacterium to be transmitted requires the tick (most often a nymph, or immature tick) to be attached for 36 to 48 hours. Of those infected about 70 percent develop a rash at the bite site, which sometimes resembles a “bull’s eye.” Later, symptoms may involve the skin, eyes, heart, nervous system, brain, or joints. Early detection is important in the treatment of Lyme Disease (CDC. *Lyme Disease*).

Monitoring Mosquitoes and Ticks

Both the Rhode Island Department of Health (RIDOH) and the University of Rhode Island (URI) have programs that monitor the extent of mosquito and tick populations and/or disease incidents. From June through October, RIDOH’s Arboviral Surveillance program monitors the epidemiology, incidence, and geographic distribution of West Nile Virus, Eastern Equine Encephalitis Virus, and other arboviruses in Rhode Island for early detection and prevention of any human transmission (RIDOH. *Arboviral Surveillance*).

The State requires health care providers to report positive tick-borne laboratory results to RIDOH. The Department of Health then monitors and analyzes the tick-borne disease data to detect potential increases in disease and to identify opportunities for outreach (RIDOH. *Tick*).

The University of Rhode Island Tick Encounter Resource Center has set up a program called *TickSpotter* to help keep track of tick activity across North America. The program has an app that allows participants to take a photo of the tick they found, use the *Tick Identification Guide* to correctly identify the tick, and then submit the information. The submissions help to monitor tick population trends and tickborne disease risk (URI. *Tick Encounter*).

Location

Mosquitoes breed in standing water which can be found along the river, creek, and pond areas as well as in swimming pools, birdbaths, ditches, and just about any outdoor vessels that can hold even a small amount of water. As such, although higher concentration of mosquitoes will be found in wetland and forested areas, conditions conducive for breeding can be found town-wide. If residents are proactive and minimize standing water on their property, they will lessen the mosquito population in the vicinity of their homes.

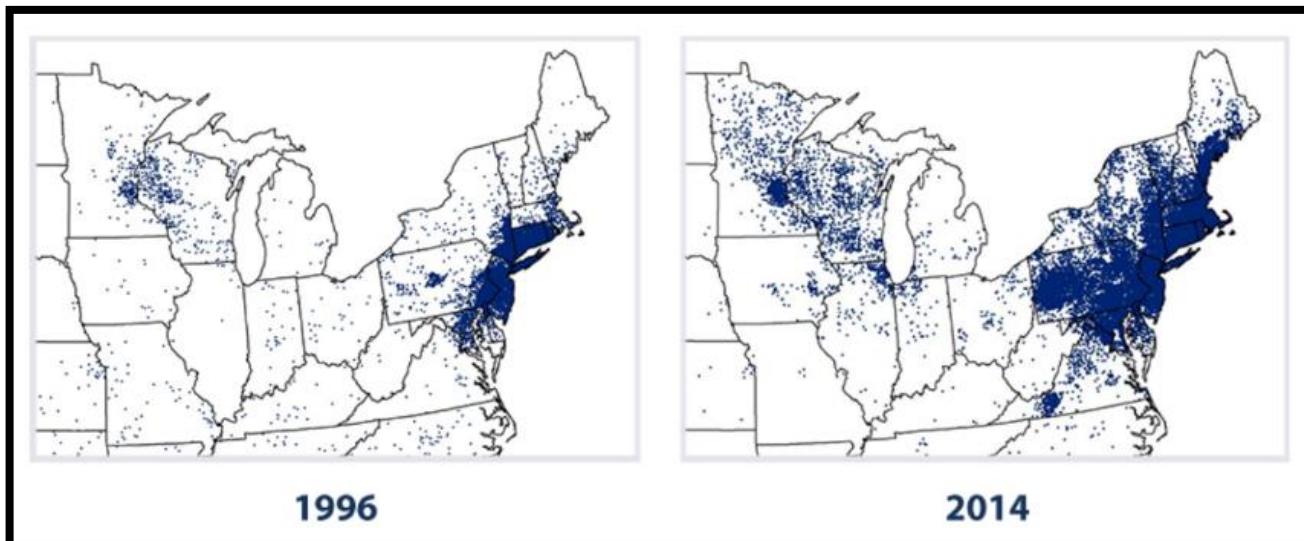
Although ticks can be found in urban areas and along coastlines, higher populations tend to be found in wooded and grassy areas where the creatures they feed on live and roam, including deer, rabbits, birds, lizards, squirrels, mice, and other rodents. Typically ticks climb to the top of a grass blade or the tips of a bush or branch and wait for potential prey to pass by. They latch onto the fur, hair, or clothing of their prey by extending their hooked front legs. Once on their host they tend to climb upward before attaching and feeding (IGeneX).

Previous Occurrences

According to the CDC, in 2019 the United States saw a large increase in the total number of Eastern Equine Encephalitis cases (38) and deaths (19). Three cases were in Rhode Island, but none of those resulted in death (CDC. *Eastern Equine Encephalitis*). The CDC reports a low incidence of West Nile Virus in Rhode Island over the past two decades (15 cases from 1999 to 2018) (CDC. *West Nile Virus*).

As illustrated in **Figure 4-30**, the incidence of Lyme disease in the United States has significantly increased over the past two decades. Cases documented by the CDC have nearly doubled between 1991 and 2014 and recent estimates suggest that approximately 300,000 people may get Lyme disease each year in the United States (EPA. *Climate Change Indicators*). According to RIDOH, between 2014 and 2017 Barrington saw an upward trend in Lyme Disease: 2014 (13 cases); 2015 (14 cases); 2016 (18 cases); 2017 (26 cases). In 2018 the Town had 15 cases (RIDOH. *Lyme Disease Surveillance*, 16).

Figure 4-30 Reported Lyme Disease Cases in 1996 and 2014 (adapted from CDC)



These maps show the distribution of reported cases of Lyme disease in 1996 and 2014. Each dot represents an individual case placed according to the patient's county of residence, which may be different than the county of exposure. The year 1996 was chosen as a reasonable starting point for comparison with recent years. These maps focus on the parts of the United States where Lyme disease is most common.

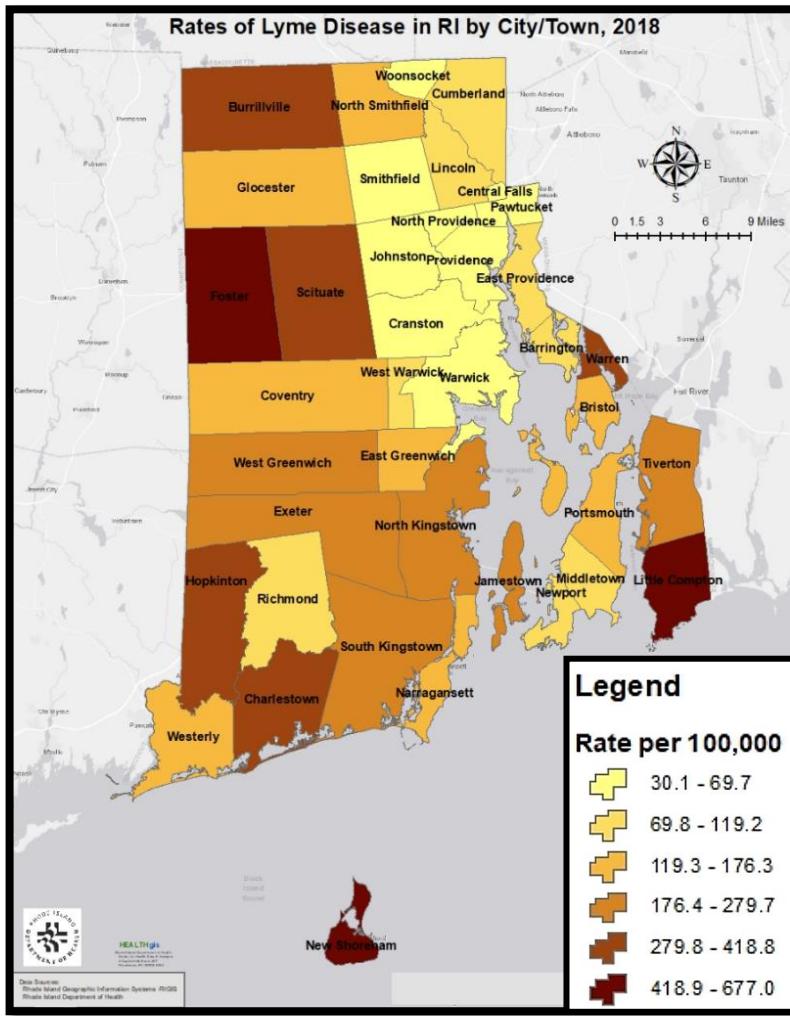


Figure 4-31 Rates of Lyme Disease in RI by City/Town, 2018 (RIDOH)

Figure 4-31 shows the 2018 rates of Lyme disease by City/Town in Rhode Island. During that period, Barrington had a total of 15 cases, which corresponds to an incidence rate of approximately 93 per 100,000 (RIDOH. *Lyme Disease Surveillance*, 20).

Climate Change Impacts

Climate change is expected to cause heavier precipitation, longer warm seasons, and warmer winters. These changing temperature and precipitation patterns could make conditions more hospitable for mosquitos and ticks and impact survival and spread of the diseases they transmit to humans (RIDOH. *Mosquitoes*).

“Both the infectious agent (protozoa, bacteria, viruses, etc.) and the associated vector organism (mosquito or tick) are very small and devoid of thermostatic mechanisms. Their temperature and fluid levels are therefore determined directly by the local climate. Hence, there is a limited range of climatic conditions - the climate envelope - within which each infective or vector species can survive and reproduce. It is particularly notable that the incubation time of a vector-borne infective agent within its vector organism is typically very sensitive to changes in temperature, usually displaying an exponential relationship. Other climatic sensitivities for the agent, vector, and host include level of precipitation, sea level elevation, wind and duration of sunlight” (Patz, 104).

Probability of Future Events

Based on past occurrences there is a low probability of Eastern Equine Encephalitis or West Nile Virus occurring in Barrington over the upcoming 5-year period. There is a high probability that a number of Barrington residents will be infected by Lyme disease, most likely at a rate similar to or exceeding 2014-2018 rates. According to Climate Central, in the 1980’s Providence experienced 129 mosquito days per year which rose to 144 days per year in the 2010s (Climate Central. *This News*).



4.3.4.2 Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses

Description and Extent

The terms epidemic and pandemic are used to describe the degree at which a disease is spreading. An epidemic is an outbreak of a disease that occurs in a community, geographical area, or several countries which spreads quickly and affects many people at the same time. An epidemic becomes a pandemic when it spreads over significant geographical areas and affects a large percent of the population in a country or around the world. A pandemic often creates social disruption and economic loss with a lengthy response and recovery period. Many diseases throughout the history of the world have been pandemic (Rochester Regional).

Global, federal, state, and local agencies closely monitor diseases that have the potential to cause outbreaks and work to develop strategies to contain their spread, including medical countermeasures such as antibiotics and antiviral medications (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-154).

❖ *Influenza (Flu)*

According to the RIDOH, “Flu is a contagious respiratory illness caused by viruses. People get sick from seasonal flu viruses every year. Flu can cause illness ranging from mild to severe. In some cases, flu can lead to hospitalization and even death. Most people who get the flu will have a fever and cough or sore throat. They may also have a runny or stuffy nose, body aches, a headache, chills, fatigue, vomiting, or diarrhea” (RIDOH. *Flu*).

Epidemics of influenza typically occur during the winter months and have been responsible for an average of approximately 36,000 deaths per year in the U.S. from 1990 through 1999. Although rates of infection are highest among children, rates of serious illness and death are highest among persons aged 65 and over and those with serious underlying health conditions (Harper, Scott).

A 2018 Centers for Disease Control and Prevention (CDC) study suggests, “that on average, about 8% of the U.S. population gets sick from flu each season, with a range of between 3% and 11%, depending on the season” (CDC. *Seasonal Influenza*). To prevent contracting seasonal flu people can take precautions such as regularly washing their hands and avoiding people who are sick, but the best way to prevent the flu is to get vaccinated every year. The effectiveness of a vaccine to protect a person from the flu depends on several factors including the match between the flu virus strain in the community and the vaccine strain, and the characteristics of the person being vaccinated (such as their age and health) and their body’s ability to use the vaccine to fend off the virus (CDC. *Seasonal Influenza*).

An influenza pandemic is a global outbreak of a new strain of the influenza A virus that has been transmitted to humans from another animal species. Species that are thought to be important in the emergence of new human strains are pigs, chickens, and ducks. Because the virus is new to humans, very few people will have immunity and an effective vaccine might not be widely available. The new strain can therefore spread rapidly infecting a large number of people (CDC. *Seasonal Influenza*).

❖ *Coronavirus Disease 2019 (COVID-19)*

According to the RIDOH, “Coronavirus Disease 2019 (COVID-19) is a virus strain that has only spread in people since December 2019” (RIDOH. *Covid-19 Information*). On March 11, 2020 the Coronavirus Disease was declared a pandemic by the World Health Organization and on March 13, 2020 the United States declared the outbreak a national emergency (CDC. *New ICD*).

Symptoms of COVID-19 range in severity and may include fever or chills, cough, shortness of breath or difficulty breathing, muscle or body aches, sore throat, headache, nausea or vomiting, diarrhea, runny or stuffy nose, fatigue, and recent loss of taste or smell. RIDOH recommends that anyone with COVID-19 symptoms, or exposed to someone with symptoms or who tested positive should be tested. Prior to receiving test results, individuals should try to isolate from those who are not sick. Anyone diagnosed with COVID-19 must isolate until they are well and test negative (RIDOH. *Covid-19 Information*). To prevent infection with COVID-19, the CDC recommends frequent handwashing with soap and warm water; coughing and sneezing into your elbow or a tissue; avoid touching mouth, nose, and eyes; and if you are sick, stay at home.

The CDC established a National Notifiable Diseases Surveillance System that enables states and other jurisdictions to share infectious and non-infectious disease-related data. Data for both Influenzas and Coronaviruses are collected through this system. Reporting is mandated by state laws or regulations and should follow uniform reporting criteria. The CDC has a Pandemic Severity Index (PSI) to assess the potential magnitude of the impact and resulting Community Mitigation Strategies to help guide the states and jurisdictions (CDC. *Pandemic Influenza*).

As outlined in the RI-SHMP (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-154 & 3-155) the extent of an infectious disease's impact depends a number of factors including:

- The disease's virulence, transmissibility, and pathogenesis
- Individuals' vulnerability factors, such as underlying medical conditions, malnutrition, behavior, and pregnancy
- Immunization prevalence
- Quality and availability of healthcare services
- Availability and accessibility of medical countermeasures that protect against and treat the disease
- Modes of transmission
- Environmental conditions, including temperature and rainfall

Location

Factors like high population density where people are in routine, close contact with one another, can aid transmission of infectious diseases (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-154). Overall, the Town of Barrington has a low population density which is favorable in terms of minimizing the spread of communicable diseases. Areas of potentially higher risk in Town include senior living facilities, schools, and day care facilities where people are in close contact and where people may be more vulnerable to communicable diseases. However, as COVID-19 is a highly contagious communicable disease, the entire Town is considered at risk.

Previous Occurrences

❖ Influenza (Flu)

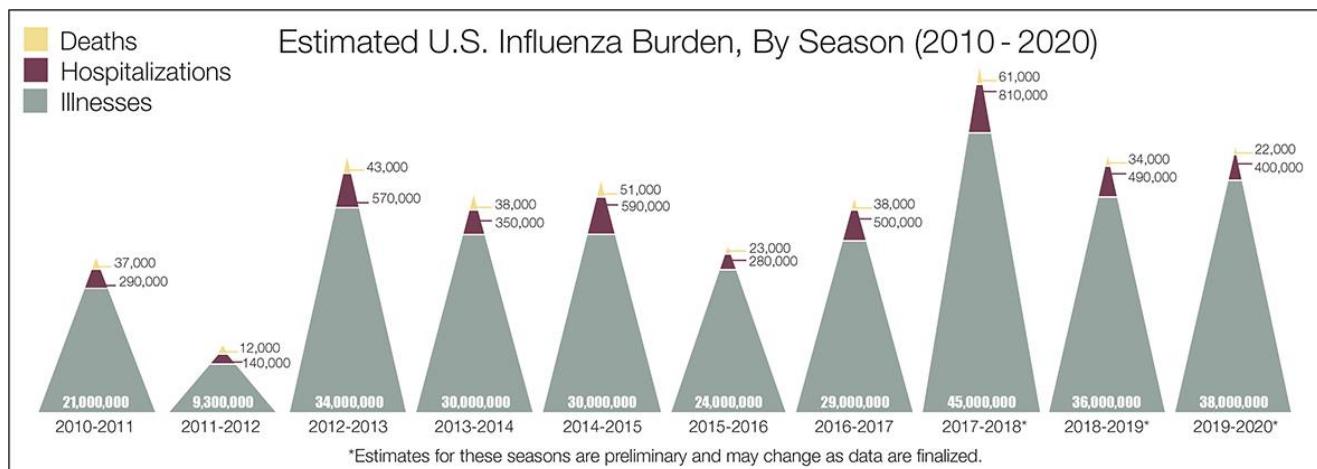
Due to public awareness, vaccines, and past immunity, it is rare that the flu season becomes epidemic or pandemic. There have however been four influenza pandemics in the 20th century (CDC. *Pandemic Influenza*):

- Spanish flu - H1N1 virus (1918-1920)
- Asian flu - H2N2 virus (1957-1958)
- Hong Kong flu - H3N2 virus (1968-1969)
- 2009 flu pandemic - H1N1pdm09 virus (2009-2010)

Cases of influenza are common every year in Rhode Island and across the United States. Generally mid-September through mid-May is considered the flu season, peaking between December and February. As illustrated in **Figure 4-32**, over the past decade, the worst flu season was 2017-2018, when 61,000 people nationwide died from the flu. During the 2018-2019 flu season, the CDC estimates the U.S. experienced approximately 34,000 deaths and during the 2019-2020 flu season, approximately 22,000 deaths (CDC. *Seasonal Influenza*).

Interestingly, during the 2020-2021 flu season, which coincided with the COVID-19 pandemic, the U.S. has experienced extremely low flu numbers. According to Scientific American, “the drop-off in flu numbers following COVID’s arrival was swift and global. Since then, cases have stayed remarkably low. ‘There’s just no flu circulating,’ says Greg Poland, who has studied the disease at the Mayo Clinic for decades. The U.S. saw about 700 deaths from influenza during the 2020–2021 season” (Peek).

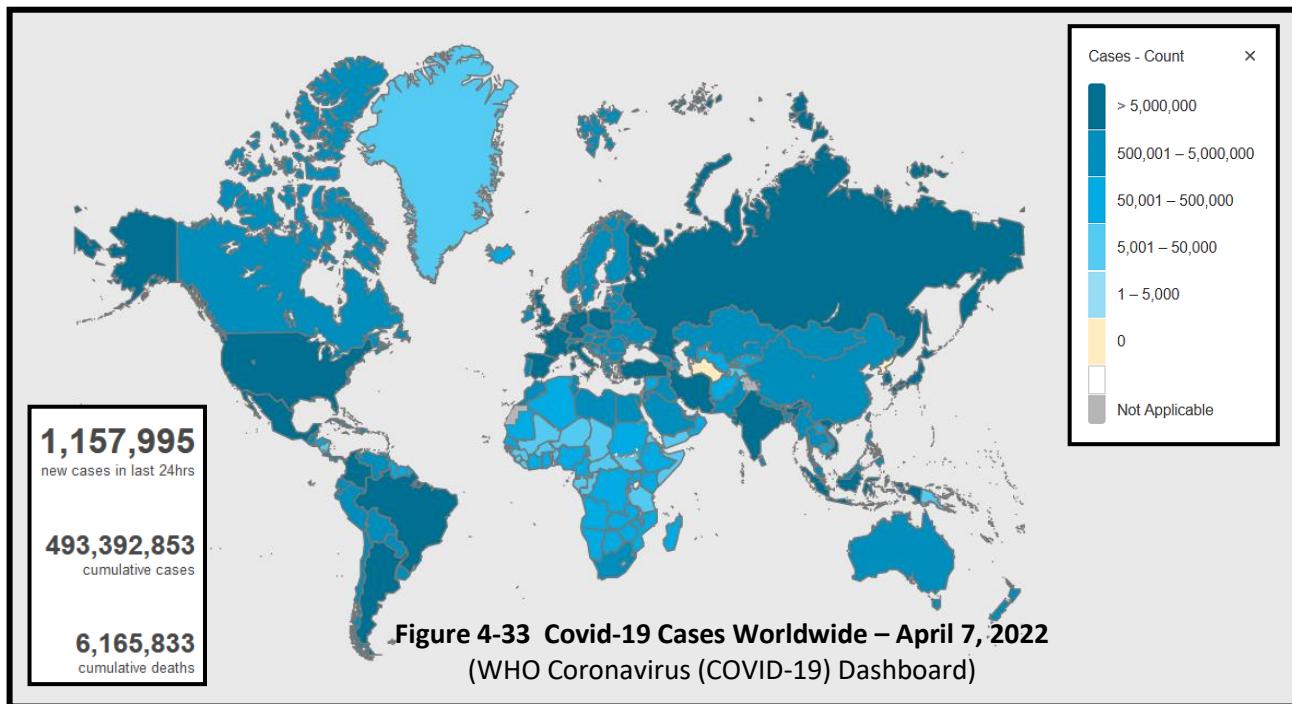
Figure 4-32 (CDC. *Seasonal Influenza*)



With respect to Rhode Island, the 2019-2020 Flu Season (October 6, 2019 - May, 22, 2020) was a moderately severe season with 948 hospitalizations for influenza, resulting in 20 deaths. This was lower than during the 2018-2019 season which reported a total of 1,032 hospitalizations and 39 deaths. According to RIDOH’s Influenza Surveillance Report for the 2020-2021 Flu Season (September 27, 2020 - May 22, 2021), Rhode Island paralleled the national trend with unprecedented low levels of influenza. Of the 12 positive influenza tests, only 2 were hospitalized, and there were no deaths. These numbers may be skewed however, because there is so much overlap in the symptoms of COVID-19 and influenza, that people may have assumed they were experiencing COVID-19 and did not get tested for influenza. Additionally, the extensive mask wearing to protect against COVID-19 may have also protected against influenza (RIDOH. *Influenza Surveillance*).

❖ **Coronavirus Disease 2019 (COVID-19)**

In 2007, WHO reported that since 1970 over 40 infectious diseases had been discovered (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-157). Hence, it is not surprising that at some point a new infectious disease will create an epidemic or pandemic. This is what appears to have happened with the Coronavirus Disease 2019 (COVID-19), which according to RIDOH, “is a virus strain that has only spread in people since December 2019” (RIDOH. *Covid-19 Information*). As depicted in **Figure 4-33**, the Coronavirus spread rapidly creating a worldwide pandemic (WHO. *Coronavirus Dashboard*).



Worldwide:

Globally, as of April 7, 2022, there were 493,392,853 confirmed cases of COVID-19, including 6,165,833 deaths, reported to WHO. As of April 5, 2022 approximately 11,250,782,214 vaccine doses have been administered worldwide (WHO. *Coronavirus Dashboard*).

United States:

In United States, between January 20, 2020 (first confirmed case in U.S.) and April 7, 2022 there were 79,501,007 confirmed cases of COVID-19 with 975,540 deaths, reported to WHO. Between the U.S. vaccination start date of December 14, 2020 and April 5, 2022, approximately 546,128,894 vaccine doses were administered in the U.S. (WHO. *Coronavirus Dashboard*).

Rhode Island:

Based on April 2020 Census Data, Rhode Island has a population of 1,097,379 (US Census Bureau. *Explore Data*). As of April 7, 2022 there has been 363,033 confirmed cases of COVID-19 in Rhode Island, including 3,524 reported deaths (RIDOH. *COVID-19 Data Tracker*). On July 1, 2021, Rhode Island became the fifth state to reach 70% of adults fully vaccinated against COVID-19 (Taylor). As of April 7, 2022 Rhode Island has administered 2,155,244 COVID-19 vaccine doses with 945,522 people at least partially vaccinated and 825,134 individuals having completed the primary vaccine series.

Table 4-15, shows the number of COVID-19 cases, hospitalizations, and deaths for the communities in Bristol County Rhode Island. The data was obtained from RIDOH for the period of March 2020 to April 7, 2022. For most of that timeframe, Barrington generally fell below the State levels However, more recently, from Feb 6, 2022 to April 2, 2022 Barrington has surpassed the State average (RIDOH. *Rhode Island COVID-19*).

According to RIDOH, the breakthrough cases among those vaccinated in Rhode Island is very small (RIDOH. *Covid-19 Data Tracker*); suggesting the vaccine efficacy is extremely effective. **Figure 4-34** graphically depicts the rates of Covid-19 deaths based on vaccine status. The bottom line as reported by the CDC is that COVID-19 vaccines are effective at preventing infection, serious illness, and death and currently most people who get COVID-19 are unvaccinated (CDC. *Covid-19 Vaccines*).

Table 4-15 COVID-19 Cases, Hospitalizations, and Deaths (March 2020 to April 7, 2022)

Municipality of Residence	Population April 2020 Census	Total cases	Total hospitalizations	Total deaths	Total number of people at least partially vaccinated
Barrington	17,153	4,221 (24.6%)	104 (0.6%)	22 (0.1%)	98.3%
Bristol	22,493	6061 (26.9%)	200 (0.9%)	83 (0.4%)	74.1%
Warren	11,147	3256 (29.2%)	131 (1.2%)	64 (0.6%)	79.8%

Notes:

- COVID-19 cases and COVID-19 associated deaths exclude out-of-state residents. COVID-19 hospitalizations include all patients hospitalized in Rhode Island, some of whom may not be Rhode Island residents. (RIDOH. *Rhode Island COVID-19*).
- The percentage rates shown represent the percent of the TOTAL population based on US Census Department data for April 1, 2020 (US Census Bureau. *Explore Data*).

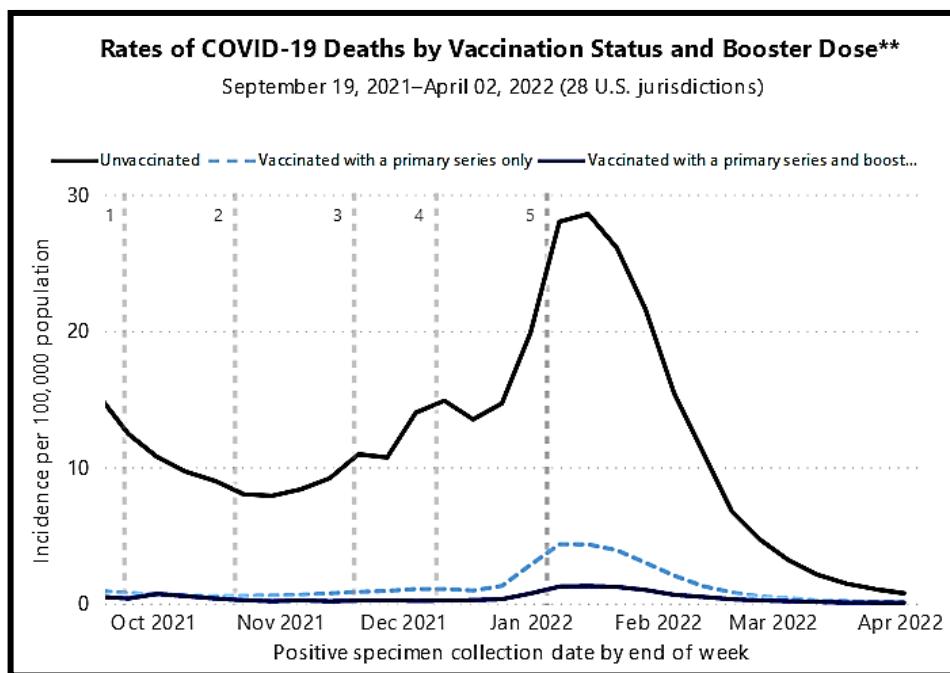


Figure 4-34
(CDC. *COVID-19 Data Tracker*)

Based on the CDC COVID-19 Response, Epidemiology Task Force, Surveillance & Analysis Team, Vaccine Breakthrough Unit –

** Compared to people vaccinated with a primary series and a booster dose, in March 2022, unvaccinated people age 12 years and older had:

- 1.9x greater risk of testing positive for Covid-19
- 17.0x greater risk of dying from Covid-19

Climate Change Impacts

According to an article published on WedMD in February 2020, researchers warn that the sudden weather changes associated with climate change, could fuel future flu epidemics. Lead researcher Zhaohua Wu, from Florida State University's Department of Earth, Ocean and Atmospheric Science, explains, "The historical flu data from different parts of the world showed that the spread of flu epidemic has been more closely tied to rapid weather variability, implying that the lapsed human immune system in winter caused by rapidly changing weather makes a person more susceptible to flu virus" (Preidt).

Probability of Future Events

It is highly likely that Barrington will continue to experience some level of influenza and Coronavirus cases during the ensuing 5-year period. However, it is less clear if the levels of infection for influenza virus will reach endemic or pandemic proportions and when the current Coronavirus pandemic will end. Due to the severity of human and economic loss associated with the current Coronavirus pandemic, it is critical that the Town assess local response to this crisis and determine how best to proceed as the pandemic persists and how to prepare for future pandemics.



OTHER HAZARDS

4.3.5 Other Hazards

Profiles for the following natural hazards have been included in this Section.

- 4.3.5.1 Earthquakes
- 4.3.5.2 Extreme Heat
- 4.3.5.3 Drought
- 4.3.5.4 Brush Fires (Wildland Fires)



4.3.5.1 Earthquakes

Description and Extent

According to the U.S. Geological Society (USGS), an earthquake is the vibration of the ground produced by the sudden release of slowly accumulated energy. This energy can be generated by a sudden dislocation of segments of the crust, volcanic eruptions, or manmade explosions. The sudden dislocation of segments of the crust generally produces the most destructive quakes. Tectonic plates are massive, irregularly shaped slabs of rock within the lithosphere, the rigid outermost shell of a planet, and are continually slowly moving because of convection in the mantle. But when plates come in contact, the force of their movement against one another will cause deformation or strain on the rocks, building up potential energy. If the stress becomes too great, the weaker segments of rocks may suddenly snap, releasing large amounts of energy. This energy, in the form of seismic waves travels outwardly, in all directions, from its origin, commonly referred to as the focus or hypocenter. The location on the Earth's surface directly above the focus is called the epicenter and usually sustains the greatest damage in an earthquake event (Shedlock).

Earthquakes can affect large areas, cause extensive damage to property, result in loss of life and injury to many people, and disrupt the social and economic functioning of the affected area. Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to the amplitude and duration of the ground vibrations. Ground movement can also cause flooding, dam failure, and rupture underground utilities which can result in various secondary hazards including flash floods and fires. A shallow marine earthquake event that displaces the seafloor has the potential to trigger a tsunami which provides an additional risk to coastal areas.

As discussed in the RI-SHMP, the severity of an earthquake can be expressed in terms of both magnitude and intensity. Magnitude is related to the amount of seismic energy released at the hypocenter of the earthquake. It is based on the amplitude of the earthquake waves recorded on uniformly calibrated seismographs, using the Richter Magnitude Scale (**Table 4-16**) (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-73). The magnitude of an earthquake is thus represented by a single, instrumentally determined value. Earthquakes with a magnitude of 2.0 or less on the Richter Scale are generally not felt by people, only recognized by local seismographs, and considered micro earthquakes. Around the world, hundreds of these occur daily. Earthquakes with a magnitude of at least 4.5 are strong enough to be recorded by sensitive seismographs worldwide. Great earthquakes which have a magnitude of at least 8.0 occur about once a year. The largest earthquake ever recorded was in Chile in 1960 with a magnitude of 9.5 (IRIS).

The Richter Scale is not used to express damage. An earthquake in a densely populated area that results in many deaths and considerable damage may have the same magnitude as a quake in a remote area that does nothing more than frighten wildlife. Large magnitude earthquakes that occur beneath the oceans may not even be felt by humans.

Table 4-16 also relates the Modified Mercalli Intensity (MMI) scale to the Richter Scale. The MMI scale is used to evaluate the effects of earthquakes. This scale is designated by Roman numerals and rather than a mathematical basis, is based on observed effects. The level of intensity ranges from imperceptible shaking (I) to catastrophic destruction (XII).

Table 4-16 Intensity and Effects of Earthquakes defined by the Richter and Modified Mercalli Intensity (MMI) Scales (adapted from USGS)

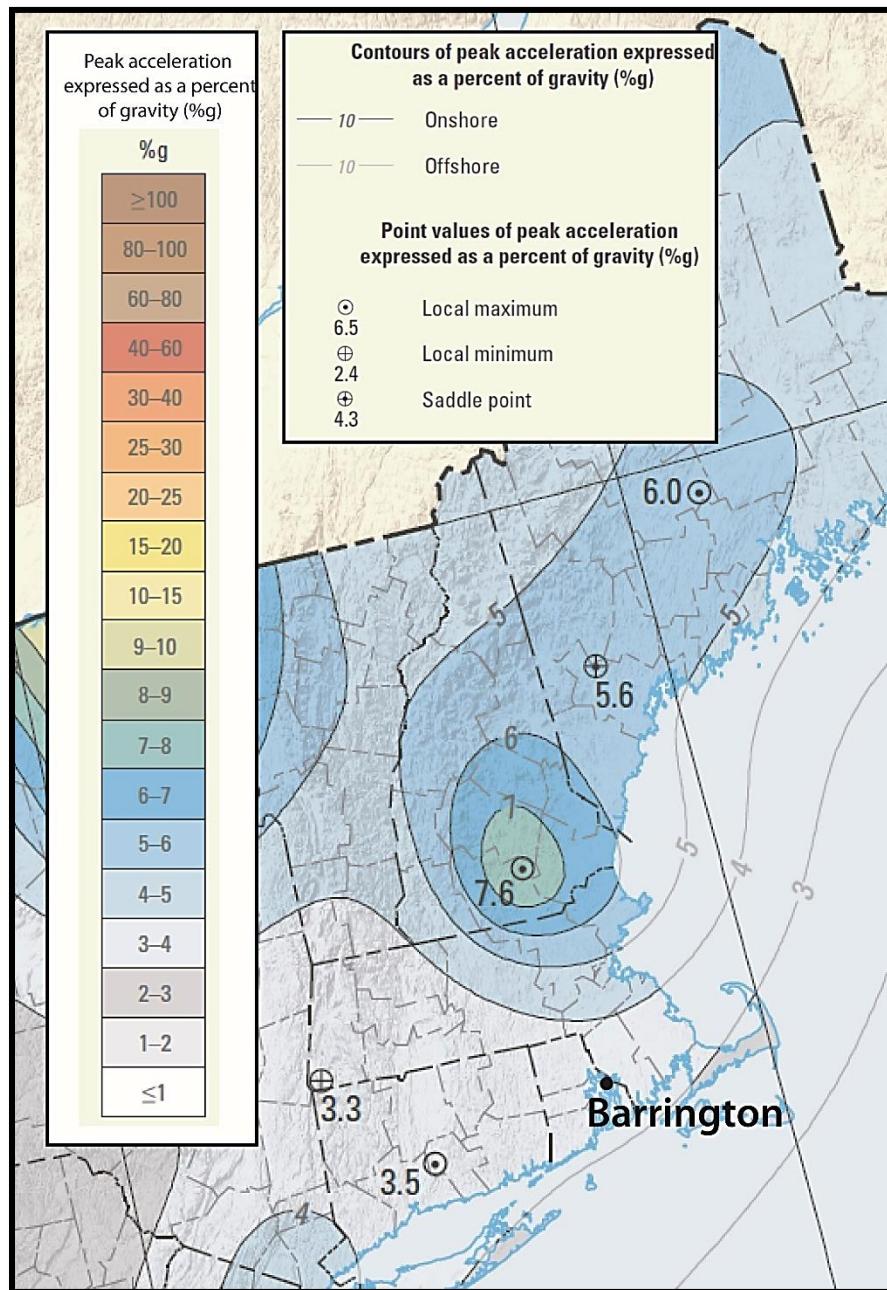
Richter Magnitude Scale	MMI Rating	Description
1.0 - 2.9	I Instrumental	Not felt except by a very few under especially favorable conditions.
3.0 - 3.9	II Weak	Felt only by a few persons at rest, especially on upper floors of buildings.
	III Slight	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck.
4.0 - 4.9	IV Moderate	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors, disturbed; walls make cracking sound. Sensation like truck striking building. Standing vehicles rocked noticeably.
	V Rather Strong	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5.0 - 5.9	VI Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
	VII Very Strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
6.0 - 6.9	VIII Destructive	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
	IX Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
7.0 and higher	X Intense	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
	XI Extreme	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
	XII Catastrophic	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Location

Although Barrington is located on the North Atlantic tectonic plate, there are no significant geologic fault lines in New England. The USGS Earthquake Hazards Program identifies the State of Rhode Island as a low seismic risk area. This is illustrated in the USGS 2014 Seismic Hazard Map (**Figure 4-35**) showing Barrington in an area on the lower end of the scale which measures potential peak acceleration of a potential earthquake.

However, as the impact from an earthquake can be experienced hundreds of miles from the epicenter, all areas of Town are considered vulnerable to some degree. Should an earthquake strike or its effects be felt in Barrington, old masonry structures that do not meet current earthquake codes could potentially be at higher risk of damage or collapse. Notable older brick/masonry structures include the Barrington Town Hall, Barrington Public Library, Barrington Cove Apartments, and some of the buildings on the St. Andrew's campus.

Figure 4-35 Seismic-Hazard Map: Peak Horizontal Acceleration with 10% Probability of Exceedance in 50 Years (adapted from USGS)



Previous Occurrences

Rhode Island periodically experiences earthquakes, including the earliest citation of a violent earthquake in June of 1638 whose epicenter was in New Hampshire. A number of earthquakes were cited by settlers in Rhode Island in the 17th century, but the epicenters are believed to have originated elsewhere, some as far away as Quebec. In 1883, an earthquake believed to have been centered in Newport was felt (Intensity V effects) from Bristol to Block Island (NESEC).

In November 2020 there was a small 3.6 magnitude earthquake felt by many in Southern New England. The epicenter was in Buzzards Bay, MA (MVTimes). Just recently, on May 14 & 15, 2022, three small earthquakes hit off the coast of Rhode Island along the fault line near the Narragansett Pier. The first had a magnitude of 2.2, followed about 17 hours later by a 2.5 magnitude aftershock and then a 2.2 magnitude aftershock roughly 4 and a half hours later (Boston.com).

According to the Rhode Island Emergency Management Agency (RIEMA), only three or four earthquakes having an MMI Scale rating of V or greater have been centered in Rhode Island, including the 1951 South Kingstown earthquake of magnitude 4.6 on the Richter Scale.

On August 23, 2011 a 5.9 magnitude earthquake struck Virginia and was felt up and down the Eastern seaboard, including Rhode Island. RIEMA opened its Emergency Operations Center on a limited basis, but indicated that statewide there were no reports of substantial damage or injury. There was no reported damage in Barrington.

Climate Change Impacts

According to an article from NASA's Jet Propulsion Laboratory, "most earthquakes occur far beneath Earth's surface, well beyond the influence of surface temperatures and conditions" (Buis, Alan. *Can*). That being said, scientists have determined some relationships between climate change and earthquakes. The amount of stress on a fault can trigger or inhibit earthquakes. "The largest climate variable that could change fault stress loads is surface water in the form of rain and snow" (Buis, Alan. *Can*). Scientists have found a correlation between surface water and microseismicity (small earth tremors with magnitudes less than zero – which humans can't feel), but as yet have not been able to apply it to a quake of any size that people can feel.

Research has shown that "changes in stress loads on Earth's crust from periods of drought can, in fact, be significant. Similarly, pumping of groundwater from underground aquifers by humans, which is exacerbated during times of drought, has also been shown to impact patterns of stress loads by 'unweighting' Earth's crust" (Buis, Alan. *Can*). While such stresses on a fault may be small compared to the normal buildup of stress from tectonic processes, it could potentially hasten the onset of an earthquake.

"Another climate-related phenomenon that's believed to have connections to tectonic processes is glaciation. The retreat of a glacier can reduce stress loads on Earth's crust underneath, impacting the movement of subsurface magma. The rapid movement of glaciers has also been shown to cause what are known as glacial earthquakes. Glacial earthquakes in Greenland peak in frequency in the summer months and have been steadily increasing over time, possibly in response to global warming" (Buis, Alan. *Can*).

Probability of Future Events

The USGS Earthquake Hazards Program identifies all of Rhode Island as occurring in a low seismic risk area (<2%g peak acceleration), therefore the probability of a significant earthquake impacting Barrington over the next five years is low.



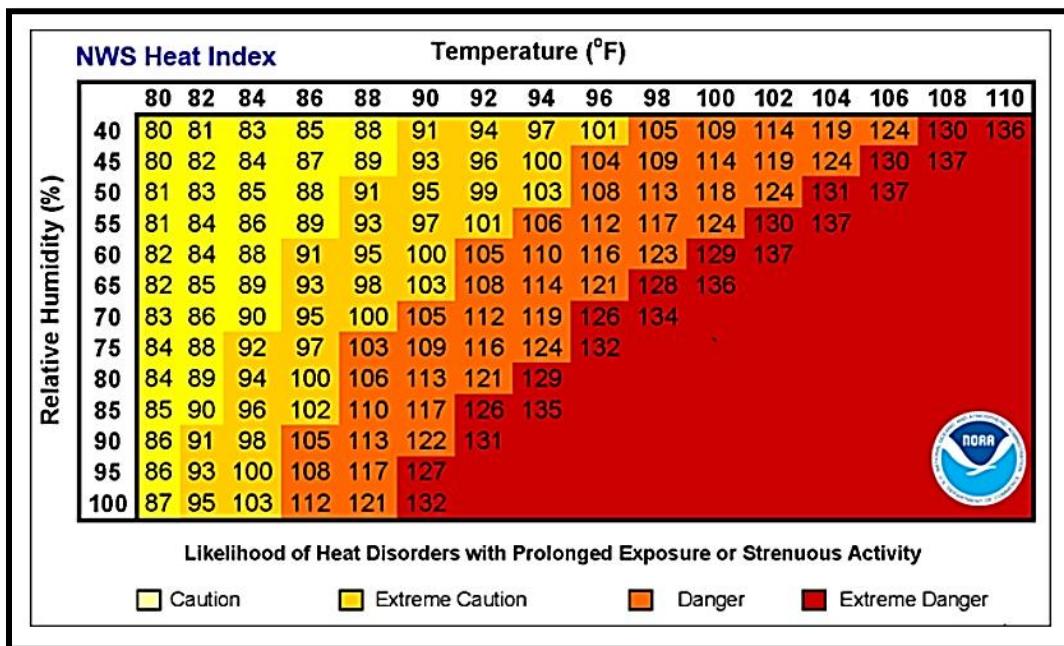
4.3.5.2 Extreme Heat

Description and Extent

According to the CDC, extreme heat is defined as a period of abnormally high temperature ($>10^{\circ}$ F above average regional temperatures) that lasts for several weeks. Humid or muggy conditions occur when a "dome" of high pressure, humid air remains near the ground. The increased water vapor in the air traps solar radiation near the surface of the earth which raises temperatures. Humidity prevents the evaporation of sweat and the associated cooling effects on the human body (CDC. *Climate Change and Extreme Heat*).

The RI-SHMP identifies a heat wave occurring if the outside temperature goes above 90 degrees Fahrenheit for three or more consecutive days. The NOAA|NWS Heat Index Program is used to alert the public of hazardous heat/humidity conditions. The Heat Index (HI), shown in **Figure 4-36**, is a measure of how hot it actually feels from the combined effect of humidity and temperature (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-93). In Rhode Island, a heat advisory is issued when the heat index value is expected to reach 100 -104 degrees for any amount of time, or between 95 to 99 degrees for 2 consecutive days (NOAA|NWS. *National Weather Service is Lowering*).

Figure 4-36 Heat Index (NOAA|NWS. Heat Forecast Tools)



According to RIDOH, extreme heat events are the leading cause of extreme weather-related deaths in the United States, with approximately 175 deaths annually. Although RIDEM reports that the number of heat related deaths in Rhode Island is declining (perhaps due to improved medical technology, proactive response to extreme weather events, and more widely used air conditioning), longer duration heat events may cause more heat related impacts (RIDOH. *Extreme Heat*).

Heat waves do not strike victims immediately, but rather their cumulative effects slowly tax the human body beyond its abilities. If the body is unable to shed heat or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise and heat-related illness may develop.

According to RIDOH (*RIDOH. Extreme Heat*), the negative effects of extreme heat include but are not limited to:

- Heat-related illnesses such as sunburn, fatigue, heat cramps, heat exhaustion, and heat stroke
- Health concerns created by stagnant atmospheric conditions trapping pollutants
- Excessively dry and hot conditions can provoke dust storms resulting in low visibility and respiratory problems
- Power shortages/outages caused by increased energy demands
- Increased demand on health care facilities by individuals suffering from various heat related health effects
- Disruption of commerce as a result of increased energy demand
- Disruption of municipal services as a result of decreased human productivity or increased energy demands
- Damage to structures and infrastructure (such as asphalt) due to softening

Location

All areas of Barrington are considered susceptible to extreme heat. As Barrington is a suburban community, the Town does not have an appreciable *urban heat island effect*. An *urban heat island effect* occurs when natural land cover is replaced by dense concentrations of buildings and pavement that absorb and retain heat. The heat is slowly released after dark, resulting in higher nighttime temperatures.

Previous Occurrences

As illustrated in **Figure 4-37**, since the mid-1990's, the number of days with temperatures at or above 90°F has exceeded Rhode Island's long-term average, with the largest number occurring over the past five years. Further, as shown in **Figure 4-38**, the average temperature in Bristol County from 1895-2022 has been in an upward trend.

Figure 4-37
Observed Number
of Hot Days in
Rhode Island

(NOAA|NCEI. *State Climate Summaries*)

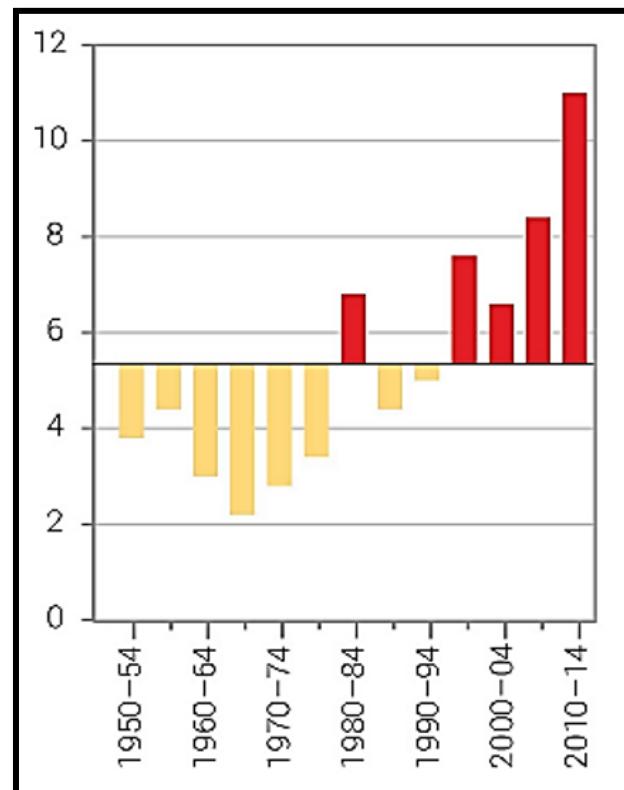
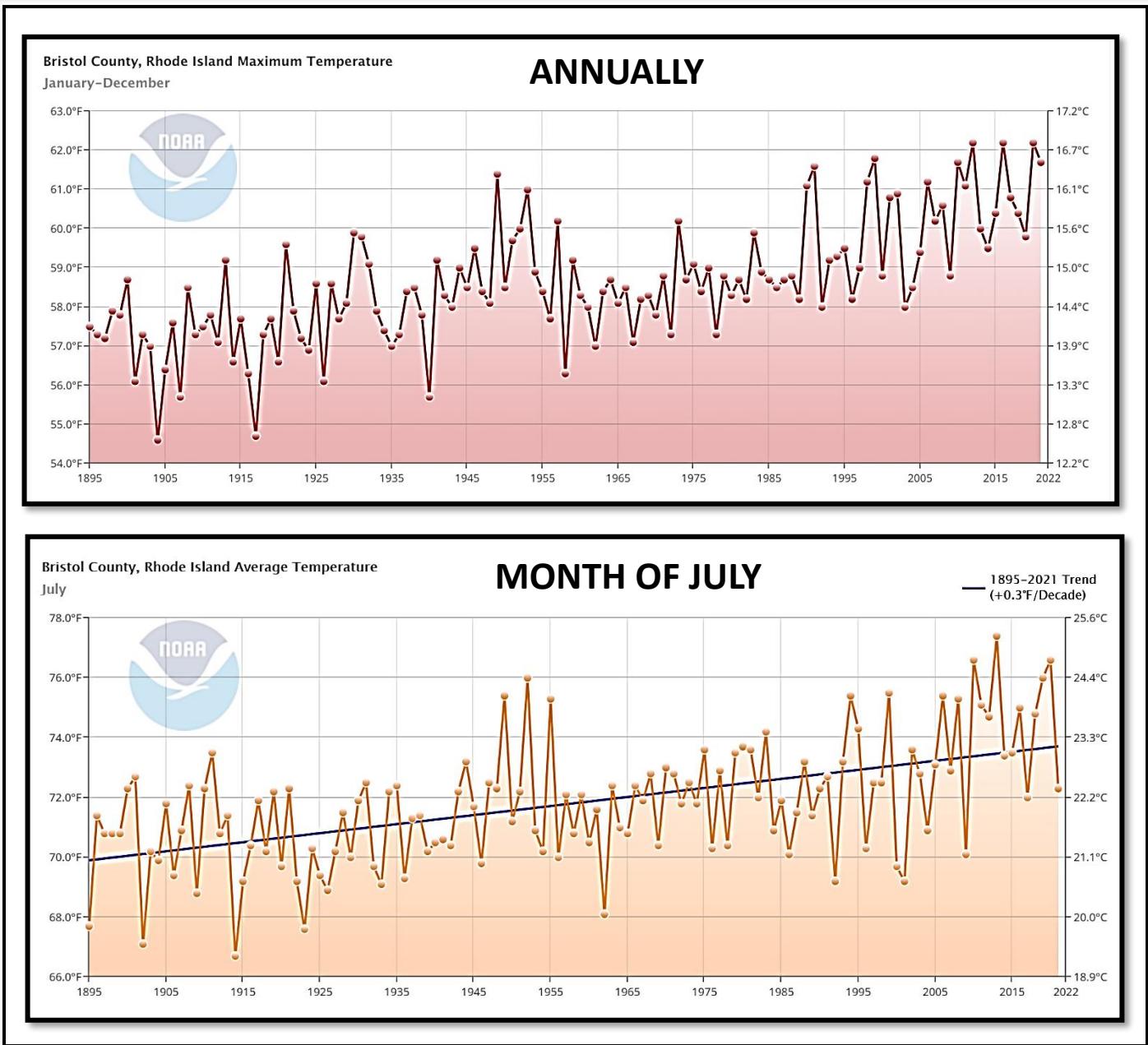


Figure 4-38 Average Temperature from 1895-2022 in Bristol County Rhode Island
 (NOAA | NCEI. *Climate at a Glance*)



Climate Change Impacts

Rhode Island's average temperature has increased by more than 3°F in the past century and more intense and prolonged heat waves are predicted with climate change. During an average Rhode Island summer, the heat index reaches 90°F for 10 days. According to RIDOH, over the ensuing 80 years, the number of days over 90°F is expected to increase significantly (RIDOH. *Extreme Heat*).

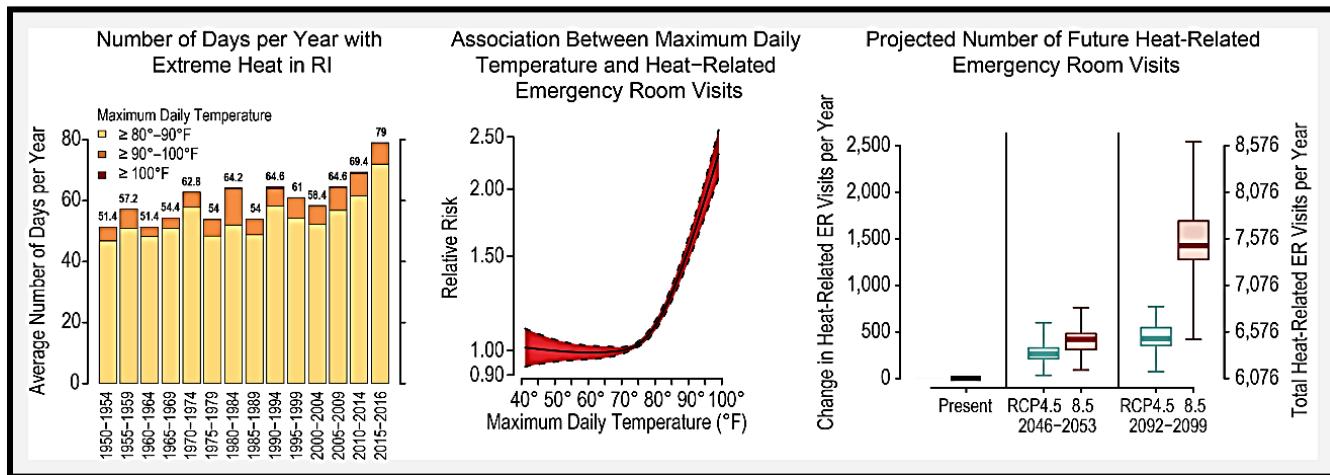
According to Climate Change RI (Climate Change RI. *Impacts on Rhode Island*):

- The long-term warming trend continued in 2019 with the Earth having its second warmest year on record; making the 2010s the hottest decade on record.
- The water in Narragansett Bay is getting warmer. The surface temperature of the Bay has increased 2.5-2.9°F (from 1960-2010). Wintertime water temperatures are warming the most rapidly.

As recognized by the U.S. Global Change Research Program *Climate Science Special Report*, climate-related weather extremes are expected to continue over climate timescales. “This assessment concludes, based on extensive evidence, that it is extremely likely that human activities, especially emissions of greenhouse gases, are the dominant cause of the observed warming since the mid-20th century. For the warming over the last century, there is no convincing alternative explanation supported by the extent of the observational evidence” (Wuebbles, Executive Summary).

According to the Fourth National Climate Assessment, “Moderate and extreme heat events already pose a health risk today, and climate change could increase this risk” (U.S. Global Change Research Program. *Fourth National Climate Assessment – Chapter 18*). **Figure 4-39** shows the observed and projected impacts of excess heat on emergency room visits in Rhode Island (left); the maximum daily temperature trend in Rhode Island which has been trended upwards over the last 60 summers resulting in an increase of about three more weeks of health-threatening hot weather over 2015–2016 than in the 1950s (middle); and incidence rate of heat-related ER visits which rose sharply as maximum daily temperatures climbed above 80°F (right). Under the higher modeled scenario, the study projects that Rhode Islanders could experience an additional 400 (6.8% more) heat-related ER visits each year by 2050 (U.S. Global Change Research Program. *Fourth National Climate Assessment – Chapter 18*).

Figure 4-39 Observed and Projected Impacts of Excess Heat on Emergency Room Visits in Rhode Island
(U.S. Global Change Research Program. *Fourth National Climate Assessment – Chapter 18*)



Probability of Future Events

As noted in the RI-SHMP, the increased trend of high heat days (over 90°F) is expected to continue. Climate change studies predict that Rhode Island could have up to 50 days over 90°F per year by 2070. (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-96). Hence, there is a high probability that extreme heat will impact Barrington over the ensuing 5-year period.



4.3.5.3 Drought

Description and Extent

Drought is a natural climatic condition which occurs in virtually all climates, the consequence of a natural reduction in the amount of precipitation experienced over a period of time. According to NOAA, lack of precipitation for a few weeks or months can create a short-term drought. Long-term droughts occur when the atmospheric circulation pattern creates a precipitation deficit for several months to several years. High temperatures, prolonged winds, and low relative humidity can exacerbate the severity of drought.

According to the Bristol County Water Authority, drought conditions are evaluated by the State's Drought Steering Committee on a regional basis, based on hydrologic indices including precipitation, groundwater levels, stream flow, surface water reservoir levels, and the Palmer Drought Index (BCWA. *Water*, 31). According to the NC Institute for Climate Studies (NCICS), precipitation in Rhode Island averages about 45 inches per year (NOAA|NCEI. *State Climate Summaries*).

The National Drought Mitigation Center classifies droughts as follows:

- **Agricultural drought:** related to agricultural impacts from lack of precipitation, reduced ground water levels, and dry soils
- **Hydrological drought:** related to the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (stream flow, reservoir and lake levels, ground water)
- **Meteorological drought:** refers to a reduction in the normal rainfall for a given geographic area; it is area-specific, as the average rainfall can vary greatly in different areas
- **Socioeconomic drought:** measures the impact that the statements above have on people/businesses

Table 4-17 Palmer Drought Severity Index (NDMC)

Severity	Index Value
Extreme Drought	-4 or less
Severe Drought	-3.0 to -3.99
Moderate Drought	-2.0 to -2.99
Mild Drought	-1.0 to -1.99
Incipient Dry Spell	-0.5 to -0.99

NOAA's National Climate Data Center (NCDC) recognizes that, "The wide variety of disciplines affected by drought, its diverse geographical and temporal distribution, and the many scales drought operates on make it difficult to develop both a definition to describe drought and an index to measure it" (NOAA|NCEI. *Measuring Drought*). Of the various quantitative measures of drought used, the Palmer Z index is widely used to measure short-term (monthly) drought and the Palmer Drought Severity Index (PDSI) - shown in **Table 4-17** - to measure the duration and intensity of the long-term drought. Long-term drought is cumulative and the PDSI uses temperature and precipitation levels to determine dryness as compared to normal rainfall patterns for a particular locale (NOAA|NCEI. *Measuring Drought*).

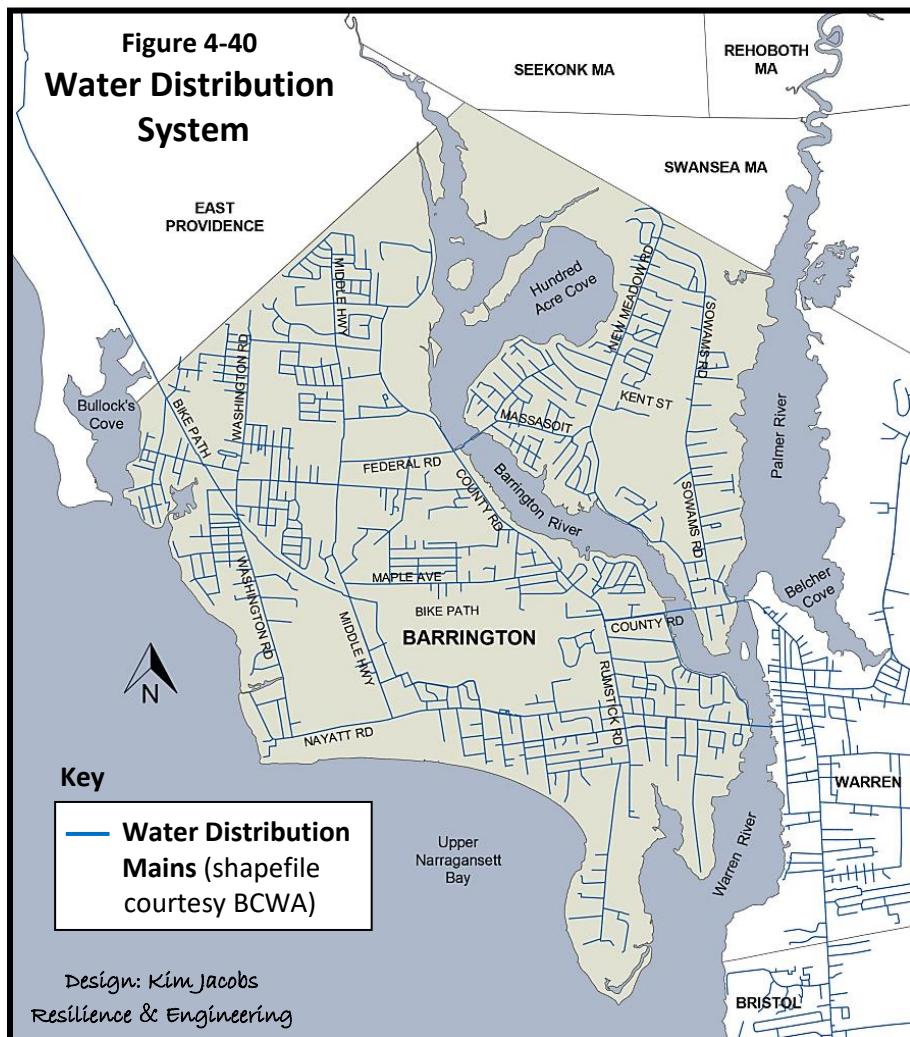
RIDEM indicates that throughout most of the State the annual precipitation averages 42 to 46 inches. This generally ensures a plentiful water supply for Barrington's daily requirements, which are primarily dominated by potable water needs. Barrington's public water supply, along with that of Warren and Bristol, is provided by the Bristol County Water Authority (BCWA), a public water authority which has been operational since 1984. The Authority's administrative office is located at 450 Child Street in Warren, and delegates from the three towns serviced by BCWA comprise the Board of Directors. Currently, the BCWA purchases 100 percent of its water - roughly 3.31 million gallons per day (MGD) - from the Providence Water Supply Board's (PWSB) Scituate Reservoir, which is treated at the Holton Water Treatment Plant in Hope, RI. The water is delivered via the East Bay Pipeline under the Providence River. Completed in 1998, the pipeline provides the system with a supply of

up to 3.5 MGD of treated water. For redundancy, in 2016 the BCWA installed an emergency connection to the East Providence 16" water main. In an emergency situation, this main can supply approximately 2 MGD (60%) of the roughly 3.31 MGD (average day use) required by the BCWA. As the East Providence emergency connection cannot meet the full needs of the Authority's service area, BCWA conducted an extensive engineering and costing study which concluded that a pipeline to connect with Pawtucket's water system is the most effective and cost-efficient option for an alternative water supply. The BCWA Board approved moving forward with the Pawtucket Pipeline Project with Phase I construction (1.5 miles of 24" main) tentatively scheduled to be completed in 2022 and Phase II (5 miles of 30" main) by 2026 (BCWA. Website).

It would take a fairly extensive drought to significantly impact the BCWA's ability to supply potable water to Barrington. However, if this did occur, it would have a significant impact on the Town. During a drought or extended dry conditions that require an emergency response to reduce water usage, the Town Manager is responsible for coordinating with BCWA and the Water Resource Board (WRB).

Location

All areas of Barrington are considered susceptible to drought conditions. However, as shown in **Figure 4-40**, the majority of Barrington is serviced by the Bristol County Water Authority (BCWA). The exception is in the northeastern area which is reliant on wells and therefore considered at greater risk to drought. In the northeastern George Street locale, there are 11 houses dependent on well water. Additionally, Four-Town Farm is a heavy user of water, requiring it for irrigation on approximately 60 acres of farmland.



Previous Occurrences

Droughts, while not frequent in Rhode Island, do occur. Rhode Island does experience extended periods of dry weather generally in the late spring and the first half of summer, during which crops and lawns may require irrigation.

However, according to the *RI Water 2030* plan, there have been just six historical drought events since 1929. The last long-term drought in the state was in the early to mid-1960s. This drought lasted for three summers (1965-1967) and included long periods of below normal precipitation during the winter, spring, and summer months. Historically, Rhode Island's driest year on record is 1965, with less than 26 inches of rainfall (RIDSP. *RI Water 2030*).

The Bristol County Water Authority (BCWA) reported that during 1987 the county experienced a serious drought that required a ban on non-essential uses of water and mandated water use restrictions. Another drought that impacted Barrington was documented from January-April 2012 with precipitation 5 to 7 inches below normal for that three-month period. Most recently, beginning in the summer and extending through October 2016, a severe drought impacted the northeastern United States, including Rhode Island, where ponds and rivers were well below normal levels (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-65).

Although not directly impacting Barrington, according to the USGS, below average and infrequent rainfall from May through September 2020 led to an extreme hydrologic drought across much of New England, including northern Rhode Island (USGS. 2020).

NOAA's National Integrated Drought Information System provides current as well as historical drought conditions throughout the U.S. Information for Rhode Island can be accessed through the following website: <https://www.drought.gov/states/rhode-island>

Climate Change Impacts

There are a number of ways climate change may contribute to worsening drought conditions. For example, the Center for Climate and Energy Solutions indicates that "Warmer temperatures can enhance evaporation from soil, making periods with low precipitation drier than they would be in cooler conditions" (C2ES. *Drought*).

Although most precipitation models predict an increasing trend in overall precipitation for Rhode Island, they further suggest that simultaneous warming trends and less frequent but more intense precipitation events favor an increase in short-term (one to three month) drought intensity (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-61 & 62).

Probability of Future Events

The last major drought in Rhode Island was more than 50 years ago, and based on future precipitation projections, a long-term drought in Rhode Island is unlikely. However, over the next five years, the Town may experience periodic short-term drought conditions.



4.3.5.4 Brush Fires (Wildland Fires)

Description and Extent

The U.S. Forest Service has established the National Fire Danger Rating System to determine the daily risk to fire experienced by different regions of the country (**Table 4-18**). The system uses mathematical formulas including wind speed and fuel type to determine a fire index. The fire indexes are categorized into five groups based on severity, and each group has an associated class rating (Classes 1 through 5) and fire risk level. A fire index of zero occurs when there is snow on the ground or there has been a prolonged period of substantial rain.

Table 4-18 National Fire Danger Rating System

(RIDEM. *Wildland*, 1)

Fire Index	Rating	Description
0	Class 1	No rating
1-30	Class 2	Low danger
31-60	Class 3	Medium danger
61-80	Class 4	High danger
81+	Class 5	Extreme

Wildland fires are fueled by natural cover, including native and non-native species of trees, brush and grasses, and crops along with weather conditions and topography. Climatic and meteorological conditions that influence the moisture content of wood and leaf litter, thereby impacting wildfires, include solar insulation, atmospheric humidity, and precipitation. Dry spells, heat, wind, and low humidity increase vegetative susceptibility to fire (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-104).

Wildland fires within the Town of Barrington are generally limited to *Brush Fires*. The USDA Forest Service defines a Brush Fire as: A fire burning in vegetation that is predominantly shrubs, brush, and scrub growth. Peak fire season in Rhode Island is typically between mid-March and mid-May when dry windy weather can occur increasing the potential for fires (National Park Service).

Wildland fires can disrupt and endanger wildlife and ecosystems, and if they reach the built environment can damage structures and other property. Rhode Island Department of Environmental Management (RIDEM) Division of Forest Environment is responsible for predicting the risk of fires igniting. Forewarning of dangerous fire conditions aids firefighters and can result in reducing the severity of a fire thereby mitigating risks to life and property.

Location

Barrington, and Rhode Island in general, historically exhibits a humid continental climate, with hot, rainy summers and cold winters, thereby warranting a low or medium fire rating (Class 1 or 2). According to the RI-SHMP, Barrington does not have any critical facilities located in a Wildland Urban Interface zone. These zones represent areas where developed and undeveloped vegetated land intermingle and should a wildland fire occur, exacerbates the threat to structures. Based on 2011 land use figures, approximately 38 percent of Barrington is forested (1,969 acres), and approximately one percent is brush/transitional (45 acres).

Previous Occurrences

Rhode Island has experienced some significant wildfires. The most devastating was the Coventry fire of 1942, which consumed 18,000 acres of forest. A wildfire in Exeter in 1951 consumed 5,000 acres (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-104). Significant wildfires have not been known to occur in Barrington, although occasional brush fires have occurred in the wooded parts of Town.

Climate Change Impacts

Wildland and brush fire risk depends on a number of factors, including temperature, soil moisture, and the presence of potential fuel (tree, shrubs, etc.). These factors have direct or indirect ties to climate variability and climate change. Changes in climate that create warmer, drier conditions increase the fire season and help fires spread making them harder to put out.

Probability of Future Events

Barrington's flat topography, along with the overall humid weather, puts the Town at a low risk for future wildland and brush fires.

4.4 VULNERABILITY ANALYSIS

Hazard Mitigation Plan: The Town of Barrington has successfully met the following requirement →

44 CFR Subsection D §201.6(c)(2)(ii): [The risk assessment shall include] a description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:

- (A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;
- (B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate; and
- (C) Provide a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

With Barrington's hazards identified and proposed (Sections 4.1-4.3), the Steering Committee conducted a vulnerability assessment to describe the impact that each identified hazard might have on the Town. The term vulnerability indicates what is likely to be damaged by a particular hazard and how severe that damage could be. The vulnerability analysis, in conjunction with the Capability Assessment (Section 5), was used in developing the *Mitigation Strategy* and *Action Plan* (Section 6).

CRS CREDIT:		
Mitigation Planning Element	CRS Planning Step	Max Pts
Phase II – Risk Assessment	5. Assess the Problem	52
CRS Coordinator's Manual – Activity 510: Floodplain Management Planning		

The vulnerability assessment used the process described in the FEMA publication *Understanding Your Risks - Identifying Hazards and Estimating Losses* as a guideline for the analysis (FEMA. *Understanding*). In assessing the Town's vulnerability to the identified hazards, the Steering Committee considered what is at risk (built environment including public infrastructure, natural environment, local economy, and people) and what the impacts might be (structural and environmental damage, economic loss, inconvenience to residents, physical and emotional harm, and loss of life). The Steering Committee also identified a list of critical facilities to include in the vulnerability analysis. The Vulnerability Analysis presented in this Section is organized as follows:

- 4.4.1 Critical Facilities
- 4.4.2 Built Environment/Infrastructure
- 4.4.3 Natural Environment
- 4.4.4 Economy
- 4.4.5 People
- 4.4.6 Future Development Trends

As evidence by the **Public Opinion Survey** responses, the majority of participants (344 out of 442 – or 78%) indicated that either they or someone in their household had been negatively impacted by a natural disaster while living or doing business in the Town of Barrington. More people were impacted by Wind-Related hazards (69%) compared to Winter-Related (54%), Infectious Disease-Related (42%), or Flood Related (35%).

Two distinct risk assessment methodologies were used in the vulnerability assessment. The first consists of a quantitative analysis that relies upon best available data and technology, while the second approach consists of a somewhat qualitative analysis that relies on local knowledge and rational decision making. For hazards that do not have the data to support quantitative analysis, vulnerability is discussed in more general qualitative terms.

CRITICAL FACILITIES

4.4.1 Critical Facilities

Although the Town as a whole is considered in the overall vulnerability assessment, it is important to identify critical facilities that if adversely affected by a hazard event may result in more severe consequences to public health and safety or interrupt essential services and operations for the community. Barrington's Critical Facilities have been classified into the following categories: Schools; Day Care/Early Learning; Special Population Centers; Government/Emergency Centers; Institutional/Commercial; Natural Resources, and Infrastructure.

A *Vulnerability Analysis* was conducted to determine the potential susceptibility of each critical facility to the profiled hazards. A summary of the analysis in tabular format has been provided in **Appendix 4-3**, and discussed in the narrative of **Subsections 4.4.2 – 4.4.5**. A list of the critical facilities is included in **Table 4-19**, and their locations depicted in **Figure 4-41** (a larger scale of this map is included in **Appendix 4-2**).

Table 4-19 Critical Facilities with Map Number Identification

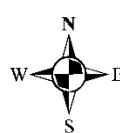
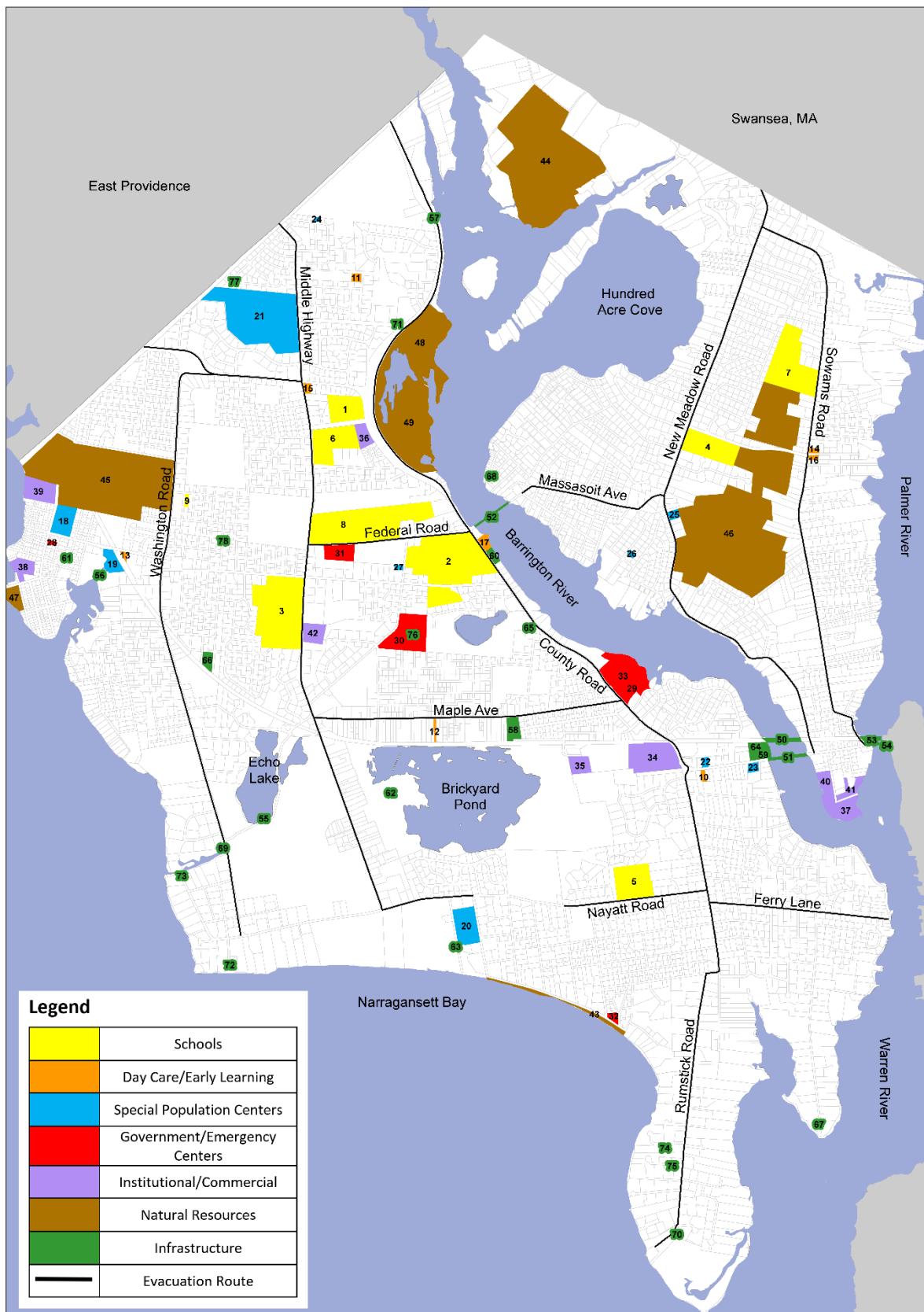
Schools	Day Care/ Early Learning	Special Population Centers	Government/ Emergency Centers
1 Barrington Christian Academy (Private)	10 Apple Blossom Preschool & Early Learning Center (Private)	18 Atria Bay Spring Assisted Living Facility (Private)	28 Barrington Bay Spring Community Center (Public)
2 Barrington High School (Public)	11 Barrington Early Childhood Center (Private)	19 Barrington Cove Apartments (Private)	29 Barrington Public Library (Public)
3 Barrington Middle School (Public)	12 Kids Junction (Private)	20 Former Carmelite Monastery (Public)	30 Department of Public Works/Recycling Center (Public)
4 Hampden Meadows School (Public)	13 Kids Quarters (Private)	21 Former Zion Bible Institute (Private)	31 Public Safety Building (Public)
5 Nayatt School (Public)	14 Montessori Center of Barrington (Private)	22 LIFE Incorporated (Private)	32 Town Beach Bathhouse (Public)
6 Primrose Hill School (Public)	15 Red Brick Nursery School (Private)	Maher (Private) 23 County Road 24 Grassy Plain Road 25 New Meadow Road 26 Puritan Avenue 27 Upland Way	
7 Sowams School (Public)	16 The Early Learning Centers of RI (Private)		
8 St. Andrews School (Private)	17 Tot's Cooperative Nursery School (Private)		
9 St. Luke's School (Private)			
			33 Town Hall/School Administration

Table 4-19 *Continued*

Institutional/ Commercial	Natural Resources	Infrastructure
34 Barrington Shopping Center (Private)	43 Barrington Town Beach (Public)	Bridges (Public) 50 Barrington River Bike Path Bridge 51 Barrington River Bridge 52 Central (Massasoit Avenue) Bridge 53 Warren River Bike Path Bridge 54 Warren River Bridge
35 Bayside YMCA (Private)	44 Douglas Rayner Wildlife Refuge/Nockum Hill (BLCT)	Dams 55 Echo Lake Dam (Public) 56 Unnamed Dam behind Barrington Cove Apartments (Private)
36 East Bay Health Center (Private)	45 Haines Memorial State Park (State)	57 Evacuation Route (Public) - <i>a low point on Route 114</i>
Marinas 37 Barrington Yacht Club (Private) 38 Lighthouse Marina (Private) 39 Safe Harbor Cove Haven (Private) 40 Stanley's Boat Yard (Private) 41 Striper Marina (Private)	46 Hampden Meadows Greenbelt (Public) 47 Latham Park (Public) 48 Osamequin Nature Preserve (Public) 49 Walker Farm (Public)	Park & Ride 59 Police Cove (Public) 60 White Church (Public) Sanitary Sewerage Pump Stations (Public) Primary 61 Bay Spring Ave Pump Station 62 Brickyard Pond Pump Station 63 Freemont Pump Station 64 Police Cove Pump Station 65 Prince's Pond Pump Station 66 Walnut Road Pump Station Ejector 67 Adam's Point Ejector Station 68 Juniper Street Ejector Station 69 Naya Point Ejector Station 70 Rumsk Ejector Station 71 Wampanoag Ejector Station Grinder 72 Elm Lane Grinder Station 73 Naya Rod Grinder Station 74 Pheasant Lane Grinder Station 75 Strawberry Drive Grinder Station Storm Drainage Pump Stations (Public) 76 DPW Upland Way 77 Hazelton Road 78 Prospect Street
42 US Post Office (Federal)		

Figure 4-41

Critical Facilities



0 0.5 1
Miles



2022 Hazard Mitigation & Flood Management Plan

Prepared By: Kim Jacobs and Cam Evans

Town of Barrington - June 2022 - Sources: RIGIS, Town GIS

BUILT ENVIRONMENT & INFRASTRUCTURE

4.4.2 Built Environment/Infrastructure

Barrington's built environment, including public infrastructure, is an important resource. Due to its coastal location and extensive low-lying land, the primary hazards that will impact the built environment, including public infrastructure, are flooding and coastal erosion from rain and snow events, and storm surge from hurricanes or other high-wind events. These hazards will be exacerbated by sea level rise. In addition to the items identified in **Table 4-20**, the vulnerability to Barrington's built environment/infrastructure will be further explored in the following subsections: **4.4.2.1 FEMA Flood Zones** and **4.4.2.2 Flooding, Storm Surge, and Sea Level Rise**

Table 4-20 Built Environment/Infrastructure Vulnerability

Hazard Group	Vulnerability (<i>What is at Risk</i>)
 Flood-Related Hazards (Inland Flooding/Dam Failure; Coastal Flooding/Storm Surge; Coastal Erosion)	<ul style="list-style-type: none"> Significant flooding can lead to extensive damage to structures and personal property; disrupt potable water, stormwater, and sewer system operations; and flood roadways creating dangerous conditions for motorists; increase the water table level resulting in subsurface issues such as wet basements Properties and structures in the SFHA are at highest risk to the impacts from flooding Low-lying areas along the coast are at higher risk to storm surge and coastal erosion: Barrington, located in the upper part of Narragansett Bay, experiences high storm surge elevations due to the funneling effect the Bay has on severe cyclone storms passing by the area; when coupled with normal tides, storm surge can raise the mean water level 15 feet or more; coastal erosion produced by wave action can become very destructive, damaging natural and manmade structures, battering solid objects, and scouring sand from around foundations; as storms erode the shoreline, they put adjacent properties at greater risk Future increases in relative sea level will intensify coastal flooding and displace coastal populations; threaten infrastructure including reducing the effectiveness and integrity of existing seawalls and revetments, designed for historically lower water levels; contaminate water supplies through saltwater intrusion into aquifers Inundation of residential lots near the shoreline, including those at the end of residential streets near the Palmer River and the Warren River Water from Echo Lake, Brickyard Pond and Mussachuck Creek affecting adjacent neighborhoods and the RI Country Club Waters extending from Bullock Cove into low-lying areas of Latham Park, and from Allin's Cove into low-lying areas in the Alfred Drown and Bay Spring neighborhoods Water from the Barrington and Warren Rivers covering sections of Mathewson Road and Tyler Point, impacting boat facilities and other uses close to the Barrington and Warren Rivers, and a critical roadway for residents in the Mathewson Road area Regular flooding at high tide of the Wampanoag Trail, County Road near the High School and Prince's Pond, and sections of New Meadow Road and Sowams Road (in particular nearest the Barrington and Palmer Rivers) Worsening flooding of RI 114/103 on the Warren side of the Warren River Bridge Refer to Sections 4.4.2.1 – 4.4.2.2 for additional flood-related vulnerabilities, including the vulnerability of critical facilities

 Wind-Related Hazards (High Winds – Thunderstorms/ Lightning/Hail; Tornadoes; Tropical Cyclones)	<ul style="list-style-type: none"> High winds, including those associated with tornadoes and tropical cyclones can cause damage to structures, property, vehicles, and infrastructure including utility lines Current Rhode Island Building Code requires residential and commercial structures in Barrington to be built to withstand 110 mile per hour winds, or a Category 2 hurricane; older homes built to a less stringent code are at greater risk of structural damage due to wind-force; most of the facilities that house and support Barrington's special population centers were mostly built in the latter half of the 20th century and meet this requirement Downded trees and branches during wind-events are anticipated to create some travel disruption and occasionally damage structures or electrical utilities and communications lines; power outages or downed communication lines can pose threats to public safety, including inability to access emergency services or support medical equipment Refer to Sections 4.4.2.2 for additional wind-related vulnerabilities, including the vulnerability of critical facilities
 Winter-Related Hazards (Heavy Snow; Ice; Extreme Cold)	<ul style="list-style-type: none"> Snow and ice can impact access to homes and critical facilities such as hospitals, schools, and supermarkets Snow, ice, and freezing temperatures may create treacherous driving conditions, cause transportation delays, and create transportation challenges for first responders or others who may need to be on the roads Barrington has sidewalks along most key arteries in Town; walking along roadways can be dangerous if sidewalks aren't cleared of snow and ice Heavy snow and ice accumulation can weigh down and damage utility wires or cause trees/tree limbs to come down which may damage utility wires and block roadways; damaged utility wires may lead to power loss which could disrupt critical infrastructure and technology; lack of household heat could cause water and sewer pipes to freeze and even rupture There remain a few areas of Town along the coastline, particularly the neighborhoods in the vicinity of Narragansett Avenue/Shore Drive and Willow Way/Appian Way, where many of the houses have not been substantially renovated and therefore may not meet current building codes; these homes may be more susceptible to roof collapse due to heavy snow loads If extreme cold conditions are combined with low/no snow cover, the cold can better penetrate downward through the ground and potentially create problems for underground infrastructure Critical Facilities: A number of critical facilities that service vulnerable populations may be more at risk from nor'easters, heavy snow, or ice, including the Barrington Christian Academy (9 Old County Road), St. Andrews School (63 Federal Road), St. Luke's School (10 Waldron Avenue), Kids Junction (406 Maple Avenue), Kids Quarters (64 Bay Spring Avenue), the former Carmelite Monastery (25 Watson Avenue), and the former Zion Bible Institute (27 Middle Highway). Other critical facilities that may be more at risk from winter-related hazards include several of the marinas and the U.S. Post Office (200 Middle Hwy). The following structures, some serving vulnerable populations, have portions of flat roofs which may be at greater risk of collapse due to heavy snow loads: Hampden Meadows School (297 New Meadow Road), Nayatt School (400 Nayatt Road), Sowams School (364 Sowams Road), Montessori Center of Barrington (303 Sowams Road), Barrington Cove Apartments (90 Bay Spring Avenue), Barrington Shopping Center (184 County Road), and the Town Beach Bathhouse.
 Infectious Disease (Vector-borne Diseases Transmitted by Ticks and Mosquitoes; Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses)	<p>Mosquitoes & Ticks</p> <ul style="list-style-type: none"> The tick and mosquito population are not expected to have an impact on Barrington's built environment & infrastructure <p>Influenza Viruses or Coronaviruses</p> <ul style="list-style-type: none"> The influenza viruses or coronaviruses are not expected to have an impact on Barrington's built environment & infrastructure

 <p>Other Hazards (Earthquakes; Extreme Heat; Drought; Brush Fires)</p>	<p>Earthquakes</p> <ul style="list-style-type: none"> If a significant earthquake occurred with an epicenter relatively close to Barrington, all buildings may be at risk to some level of damage. As Barrington complies with State Building Codes, it is unlikely that most structures would sustain much damage from a moderate earthquake occurring in Rhode Island or southern Massachusetts Should an earthquake strike and its effects be felt in Barrington, older masonry structures that do not meet current earthquake codes could potentially be at higher risk of damage or collapse. There remain a few areas of Town along the coastline, particularly the neighborhoods in the vicinity of Narragansett Avenue/Shore Drive and Willow Way/Appian Way, where many of the houses have not been substantially renovated and therefore may not meet current building codes; these homes may be more susceptible to damage from an earthquake Although earthquakes can rupture underground utilities, this is not an expected impact in Barrington Critical Facilities: Although an earthquake of significance is considered a low probability for Barrington, should one occur, depending on the magnitude and epicenter, all critical facilities structures could experience some level of damage. Older brick/masonry critical structures are at higher risk and include the Barrington Town Hall, Barrington Public Library, Barrington Cove Apartments, and some of the buildings on the St. Andrew's campus. Critical infrastructure including bridges, sections of the evacuation route, dams, and the National Grid Substation (236 Maple Avenue) may be impacted as well. <p>Extreme Heat</p> <ul style="list-style-type: none"> Although extreme heat can cause pavement to soften and expand (creating rutting and potholes), as heat waves in the near future are expected to be of short duration, the impact to Barrington is expected to be minimal Increased energy demands, particularly related to AC usage, may cause power shortages/outages <p>Drought</p> <ul style="list-style-type: none"> Long-term drought conditions may threaten levels or quality of municipal public water supplies – however as climate change models predict more precipitation for the Northeast, the probability of a long-term drought in the near future is considered low for Barrington The northeastern area of Barrington (George Street area) is reliant on potable wells, and therefore more vulnerable to even short-term droughts that might threaten the quantity of well water for potable use and agriculture <p>Brush Fires</p> <ul style="list-style-type: none"> Brush fires are not expected to have an appreciable impact on Barrington's built environment & infrastructure
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4.4.2.1 FEMA Flood Zones

FEMA's Federal Insurance and Mitigation Administration (FIMA) manages, among other things, the National Flood Insurance Program (NFIP). In addition to providing flood insurance and reducing flood damages through floodplain management regulations, the NFIP identifies and maps the Nation's floodplains. Mapping flood hazards creates broad-based awareness of this issue and provides the data needed for floodplain management programs and to actuarially rate new construction for flood insurance. The Federal Insurance Rate Map (FIRM) is the legal document for determining flood zone location and may be viewed at Barrington's Town Hall or online through Barrington's Web GIS mapping host.

Figure 4-42 depicts FEMA's coastal flood hazard mapping, which "is the process where the overland wave modeling results are assimilated with the topography data to delineate the boundary of the Special Flood Hazard Area (SFHA) for the 1% annual chance stillwater elevation (100-year conditions), along with mapping the location and extent of Zones VE, AE, and X" (FEMA Region III).

A map of the Town depicting the Flood Zones and location of critical facilities is provided as **Figure 4-43** (refer to **Table 4-19** for the critical facilities map numbers; a larger scale of this map is included in **Appendix 4-2**). A GIS analysis, summarized in **Table 4-21**, was conducted for the entire Town to determine the 2022 assessed valuation of properties in the various flood zones. The flood zone for a parcel was determined using a spatial intersection of the parcel (Barrington Tax Assessor March 2022 data) and the FEMA Digital FIRM (DFIRM) GIS layers. Recognizing that sea levels rise will continue to move the floodplain designations inland, a property's flood zone was categorized based on the highest risk flood zone any portion of the parcel intersected.

High Risk: VE Zone (1% annual chance of flooding and wave action hazard)

The analysis summarized in **Table 4-21** shows that the total assessed value for properties with any portion of the parcel intersecting the VE Zone is \$394,332,872 (approximately 11% of tax base).

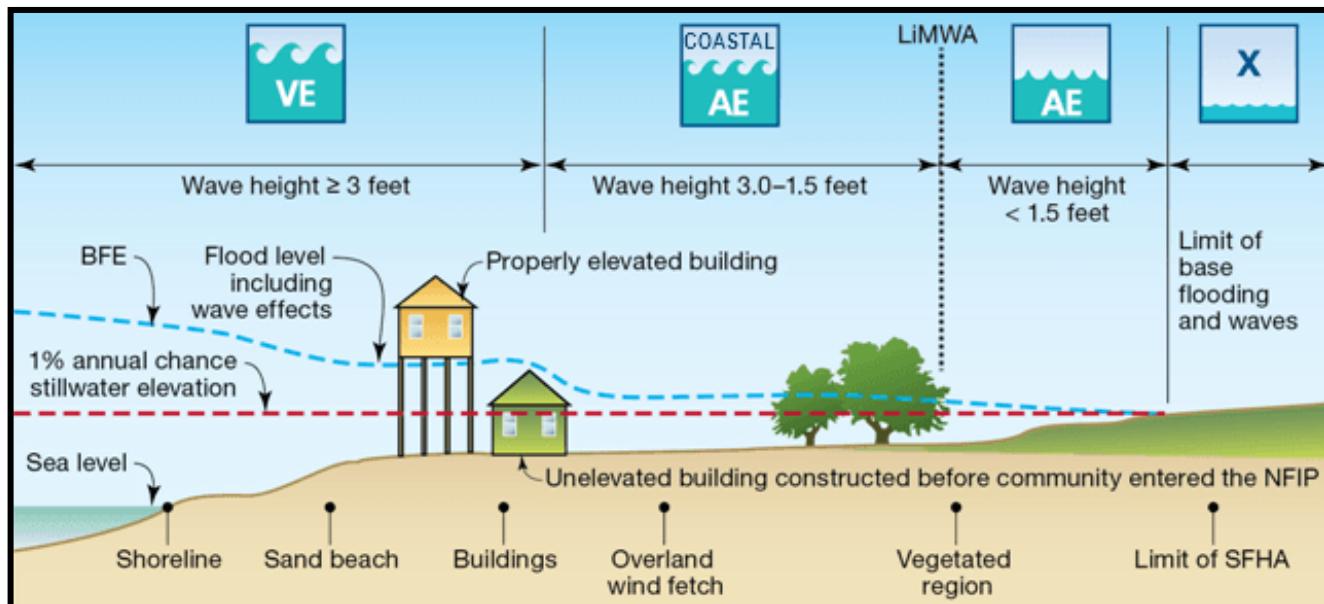
Critical Facilities: The only critical facilities structure in the VE zone is the bathhouse at Barrington Beach. In addition, four of the sanitary sewer pump stations are located on property in the VE floodplain (Bay Spring Avenue Primary Pump Station, Adam's Point and Rumstick Ejector Stations, and Nayatt Road Grinder Station).

High Risk: AE Zone (1% annual chance of flooding)

The analysis summarized in **Table 4-21** shows that the total assessed value for properties with any portion of the parcel intersecting the AE Zone is \$1,124,083,078 (approximately 30% of tax base).

Critical Facilities: There are a number of critical facilities that service vulnerable populations with at least some part of their building footprint located in the AE flood zone, including Barrington High School (220 Lincoln Avenue), two day care/early learning centers (Kids Junction - 406 Maple Avenue; and Tot's Cooperative Nursery School - 461 County Road), and several group homes. The Barrington Shopping Center (184 County Road) and some buildings at several of the marinas in Town have at least part of their building footprint in the AE Zone. The entrances/outlets for all bridges in Town, sections of the hurricane evacuation route, and both of the Town's park & ride lots are located in the AE floodplain. The National Grid Substation (236 Maple Avenue) and the dams (which are categorized as low risk) are also in the AE flood zone. In addition, six of the sanitary sewer pump stations are located on property in the AE Zone (Brickyard Pond, Freemont, and Police Cove Primary Pump Stations; and Juniper Street, Nayatt Point, and Wampanoag Ejector Stations).

Figure 4-42 Typical Shoreline – Coastal Flood Hazard Mapping (FEMA Region III)



Moderate Risk: X shaded (between 1% and 0.2% annual chance of flooding)

The analysis summarized in **Table 4-21** shows that the total assessed value for properties with any portion of the parcel intersecting the X shaded Zone is \$1,597,587,300 (approximately 43% of tax base).

Low Risk: X unshaded (0.2% annual chance of flooding)

The analysis summarized in **Table 4-21** shows that the total assessed value for properties with any portion of the parcel intersecting the X unshaded Zone is \$571,296,343 (approximately 16% of tax base).

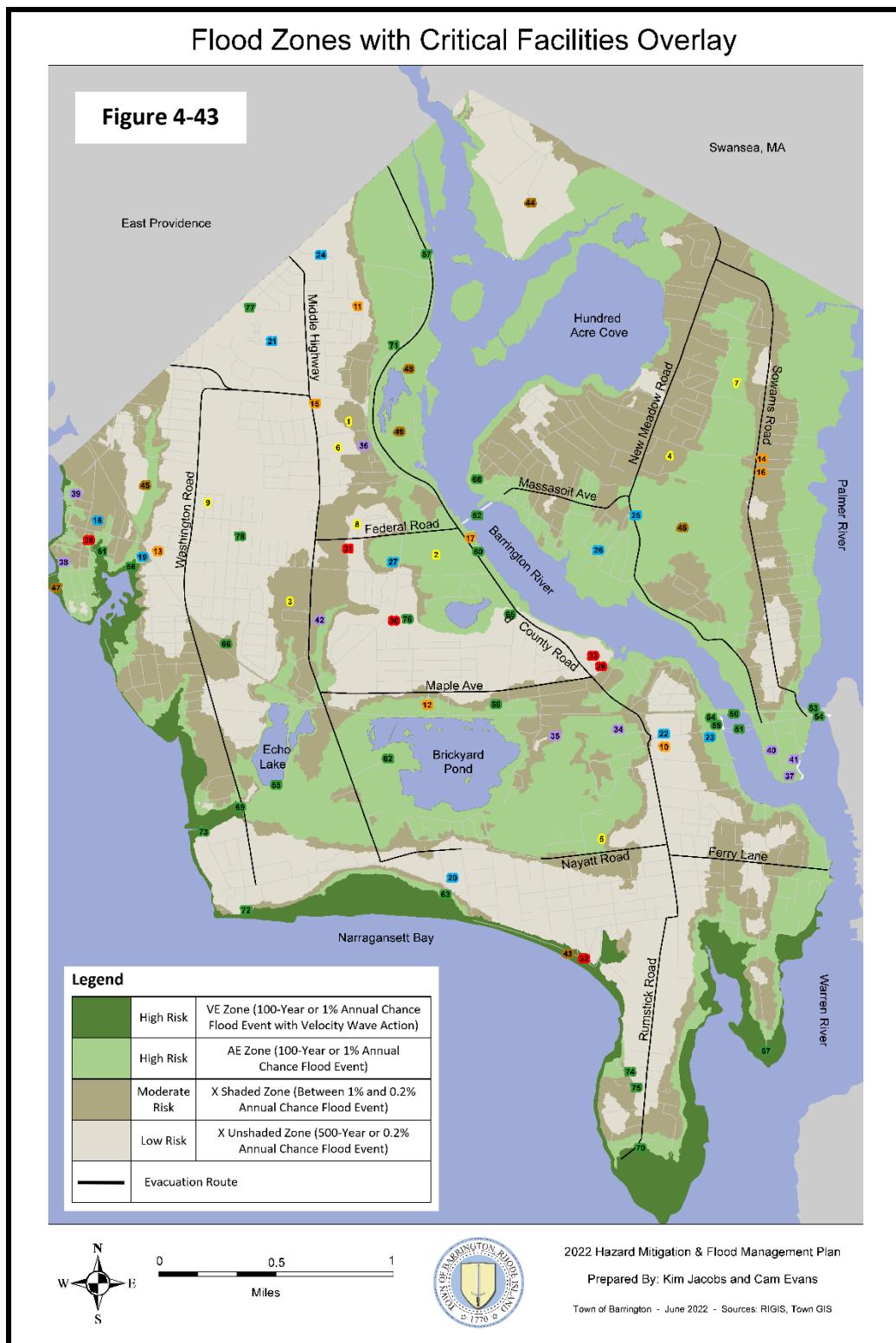


Table 4-21 Parcel Vulnerability Based on Flood Zones (Barrington Tax Assessor Data/GIS)

HIGH RISK: Velocity Flood Zone (VE) – 1% Annual Chance with additional hazards associated with wave action						
Land Use		Number of Parcels	Assessed Value			
			Principal Structure	Accessory Structures	Land	Total
RESIDENTIAL	Single-Family	236	136,391,000	2,689,000	203,126,000	342,206,000
	Multifamily (2-5 units)	6	2,182,000	23,000	2,515,000	4,720,000
	Apartments/Other	1	4,113,000	7000	705,000	4,825,000
MUNICIPAL/INSTITUTIONAL/COMMERCIAL/INDUSTRIAL	Public-owned Municipal Buildings	16	0	60,000	1,820,000	1,880,000
	Public-owned School Buildings	1	311,000	12,000	3,184,000	3,507,000
	Commercial 2	2	1,027,000	1,975,000	7,026,000	10,028,000
	Combination	1	253,000	0	332,000	585,000
	Industrial	2	583,000	15,000	288,000	886,000
	Federal and State	1	0	0	520,000	520,000
VACANT	Residential	19	2,000,000	0	11,696,000	13,696,000
	Industrial/Commercial	4	-----	-----	1,104,000	1,104,000
	Vacant Improved Land	1	-----	450,000	1,379,000	1,829,000
OTHER	Ex-Chapter; Tax Sale; and Other Improved	6	0	42,000	1,520,000	1,562,000
	Farm Forest Open Space	3	2,115,000	50,000	1,355,872	3,520,872
	Charitable Land	14	0	9000	3,455,000	3,464,000
	Unclassified Parcels	31	0	0	0	0
<i>Subtotal: Velocity Zone (VE)</i>		344	\$148,975,000	\$5,332,000	\$240,025,872	\$394,332,872

Table 4-21 *Continued*

HIGH RISK: 100-Year Flood Zone (AE) – 1% Annual Chance						
Land Use		Number of Parcels	Assessed Value			
			Principal Structure	Accessory Structures	Land	Total
RESIDENTIAL	Single-Family	1,575	447,683,690	6,130,363	415,781,354	869,595,407
	Mul family (2-5 units)	59	12,608,000	288,000	12,589,000	25,485,000
	Residenal Con do	17	9,655,000	0	0	9,655,000
	Apartments/Other	1	1,064,000	0	143,000	1,207,000
MUNICIPAL/INSTITUTIONAL/COMMERCIAL/INDUSTRIAL	Public-owned Municipal Buildings	101	3,630,000	363,000	31,325,000	35,318,000
	Public-owned School Buildings	16	46,048,000	1,092,000	18,654,000	65,794,000
	Commercial 2	30	35,351,900	3,461,000	23,064,100	61,877,000
	Commercial Condo	2	3,000	0	0	3,000
	Combinao n	13	5,251,000	193,000	3,838,000	9,282,000
	Cemeteries	3	0	0	1,132,000	1,132,000
	Churches and Churches-Taxable	4	4,325,000	160,000	1,765,000	6,250,000
	Federal and State	19	1,747,000	49,000	7099,,000	8,895,000
VACANT	Residential	66	-----	31,000	7,782,100	7,813,100
	Utilities	1	-----	18,000	365,000	383,000
	Industrial/Commercial	5	-----	-----	1,677,000	1,677,000
	Vacant Improved Land	4	-----	22,000	482,000	504,000
OTHER	Ex-Chapter; Tax Sale; and Other Improved	22	2,712,000	370,000	5,701,000	8,783,000
	Farm Forest Open Space	6	880,000	19,000	840,571	1,739,571
	Charitable Land	45	0	0	6,494,000	6,494,000
	Unclassie d Parcels	62	0	0	0	0
	Riparian Rights	2	398,000	3,000	1,795,000	2,196,000
Subtotal: 100-Year Zone (AE)		2,053	\$571,356,590	\$12,199,363	\$540,527,125	\$1,124,083,078

Table 4-21 *Continued*

MODERATE RISK: Between the 100 and 500-Year Flood Zones (X shaded)						
Land Use		Number of Parcels	Assessed Value			
			Principal Structure	Accessory Structures	Land	Total
RESIDENTIAL	Single-Family	2,826	763,334,200	8,338,000	605,376,100	1,377,048,300
	Mul family (2-5 units)	68	16,552,000	327,000	11,940,000	28,819,000
	Apartments/Other	7	13,750,000	0	1,822,000	15,572,000
	Residenal Con do	6	1,277,000	2,000	2,762,000	4,041,000
MUNICIPAL/INSTITUTIONAL/COMMERCIAL/INDUSTRIAL	Public-owned Municipal Buildings	29	11,509,000	357,000	12,131,000	23,997,000
	Public-owned School Buildings	4	56,014,000	176,000	9,188,000	65,378,000
	Commercial 2	32	15,062,000	642,000	13,350,000	29,054,000
	Combinao n	14	4,243,000	101,000	2,286,000	6,630,000
	Churches and Churches-Taxable	10	22,369,000	337,000	6,693,000	29,399,000
	Federal and State	7	417,000	0	2,604,000	3,021,000
VACANT	Residential	36	-----	-----	5,138,000	5,138,000
	Industrial/Commercial	4	-----	24,000	684,000	708,000
	Vacant Improved Land	4	-----	85,000	738,000	823,000
OTHER	Ex-Chapter; Tax Sale; and Other Improved	6	694,000	70,000	3,383,000	4,147,000
	Charitable Land	12	515,000	148,000	2,816,000	3,479,000
	Unclassie d Parcels	39	0	0	0	0
	Riparian Rights	1	0	0	333,000	333,000
<i>Subtotal: Between the 100 and 500-Year Zones (X shaded)</i>		3,105	\$905,736,200	\$10,607,000	\$681,244,100	\$1,597,587,300

Table 4-21 *Continued*

LOW RISK: 500-Year Flood Zone (X unshaded) – 0.2% Annual Chance						
Land Use		Number of Parcels	Assessed Value			
			Principal Structure	Accessory Structures	Land	Total
RESIDENTIAL	Single-Family	1,117	293,910,517	2,616,000	223,638,536	520,165,053
	Mul family (2-5 units)	38	7,741,103	198,000	5,175,187	13,114,290
	Residenal Con do	29	9,874,000	32,000	4,853,000	14,759,000
MUNICIPAL/INSTITUTIONAL/ COMMERCIAL/INDUSTRIAL	Public-owned Municipal Buildings	5	210,000	37,000	1,537,000	1,784,000
	Commercial 2	19	5,210,000	203,000	4,486,000	9,899,000
	Combinao n	9	2,394,000	59,000	1,428,000	3,881,000
	Churches and Churches-Taxable	2	373,000	0	349,000	722,000
	Cemeteries	1	0	0	154,000	154,000
	Federal and State	4	1,325,000	24,000	2,653,000	4,002,000
VACANT	Residential	12	0	0	1,524,000	1,524,000
	Industrial/Commercial	4	0	0	593,000	593,000
OTHER	Ex-Chapter; Tax Sale; and Other Improved	5	0	29,000	670,000	699,000
	Unclassie d Parcels	16	0	0	0	0
<i>Subtotal: 500-Year Zone (0.2%)</i>		1,261	\$321,037,620	\$3,198,000	\$247,060,723	\$571,296,343

Methodology

Table 4-21 Parcel Vulnerability Based on Flood Zones, was created using March 2022 data from the Barrington Tax Assessor's Office and the Town's GIS database (which includes RIGIS layers). The flood zone for a parcel was determined using a spaa l intersection of the parcel and the FEMA Digital FIRM (DFIRM) GIS layers. A property's flood zone was categorized based on the highest risk flood zone any portion of the parcel intersected.

Flood Insurance Analysis

FEMA's Mitigation Division manages the National Flood Insurance Program (NFIP) which was established by the *National Flood Insurance Act of 1968*, with the intent of reducing the need for post-disaster federal aid by offering flood insurance and providing mitigation incentives to properties that have significant flood risks. Legislation associated with the NFIP has undergone a number of changes over the years including that set forth in the *Flood Insurance Protection Act of 1973*, *Flood Insurance Reform Act of 2004*, *Biggert-Waters Flood Insurance Reform Act of 2012*, and *Homeowner Flood Insurance Affordability Act of 2014* (FEMA. 50 Years).

Flood insurance through the NFIP is available to property owners in communities who implement at least the minimum NFIP requirements. The Town of Barrington (CID 445392) has been a participant in the NFIP program since April 1971, providing Barrington residences and businesses the opportunity to obtain their flood insurance through that program. As a condition of a mortgage from a lender that is federally regulated, flood insurance is required for buildings located in the Special Flood Hazard Area (comprised of the V and A Flood Zones) Those without federally backed mortgages or outside of the SFHA are also able to purchase flood insurance through NFIP (or private insurers) to protect their home and/or content from physical losses caused by a flood. Communities that participate in NFIP currently have the opportunity to also participate in the Community Rating System (CRS) program. The Town of Barrington will continue to comply with NFIP requirements and has applied to participate in the CRS program.

The NFIP maintains flood insurance data for active policies and past claims. This data is a valuable resource for analyzing the impact of flood hazards in Barrington. As shown in **Table 4-22**, according to FEMA, as of May 19, 2022 Barrington had 895 active policies with a total coverage of \$273,871,900. Of the active policies, one is in the V zone, 255 in the A Zone, and the rest in the X shaded or unshaded zones (**Table 4-23**). The Town does not have access to data related to those who purchase flood insurance through the private sector. Hence, the total number of properties with flood insurance in Barrington may be higher. Two Town-owned buildings are located in the SFHA: the Barrington High School (220 Lincoln Avenue) and the Town Beach Bathhouse (99 Bay Road). Both of these buildings are insured for flood damage.

Based on information provided from FEMA Region I, from January 1, 1976 to May 19, 2022, there have been 414 NFIP claims, of which 271 were paid with a net total payment of \$1,867,629 (**Table 4-24**).

Table 4-22 National Flood Insurance Program Statistics – Barrington RI (FEMA – May 19, 2022)

Occupancy Type	Total NFIP Policies in Force	Total Coverage in Force	Annual Premium Total
1-4 Family Residential	882	\$ 269,834,200	\$1,004,256
Other Residential	3	\$ 990,500	\$5,986
Business	10	\$ 3,047,200	\$76,795
Total	895	\$273,871,900	\$ 1,087,037

Table 4-23 Properties with Flood Insurance Per Flood Zone – Barrington RI (FEMA – May 19, 2022)

Flood Zone	Total Residential and Business Parcels	NFIP Coverage as of February 2022
Velocity Zone (V)	1	\$159,700
100-Year Zone (A)	255	\$61,644,300
X shaded & unshaded	639	\$212,067,900

Table 4-24 NFIP Claim Statistics – Barrington RI, CID 445392 (FEMA – May 19, 2022)

Total Number of Claims (Jan 1, 1976 to May 19, 2022)	Net Total Payments (Building & Contents)	Average Net Payment	Non-Mitigated Repetitive Loss Properties as of May 19, 2022
V Zone-CWP (18); CWOP (11) A Zone- CWP (123); CWOP (105) X Zone- CWP (130); CWOP (29) (Total – 271 CWP; 143 CWOP)	\$1,867,629	\$4141	13 (11 Residential; 2 Commercial)

Notes: CWP = Closed With Payment; CWOP = Closed Without Payment

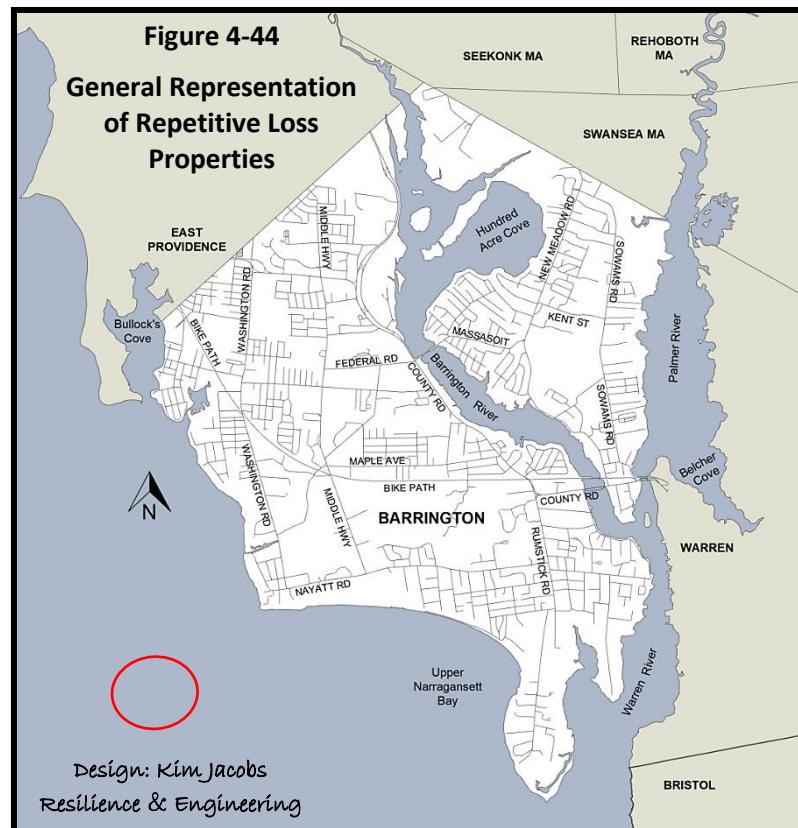
Repetitive Loss Properties

As shown in **Table 4-24**, based on FEMA data, Barrington has 13 Repetitive Loss properties. The National Flood Insurance Program currently defines properties that have had more than one flood insurance claim as follows:

- ❖ **Repetitive Loss:** Any insurable building for which two or more claims of more than \$1,000 were paid by the NFIP within any rolling 10-year period, since 1978 (claims made within 10 days of each other are counted as one claim). A repetitive loss property may or may not be currently insured by the NFIP (FEMA. Repetitive Loss Structure).
- ❖ **Severe Repetitive Loss:** Any NFIP-insured single-family or multi-family residential building that has incurred flood-related damage for which four or more separate claims payments have been made, with the amount of each claim (including building and contents payments) exceeding \$5,000; or for which at least two separate claim payments (building payments only) have been made, with the cumulative amount exceeding the market value of the building. In both instances, at least two of the claims must be within any rolling 10-year period, since 1978, and claims made within 10 days of each other are counted as one claim (FEMA. Appendix I: Severe).

Based on information provided by FEMA, the Town of Barrington has 13 repetitive loss properties. The general locations of these repetitive flood loss areas are represented in **Figure 4-44**.

This figure will be completed once the repetitive loss information has been obtained from FEMA.



4.4.2.2 Flooding, Storm Surge, and Sea Level Rise

Following is an analysis of the impact on the built environment (buildings, transportation system, and utilities) from flooding and storm surge coupled with projected sea level rise.

Hurricane Storm Surge

Flooding and coastal erosion associated with storm surge is a high-risk hazard to the Town's built environment. Storm surge is created by high-wind events. Barrington, located in the upper part of Narragansett Bay, experiences high surge elevations due to the funneling effect the Bay has on severe cyclones (tropical storms and hurricanes) passing by the area (RIEMA. *State of Rhode Island Hazard Mitigation Plan*, 3-217). **Figure 4-45** shows the locations of critical facilities overlaid with the Hurricane Surge Inundation Areas (refer to **Table 4-19** for the critical facilities map numbers; a larger scale of this map is included in **Appendix 4-2**). As depicted, even lower category hurricanes (Category 1 or 2) could flood large sections of Town.

Structures located at lower elevations in close proximity to the shoreline are at the highest risk of damage from hurricane surge inundation. As represented in **Figure 4-45**, particularly vulnerable areas include: neighborhoods along the western shoreline (in the vicinity of Narragansett Avenue/Shore Drive, Willow Way/Appian Way, Buckingham Street, Lighthouse Lane); neighborhoods along the southern shoreline (in the vicinity of the western end of Strawberry Drive/Pheasant Lane, Rumstick Drive, Rumstick Circle, Stone Tower Lane, Wildflower Road/Preston Drive, Adams Point Road, Bourne Lane); neighborhoods along the western shoreline of the Barrington River (in the vicinity of the intersections of County Road/Federal Road and County Road/Lincoln Road, Markwood Drive, Riverside Drive, Mathewson Road, Ferry Lane, Blount Circle, Briarfield Road); neighborhoods along the eastern shoreline of the Barrington River (in the vicinity of Riverview Drive, Bowden Avenue, Opechee Drive, Carver Road/Puritan Drive/Meadowbrook Drive, New Meadow Road – along the coast and heading south from Oak Manor Drive the area inland between New Meadow and Sowams Roads, Barton Avenue/Tyler Point/County Road); neighborhoods along Palmer River on the eastern shoreline (along most of Sowams Road – radiating both to the shoreline and inland – with a Category 1 hurricane potentially impacting many houses in the Seaview Drive/Baron Road/Colonial Avenue/Orchard Avenue/Lillis Avenue/ Hampden Street neighborhoods).

A detailed list of Barrington's critical facilities vulnerable to various hazards, including storm surge, has been included as **Appendix 4.3**. Following is an overview of the critical structures and infrastructure determined vulnerable to hurricane surge inundation.

Critical Facilities:

At risk from a Category 1 (or higher) Hurricane

Based on the analysis, the only critical facilities structures at risk from storm surge associated with a Category 1 (or higher) hurricane are the Tot's Cooperative Nursery School (461 County Road), the bathhouse at Barrington Beach, and buildings associated with three of the marinas (Barrington Yacht Club, Stanley's Boat Yard, and Striper Marina). The entrances/outlets for all bridges in Town, sections of the hurricane evacuation route, both of the Town's park & ride lots, and the unnamed dam behind Barrington Cove Apartments are at risk from storm surge associated with a Category 1 hurricane. In addition, five of the sanitary sewer pump stations are located on property that may be impacted from Category 1 surge inundation (Adam's Point, Juniper Street, Naya Point, and Rumsck Ejector Stations, and Naya Road Grinder Station).

At risk from a Category 2 (or higher) Hurricane

Several critical facilities structures that serve vulnerable populations are at risk from storm surge associated with a Category 2 (or higher) hurricane, including three public schools – Barrington High School (220 Lincoln Avenue), Naya School (400 Naya Road), and Sowams School (364 Sowams Road); three day care/early learning center - Kids Junction (406 Maple Avenue), Montessori Center of Barrington (303 Sowams Road), and The Early Learning Centers of RI (301 Sowams Road); two senior living facilities - Atria Bay Spring Assisted Living Facility (147 Bay Spring Avenue), and Barrington Cove Apartments (90 Bay Spring Avenue); and several

group homes. The Barrington Shopping Center (184 County Road) and Safe Harbor Cove Haven Marina (101 Narragansett Avenue) may also experience damage from storm surge associated with a Category 2 hurricane. The Echo Lake dam and six of the sanitary sewer pump stations are located on property that may be impacted from Category 2 hurricane storm surge (Bay Spring Avenue, Freemont, and Police Cove Primary Pump Stations; Wampanoag Ejector Station; and Pheasant Lane and Strawberry Drive Grinder Stations).

At risk from a Category 3 (or higher) Hurricane

Several critical facilities structures that serve vulnerable populations are at risk from storm surge associated with a Category 3 (or higher) hurricane: Barrington Middle School (261 Middle Hwy), Hampden Meadows School (297 New Meadow Road), and St. Andrews School (63 Federal Road). Other structures at risk from Category 3 surge inundation include the Barrington Bay Spring Community Center (170 Narragansett Avenue), Public Safety Building (100 Federal Road), Bayside YMCA (70 West Street), East Bay Health Center (2 Old County Road), Lighthouse Marina (110 Shore Drive), and U.S. Post Office (200 Middle Hwy). The National Grid Substation (236 Maple Avenue) and three of the sanitary sewer pump stations (Brickyard Pond and Prince's Pond Primary Pump Stations, and Elm Lane Grinder Station) are located on property that may be impacted from Category 3 hurricane storm surge.

At risk from a Category 4 (or higher) Hurricane

Two critical facilities structures that serve vulnerable populations, the Barrington Christian Academy (9 Old County Road) and Kids Quarters (64 Bay Spring Avenue), are at risk from storm surge associated with a Category 4 (or higher) hurricane. In addition the Walnut Road Primary Pump Station is located on property that may be impacted from Category 4 hurricane surge inundation.

Sea Level Rise

The Town of Barrington already experiences effects of flooding and storm inundation under current sea levels. During periods of extremely high tide or “king tides,” a reverse storm flow can cause sea water to percolate up from storm drains onto the roadways. Because large portions of the Town are low-lying (i.e., less than 20 feet above sea level) even minor storms can cause significant flooding in Town. If, as projected by climate scientists, the frequency and intensity of storms will increase in the near future, buildings and infrastructure in Barrington’s low-lying areas along the shore, in particular houses and roadways within the Velocity and Coastal A Flood Zones, may be subjected to greater risk of flood and wind damage in the future. Specific impacts related to SLR are included in the upcoming narrative: **Building Damage, Transportation System, and Public Utilities Analyses**.

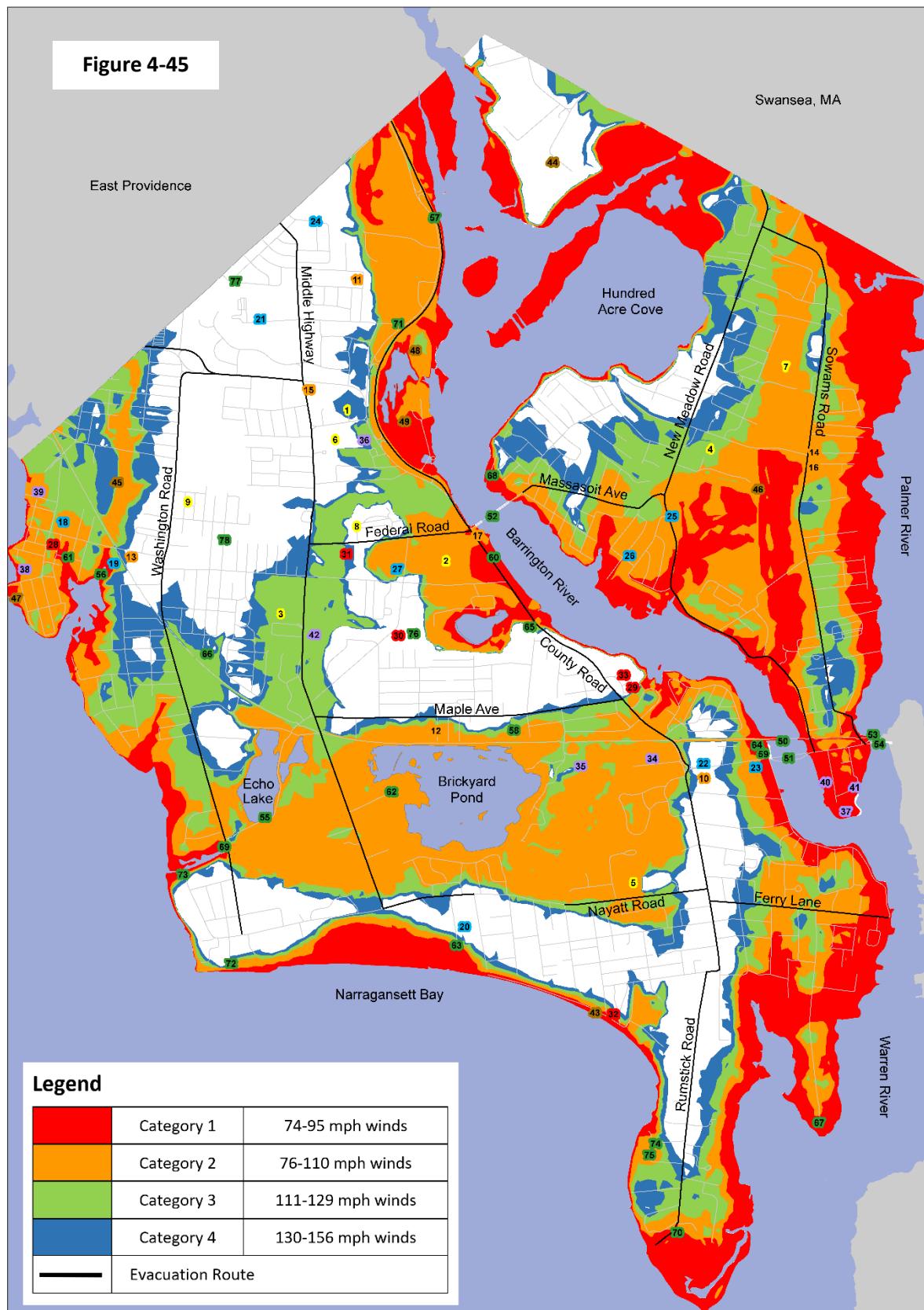
A key result of climate change is sea level rise (SLR). With an extensive coastline, Barrington is among the most susceptible communities in the state to impacts from sea level rise, which will enlarge the flood zones increasingly impacting more properties, and amplify the effects of storm surge. Coastal erosion and encroachment resulting from rising seas increase Barrington’s exposure to cascading damages. The CRMC warns that the threat of sea level rise will grow significantly in the coming decades and has adopted NOAA’s “worst-case” high curve projection to guide planning in Rhode Island (**Table 4-25**). **Figure 4-46** shows the locations of critical facilities overlaid with the current Mean High-Water level and projected 1, 3, 1nd 5-foot SLR scenarios (refer to **Table 4-19** for the critical facilities map numbers; a larger scale of this map is included in **Appendix 4-2**).

Table 4-25 Sea Level Rise Projections for Rhode Island (NASA. Interagency)

NOAA 2022 SLR Scenarios	2030	2050	2080	2100
Worst-case projections based on high curve	0.71 feet	1.60 feet	4.19 feet	6.47 feet

Hurricane Surge Inundation Areas with Critical Facilities Overlay

Figure 4-45



0 0.5 1
Miles



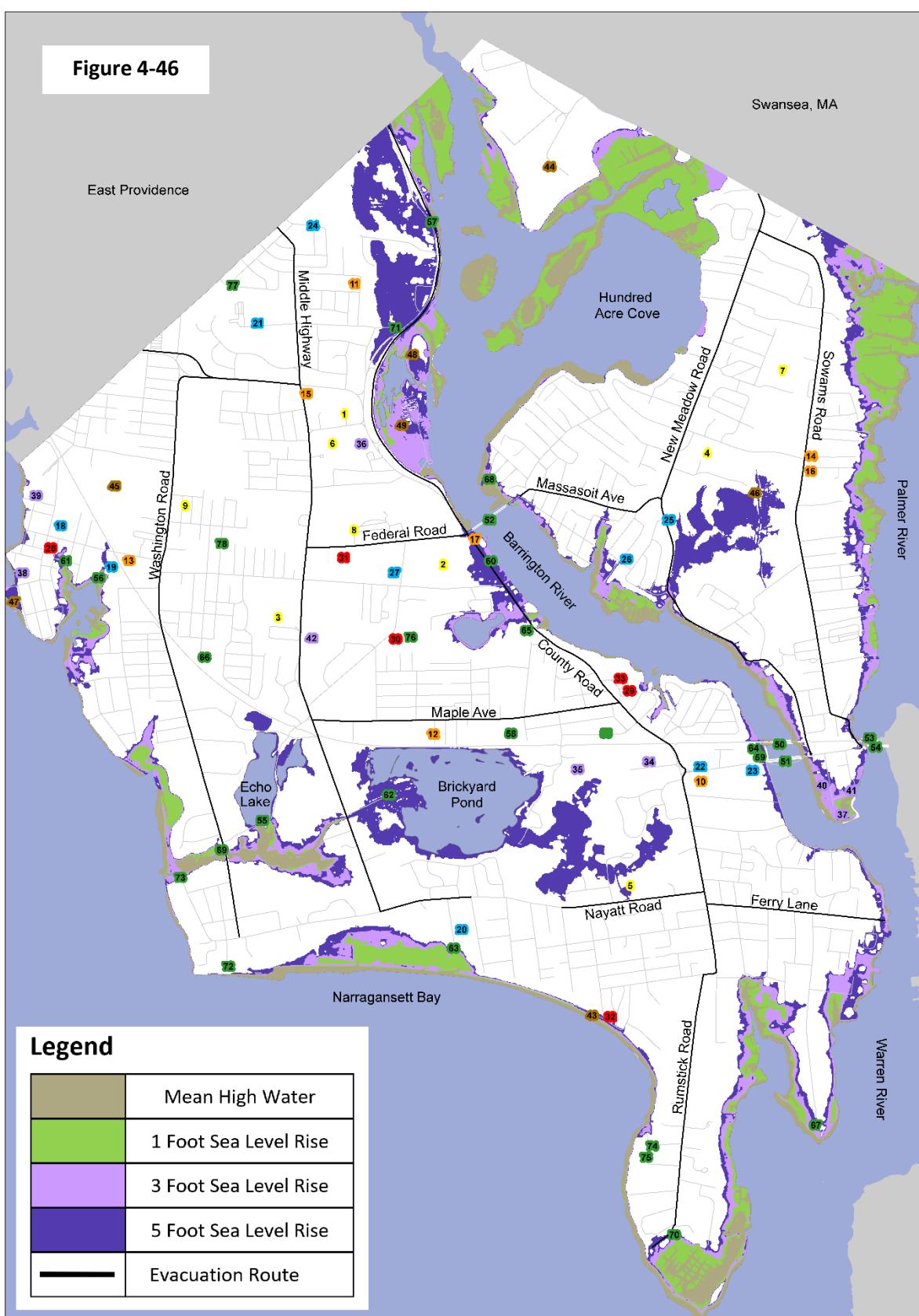
2022 Hazard Mitigation & Flood Management Plan

Prepared By: Kim Jacobs and Cam Evans

Town of Barrington - June 2022 - Sources: RIGIS, Town GIS

Sea Level Rise Inundation Areas with Critical Facilities Overlay

Figure 4-46



0 0.5 1
Miles



2022 Hazard Mitigation & Flood Management Plan

Prepared By: Kim Jacobs and Cam Evans

Town of Barrington - June 2022 - Sources: RIGIS, Town GIS

Building Damage Analysis

An extensive building damage assessment was undertaken as part of a joint project between the Town of Barrington and the Coastal Institute (CI) at the University of Rhode Island (URI). The analysis was conducted by Patrick MacMeekin, a Graduate Student in the Masters of Environmental Science and Management Program, Department of Natural Resources at URI. Details on the analysis methodology can be found in the report authored by Mr. MacMeekin and his mentor Mr. Vinhateiro, titled *Geospatial Analysis of Sea Level Rise for Rhode Island Municipalities*. Some of the maps produced have been included as Figures in this Section, with larger versions and additional maps included in **Appendix 4-4**.

The Flood Risk Analysis to buildings examined which primary structures would be affected by a given sea level rise associated with a 100-year storm return period, and to what extent the primary structure would be damaged. The analysis utilized the structure category and damage functions developed by the US Army Corps of Engineers (USACE) as part of the North Atlantic Comprehensive Coastal Study (NACCS). Analysis parameters can be reviewed in the *Geospatial Analysis Report*, but for example damage functions estimate that a ground level structure with a basement will sustain more damage than an elevated structure without a basement during a coastal flood event. The damage percentage for each of the four categories accounts for the first-floor elevation (above sea level) and considered building type as defined by NACCS building prototype codes. The results of the building analysis were represented in both *Damage Density Maps* and *Percent Structural Damage Maps*. Both sets of maps also display flood water depth indicated by a blue to purple color ramp.

The *Damage Density Maps* provide an excellent visual representation of flood vulnerability throughout the Town showing where flood risk is greatest and where the Town may want to consider targeted adaptations such as elevating structures and property buyouts. **Figure 4-47** depicts the density of primary structures that will be damaged across Barrington based on a 100-year storm return period scenario coupled with no additional SLR, 2-feet of SLR, and 5-feet of SLR. The damage density on the maps is represented by a ramped scale from hotter to cooler colors: red the highest, yellow moderately high, and dark green the lowest. As can be seen, the primary structures along the Barrington's northwestern coastline (Bay Spring and surrounding neighborhoods) are collectively the most vulnerable to flood damage. This area of Town is for the most included on Tax Map Plats 1, 2, and 3.

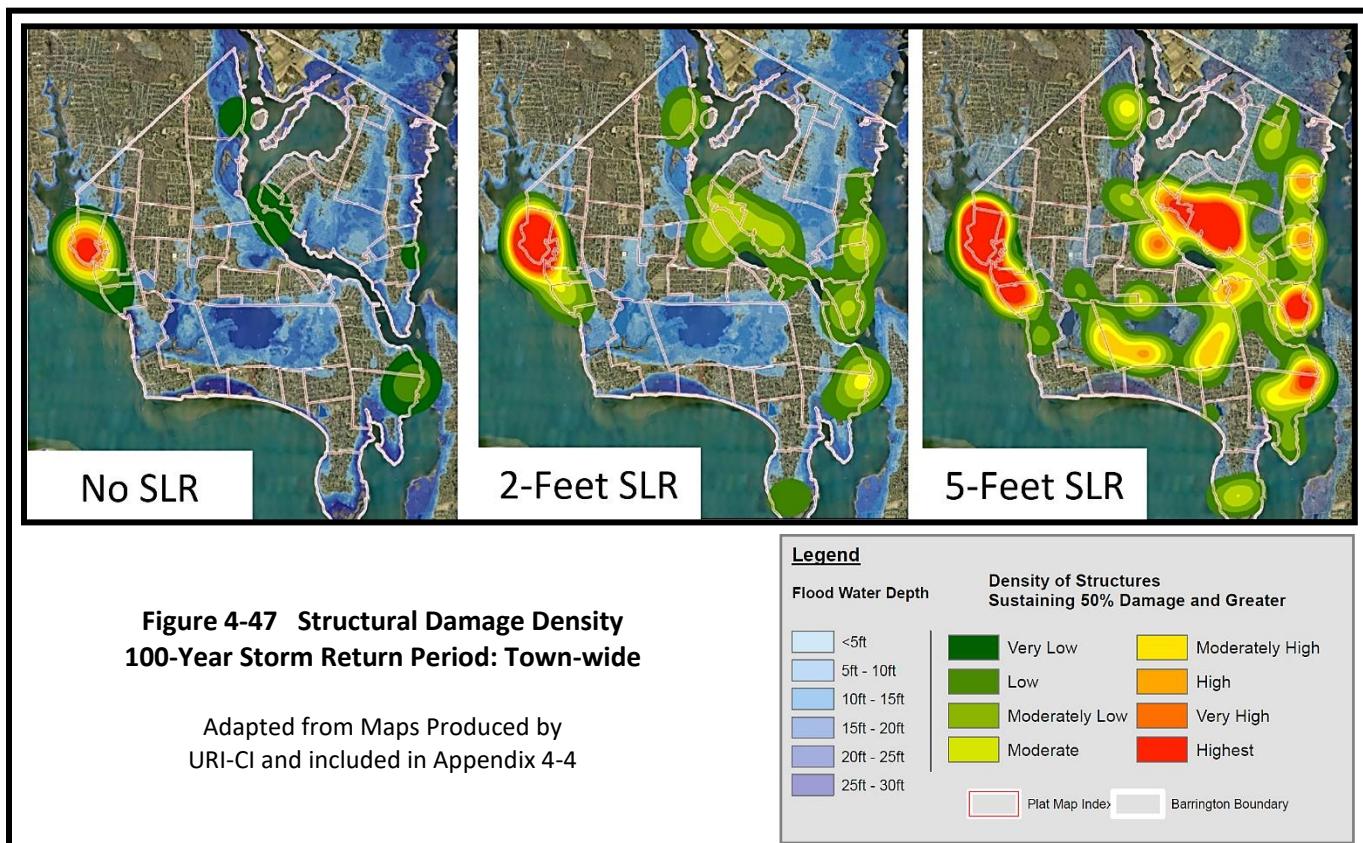
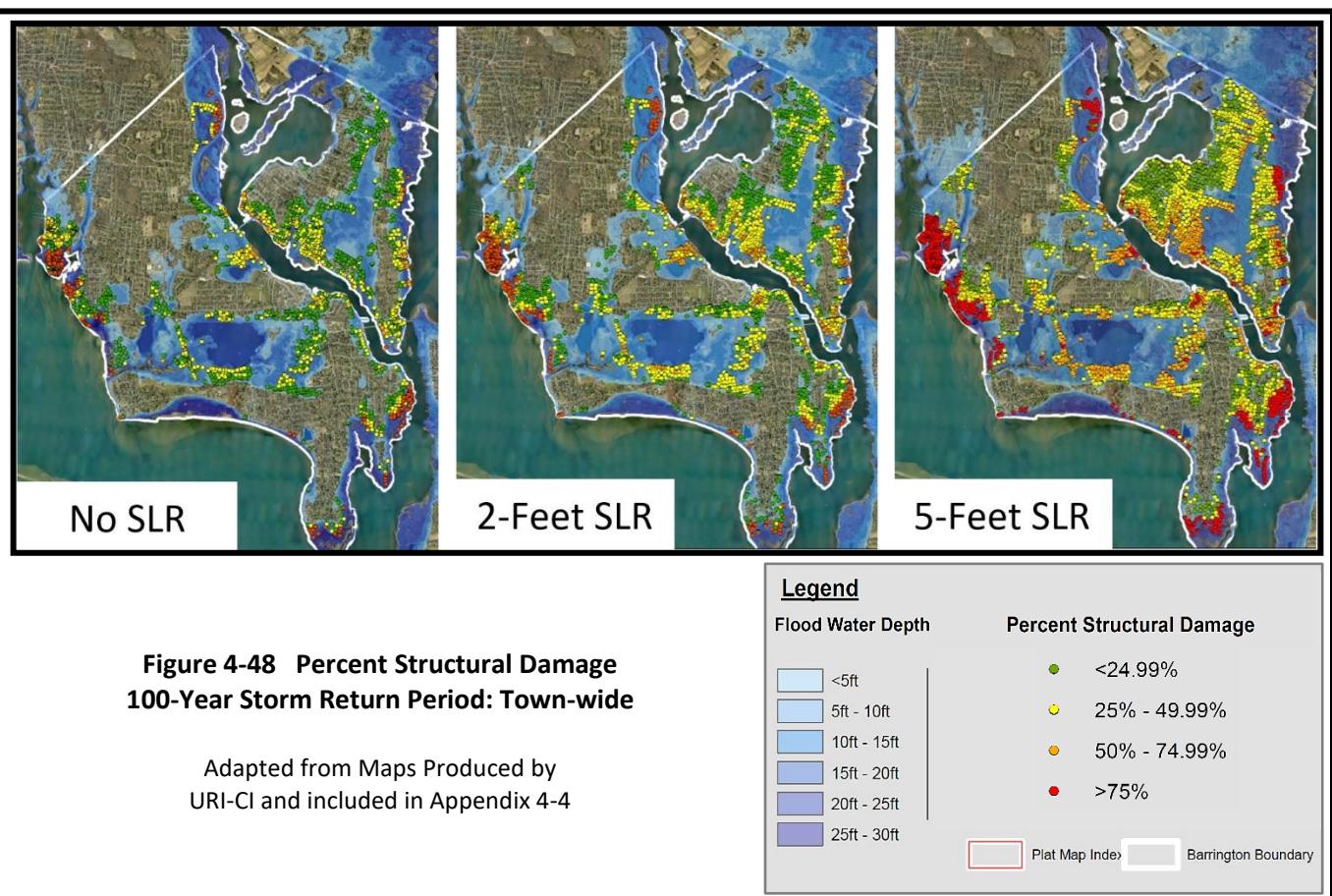


Figure 4-48 depicts the percent of damage to primary structures based on a 100-year storm return period scenario coupled with no additional SLR, 2-feet of SLR, and 5-feet of SLR. **Table 4-26** presents the building damage findings based on those scenarios. As indicated in **Table 4-26**, the analysis determined that under current conditions, roughly 1,894 primary structures (with a tax value of nearly \$576M) will sustain some damage from a 100-year flood. Of those, 308 will have significant damage (sustaining 50% or greater damage). With 2-feet and 5-feet of sea level rise, the same 100-year storm event will cause significant damage (sustaining 50% or greater damage) to approximately 631, and 1412 primary structures, respectively.

Table 4-26 Extent of Damage to Structures: Town-wide (maps/analysis produced URI-CI)

Sea Level Rise Scenario With 100-Year Storm Return Period	<24.99% structure damage # Primary Buildings (Assessed Value)	25% - 49.99% structure damage # Primary Buildings (Assessed Value)	50% - 74.99% structure damage # Primary Buildings (Assessed Value)	>75% structure damage # Primary Buildings (Assessed Value)	Total Structures Sustaining some Level of Damage # Primary Buildings (Assessed Value)
0-Feet SLR	853 (\$297,871,402)	733 (\$190,439,618)	89 (\$23,650,000)	219 (\$63,999,000)	1,894 (\$575,960,020)
2-Feet SLR	868 (\$358,313,103)	1,089 (\$307,134,726)	299 (\$7,743,800)	332 (\$98,602,000)	2,588 (\$841,487,829)
5-Feet SLR	760 (\$279,626,014)	1,268 (\$392,168,402)	799 (\$234,168,427)	613 (\$183,514,000)	3,440 (\$1,089,476,843)



Transportation System Analysis

As described in the 2015 Comprehensive Community Plan, Barrington has approximately 110 miles of State- and Town-maintained roadways: 74.7% are classified as local; 12.4% are classified as major arterial; 6.8% are classified as minor arterial; 4.0% are classified as principal arterial; and 2.1% are classified as other freeway/expressway (Town of Barrington RI. *Comprehensive*, 42).

The Town's major artery is Route 114/103, a heavily traveled State road that links Barrington with other East Bay communities; it is the only direct route connecting Barrington with Warren to the south. Route 114/103 splits at the Wampanoag Trail in the northern portion of Town, where Route 103 becomes an east-west route connecting to East Providence at Willett Avenue. Route 114 continues north as the major route for motorists traveling to other points in East Providence, Seekonk, Providence or beyond.

Barrington is largely dependent on the use of private vehicles. According to the 2020 ACS 5-year Estimates Data Profiles, just 211 workers out of 7,892, or 2.7 percent, commute to work by bus. The same survey estimated that 130 households (2.2%) had no vehicle at their home (US Census Bureau. *Data*).

The Rhode Island Public Transit Authority (RIPTA) remains the only public transit system serving Barrington. RIPTA's Route 60 serves Route 114 in Barrington as it travels between Providence and Newport, and is one of RIPTA's most successful bus routes. There are about 14 bus stops located between Massasoit Avenue and the Warren Bridge. There are also a number of stops on Route 114 north of Massasoit, although guardrails make it difficult for bus riders to cross along this highway section.

Northbound bus shelters are located just north of Town Hall and at the White Church, and south bound bus shelters are located at the East Bay Mental Health Center and across from Police Cove. In 2013 RIPTA discontinued Route 32, which provided twice daily bus service to West Barrington. According to RIPTA's website, the closest bus route to West Barrington is Route 33, which runs between Riverside and Providence. The route terminates in Riverside at the Shaw's plaza on Willet Avenue.

Senior Services, operated by the Barrington Senior Center, also offers transportation to and from the Center for residents aged 60 and above. Reservations must be made a day in advance.

Maintaining roadway viability is critical to Barrington. Statewide Planning reports that, "Sea level rise presents a major challenge to Rhode Island's transportation infrastructure, both via daily tidal flooding of coastal assets and making storm surge events more severe" (RIDSP. *Technical Paper 167*, 4). Unlike storm surge or other flooding, sea level rise is a long-term, permanent trend with implications for coastal transportation infrastructure. In order to assist municipalities to prepare for sea level rise and storm surge in their local planning efforts, Statewide Planning utilized STORMTOOLS, developed by CRMC in collaboration with URI, to identify the transportation assets at risk. Although there may be some inherent limitations in the modeled scenarios (compounding impacts from erosion, riverine flooding, and such), the findings provide municipality's valuable information regarding the affect SLR will have on their local transportation infrastructure.

Based on Statewide Planning's vulnerability assessment of State transportation assets, three of the ten most vulnerable segments of roadway under state jurisdiction that will be inundated by up to five feet of sea level rise, are located in Barrington. All three of these roads, identified in **Table 4-27**, are part of the Army Corps of Engineers Hurricane Evacuation Route, and both County Road and Wampanoag Trail are principal arterties. In Technical Paper 164, Statewide Planning indicates that, "A vulnerability assessment focused on assets under state jurisdiction found that infrastructure at greatest risk is located in Bay communities and on Block Island. In particular, the East Bay communities of Barrington, Bristol, and Warren have very important transportation infrastructure that is vulnerable to sea level rise" (RIDSP. *Technical Paper 164*, 5).

Table 4-27 Three of the Top Ten Road Segments Under State Jurisdiction Most Vulnerable to SLR
 (Adapted from RIDSP. *Technical Paper 164*, 12)

Road Name	Feet of SLR When Road First Floods	Linear Feet Flooded At:		
		1-ft SLR	3-ft SLR	5-ft SLR
County Road	1 ft	31	248	2,888
Massasoit Avenue	1 ft	15	59	630
Wampanoag Trail	3 ft	0	141	6,368

Additionally, in Technical Paper 167, Statewide Planning looked at the impact of SLR, with and without a 100-year storm surge, on roads under state jurisdiction. As shown in **Table 4-28**, SLR will have a permanent impact on a number of road sections throughout Barrington. It is worth noting that the intensity of a 100-year storm event, even without the compounded issue of SLR, will impact roughly 54 miles of roadway in Town.

Table 4-28 Linear Miles of Roads Under State Jurisdiction Inundated – Barrington
 (Adapted from RIDSP. *Technical Paper 167*, 20)

Exposure	Linear Miles Flooded At:					
	No SLR	1-ft SLR	3-ft SLR	5-ft SLR	7-ft SLR	Total
SLR	N/A	0.01	1.26	5.22	7.94	14.44
100-Year Storm Surge	53.91	5.08	5.93	4.82	3.85	73.58

Note: the mileage represented per column should be added to columns to the left to obtain cumulative impact

The Statewide Planning vulnerability assessment further determined that of the 90 bridges throughout the State that are vulnerable to sea level rise, the three most vulnerable are all in the East Bay and carry traffic along Route 114 which is a high-volume roadway. In order of vulnerability, they are the Barrington Bridge over the Barrington River, the Warren Bridge over the Warren River, and the Silver Creek Bridge over the tidal inlet in Bristol (RIDSP. *Technical Paper 167*, 22). Technical Paper 167 further demonstrates that rising seas will make traversing underneath the Barrington River and Warren River vehicular bridges—and by extension the bike path bridges—impossible. For example, 7 feet of SLR would leave negative 10 inches of freeboard for the Barrington River Bridge. (Freeboard is the space between the bottom of a bridge's structure and the surface of the water underneath the bridge.) The Harbormaster's dock at Police Cove, located between the Barrington River bike path bridge and vehicular bridge, would be rendered unusable.

The two East Bay Bike Path bridges over the Barrington and Warren Rivers are slated for replacement through the State Transportation Improvement Program (STIP). The Barrington Town Council in February 2017 passed a resolution requesting the State to re-evaluate the bridges and move up the schedule given concerns about the condition of the structures, as well as future impacts of SLR which will impact boaters as well. The land to either side of both bridges is within the AE flood zone. The schedule was modified with construction (estimated at \$10.4 million) scheduled to be completed in 2024 (RIDOT. *State*, 273).

In an effort to augment Statewide Planning's 2015 and 2016 road and bridge analysis, in the fall of 2020 an extensive roadway analysis was conducted as part of a joint project between the Town of Barrington and URI's Coastal Institute. As with the building analysis, the roadway analysis was also led by URI Graduate student Patrick MacMeekin. The analysis focused on local roads as well as those under state jurisdiction. Details on the analysis methodology can be found in the report authored by Mr. MacMeekin and his mentor Mr. Vinhateiro, titled *Geospatial Analysis of Sea Level Rise for Rhode Island Municipalities*. A selection of the maps produced have been included as included in **Appendix 4-4**.

"The roadway analysis was conducted in two parts: Part 1 created a raster dataset representing the depth of floodwater on the roadway for a given SLR/storm scenario. Part 2 created a line feature of the flooded roadways used to calculate the linear feet of flooded roads. Both parts used ArcGIS model builder to run the analysis" (MacMeekin, Patrick. *Geospatial*, 10). The analysis sought to identify which roads and to what extent they would be inundated by floodwater under present and future sea level rise conditions.

A Roadway Map Series was produced which included various sea level scenarios (No SLR, 2-feet SLR, 3-feet SLR, 5-feet SLR) combined with various events (MHHW, 1-year storm return, 10-year storm return, 100-year storm return). The Town appreciates the range of maps produced by the URI-Cl initiative and will use this information when developing future projects. As identified through the analysis, numerous roadways, including portions of key corridors essential to emergency evacuation, are low-lying and subject to periodic inundation from storm surge and flooding as well as future permanent inundation from sea level rise.

An example of the roadway analysis mapping has been included as **Figure 4-49**. This map shows a portion of the Wampanoag Trail (Route 114) that is vulnerable to flooding. It depicts the floodwater depth under the **3 Foot SLR with 10-Year Storm Event scenario**. A 10-year storm event means a 10% chance of occurrence in the period of one year. Per the Legend, in the Figures, flood water depth is displayed in a green to red color ramp, with dark green colors representing shallow floodwater depth, and orange to red indicating deeper floodwater. The transparent blue color represents the absolute extent of storm surge under the modeled scenario (what area of land will be flooded) but does not correlate to a particular depth of water.

As shown in **Table 4-29**, for the intersection of Primrose Hill Rd and Wampanoag Trail, the map analysis produced through the URI-Cl internship program can also be used to identify roadway flood depths and distance of flooded roads under different scenarios of sea-level rise and storm surge.

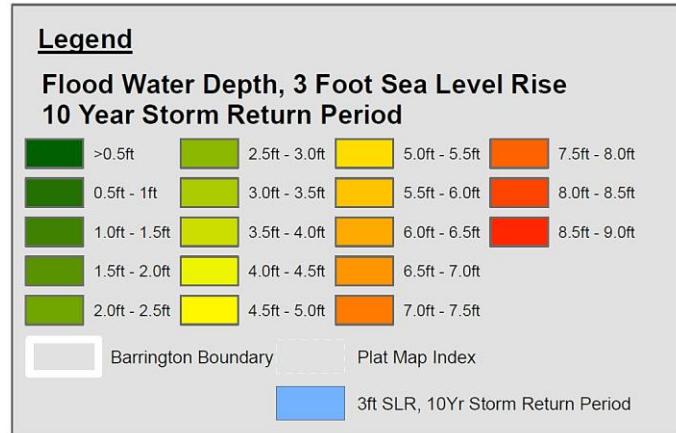
Table 4-29 Floodwater Depth on Road Surface (feet)

(URI-Cl. *Preparing for Resilience: Barrington, Warren*, 18)

Intersection of Primrose Hill Rd and Wampanoag Trail, Barrington (RI)				
Sea-level Rise Scenario	Mean Higher High Water ()	1 Year Storm Return Period ()	25 Year Storm Return Period ()	100 Year Storm Return Period ()
2 Feet	-----	0.73	8.91	12.66
5 Feet	0.58	3.73	11.91	15.90
7 Feet	2.58	5.73	13.91	18.00
10 Feet	5.58	8.73	16.91	24.57



Figure 4-49
Wampanoag trail (Route 114)
3-Foot SLR with 10-Year Storm Return Period



Flood water depth is displayed in a green to red color ramp, with dark green colors representing shallow floodwater depth, and orange to red indicating deeper floodwater

Public Utilities Analysis

Public utilities keep our communities running effectively.

❖ Above-ground utilities

"The electric grid is one of the most critical infrastructure systems for modern life, but it is also one of the most vulnerable" (Korbatov, 3). Above-ground utilities like transmission and distribution lines can be impaired by strong winds, as well as by heavy snow and ice associated with winter storms. In 2015, the U.S. insurance industry identified an annual financial loss from power outages caused by flooding, hurricanes, and extreme temperatures to be in the range of 20–55 billion (Korbatov, 3). Power outages can impact the Town's ability to manage emergencies and keep residents safe. On February 23, 2022 the Pennsylvania-based PPL Corporation received approval from the Rhode Island Division of Public Utilities and Carriers to acquire The Narragansett Electric Company from National Grid USA. PPL is based in Allentown, Pennsylvania, and provides electricity and natural gas to approximately 2.5 million customers in the U.S. The electric and transmission grid in Barrington is now owned by PPL.

❖ Stormwater Infrastructure

Stormwater infrastructure can be damaged from high volume rainfall events due to high flow velocity causing erosion or from floodwater carrying debris which can clog storm drains, pipes, and outfalls. Coastal flooding at stormwater outfalls may drive backflow into the system, causing upland flooding through street drains and drainage ditches. In addition to flooding, prolonged presence of saltwater can damage stormwater infrastructure. Coastal erosion can also expose infrastructure along the shoreline which may lead to damage.

❖ Potable Water Supply

Barrington's public water supply, along with that of Warren and Bristol, is provided by the Bristol County Water Authority (BCWA), a public water authority which has been operational since 1984. Delegates from the three towns serviced by BCWA comprise the Board of Directors. The Authority's administrative office is located at 450 Child Street in Warren. Currently, the BCWA purchases 100 percent of its water - roughly 3.31 million gallons per day (MGD) - from the Providence Water Supply Board's (PWSB) Scituate Reservoir, which is treated at the Holton Water Treatment Plant in Hope, RI. The water is delivered via the East Bay Pipeline under the Providence River. Completed in 1998, the pipeline provides the system with a supply of up to 3.5 MGD of treated water (BCWA. *Website*).

For redundancy, in 2016 the BCWA installed an emergency connection to the East Providence 16" water main. In an emergency situation, this main can supply approximately 2 MGD (60%) of the roughly 3.31 MGD (average day use) required by the BCWA. As the East Providence emergency connection cannot meet the full needs of the Authority's service area, BCWA conducted an extensive engineering and costing study which concluded that a pipeline to connect with Pawtucket's water system is the most effective and cost-efficient option for an alternative water supply. The BCWA Board approved moving forward with the Pawtucket Pipeline Project with Phase I construction (1.5 miles of 24" main) tentatively scheduled to be completed in 2022 and Phase II (5 miles of 30" main) by 2026 (BCWA. *Website*).

As water is an important commodity, during a drought or extended dry conditions that require an emergency response to reduce water usage, the Town Manager is responsible for coordinating with BCWA and the Water Resource Board (WRB).

As shown in **Figure 4-40**, the majority of Barrington is serviced by BCWA. The exception is in the northeastern area (George Street neighborhood) which is on private wells. Wells may be vulnerable to high floodwater which can deposit mud or sediment in the wells or cause structural damage if the floodwater is carrying with it large pieces of debris.

❖ Non-Sewered Area

As shown in **Figure 4-50**, the non-sewered area of Barrington is limited to the northeastern section of Town (George Street area), which is outside of both the SFHA and Category 1-4 hurricane surge inundation areas.

❖ Sanitary Sewerage System

Barrington's Public Works Sewer Division provides maintenance and inspection of the Town-wide sanitary sewer system, which consists of approximately one hundred miles of sewer lines. As shown in **Figure 4-50**, the system includes six major sewer pumping stations, located at Police Cove near the Barrington River Bridge, on County Road near Prince's Pond, Freemont Avenue, Legion Way near Brickyard Pond, Walnut Road, and Bay Spring Avenue. The pump stations at Police Cove, Prince's Pond, and Freemont Avenue pump into the Brickyard Pond station on Legion Way. This station, along with Walnut Road and Bay Spring Avenue, pump into a sewer force main located adjacent to the East Bay Bike Path.

There are also 5 submersible (ejector) pumps and 4 grinders that move the wastewater through the system. The force main connects the wastewater collection system to the treatment facility in East Providence. The Town shares the cost of upgrades to the East Providence treatment facility based upon the percentage of Town wastewater conveyed to the plant. The sanitary force main connection with East Providence failed in December 2006. In response, the Town replaced the force main, a \$5 million-plus project. The cost was covered through the sewer enterprise fund, which is also the mechanism for covering future multi-million-dollar improvements at the treatment facility. Prior to 2017 the Town also undertook upgrades to the six primary pump stations as well as improvements to the ejector stations and grinders.

As New England storms often result in power outages, it is critical that the sewer pump stations have reliable backup power. If pump stations are not able to pump wastewater to the WWTF where contaminants can be controlled and treated in a centralized fashion, backups in the collection system and overflows at the stations may occur. Overflows can create public health issues as wastewater carries germs, bacteria, and parasites which can cause mild sickness to deadlier diseases like cholera and hepatitis. Further, if the wastewater makes its way to rivers and streams it could impact water quality and degrade aquatic habitat.

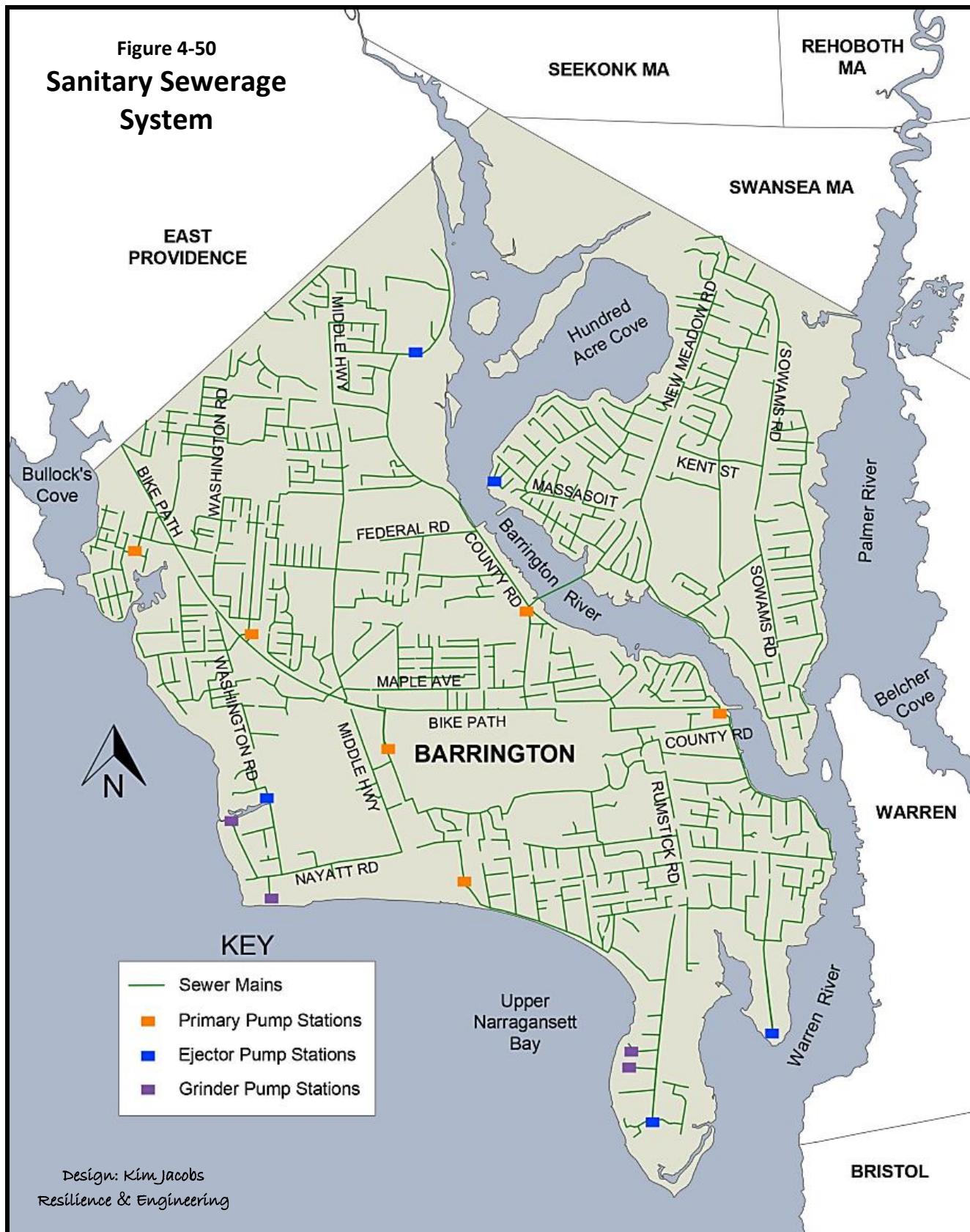
In January 2020 the Town applied and was subsequently awarded a DEM Wastewater Treatment Facility Resiliency Fund Grant to assist in the purchase of two portable backup generators. The redundancy of these generators is an important resiliency measure which will allow for the continued operation of the pump stations in the event of power outages.

Table 4-30 shows the FEMA Flood Zone and the lowest hurricane category anticipated to have surge inundation at the pump station locations.

Table 4-30 Sanitary Sewer Pump Station Vulnerability

Type	Location	Flood Zone	Hurricane Surge Inundation
Primary	Bay Spring Ave Pump Station	VE	Cat 2
	Brickyard Pond Pump Station	AE	Cat 3
	Freemont Pump Station	AE	Cat 2
	Police Cove Pump Station	AE	Cat 2
	Prince's Pond Pump Station	X	Cat 3
	Walnut Road Pump Station	X	Cat 4
Ejector	Adam's Point Ejector Station	VE	Cat 1
	Juniper Street Ejector Station	AE	Cat 1
	Naya Point Ejector Station	AE	Cat 1
	Rumsc Ejector Station	VE	Cat 1
	Wampanoag Ejector Station	AE	Cat 2
Grinder	Elm Lane Grinder Station	X	Cat 3
	Naya Road Grinder Station	VE	Cat 1
	Pheasant Lane Grinder Station	X	Cat 2
	Strawberry Drive Grinder Station	X	Cat 2

Figure 4-50
**Sanitary Sewerage
 System**



NATURAL ENVIRONMENT

4.4.3 Natural Environment

Barrington's natural features are important resources, serving as habitat for wildlife, providing passive recreational opportunities for the public, and enhancing the scenic characteristics of the community. The natural environment also plays a role in reducing natural hazard impacts and increasing the community's resiliency. For example, freshwater wetlands and coastal marshes help absorb flood waters; open spaces, soils, and landscape features contribute to stormwater management; and vegetative cover controls erosion and reduces runoff.

Due to its coastal location and extensive low-lying land, the primary hazards that will impact the natural environment are flooding and coastal erosion from rain and snow events, and storm surge from hurricanes or other high-wind events. These hazards will be exacerbated by sea level rise. In addition to the vulnerabilities identified in **Table 4-31**, risks to the natural environment will be further explored in the following subsections:

4.4.3.1 Freshwater and Saltwater Resources

4.4.3.2 Wetlands and Floodplains

4.4.3.3 Open Space

Table 4-31 Natural Environment Vulnerability

Hazard Group	Vulnerability (<i>What is at Risk</i>)
 <p>Flood-Related Hazards (Inland Flooding/Dam Failure; Coastal Flooding/Storm Surge; Coastal Erosion)</p>	<ul style="list-style-type: none"> The bay and rivers of Bristol County Rhode Island have sculpted a land area of low ridges generally running north to south, separated by open water or lowlands characterized by high water tables and wetlands. Because so much of Barrington's land is low-lying, the natural environment is highly vulnerable to flood-related hazards. Based on RIGIS contours, the higher elevation areas of Town include: <ul style="list-style-type: none"> Primrose Hill is the highest point in Town at approximately 60 feet In the vicinity of Upland Way near the intersection of Barrington Avenue/Northwest Passage there is a high point of about 50 feet The peak of Prince's Hill is approximately 48 feet Naya Point near Glen Avenue/Dexter Street is about 48 feet The Prospect/Fountain Avenue neighborhood ranges from about 40 to 48 feet The hills south of Nayatt Road rise to about 46 feet The high area of St Andrew's Campus off of Federal Road climbs to about 46 feet Coastal flooding can cause damage to property along the coast Due to increased intensity and frequency of storms, more coastal lands will be susceptible to erosion; eroded beach material and debris can be carried out to sea Flood waters can carry toxic material or contaminants spreading pollution which can negatively impact ecosystems Standing water following a flooding event can provide a conducive environment for breeding mosquitos Storm surge, caused by high winds, can cause flooding and coastal erosion Coastal erosion will narrow beaches and compromise coastal salt marshes; areas along Barrington's shoreline vulnerable to coastal erosion include Annawomscut, Barrington Beach, Barrington River, Hundred Acre Cove, Nayatt Point, Palmer River, and Rumstick Neck With an extensive coastline (19.6 miles), Barrington is among the most susceptible communities in the state to impacts from projected sea level rise (SLR) which will result in coastal erosion and encroachment <p>Future increases in relative sea level will lead to the loss of recreation areas and public space; as coastal marshes become inundated at a greater rate, salt marsh vegetation will be lost and</p>

	<p>an alteration of habitat types will result; wide-scale system changes in the terrestrial and marine environments will result; changes in surface water and groundwater characteristics will occur; salt intrusion into aquifers will contaminate drinking water supplies ((RIEMA. <i>State of Rhode Island Hazard Mitigation Plan</i>, 3-175).</p> <ul style="list-style-type: none"> As coastal wetlands - critical for flood control and habitat viability – are lost, Barrington will be increasingly exposed to cascading damages Refer to Sections 4.4.3.1 – 4.4.3.3 for additional flood-related vulnerabilities
 Wind-Related Hazards (High Winds – Thunderstorms/ Lightning/Hail; Tornadoes; Tropical Cyclones)	<ul style="list-style-type: none"> As discussed above under flood hazards, for Barrington the most significant impact to the natural environment from high winds is storm surge damage to shoreline ecosystems High winds may exacerbate fire conditions by drying out the ground cover, propelling fuel around the region, and increasing the ferocity of existing fires; lightning associated with thunderstorms have been known to spark fires High winds and hail can cause damage to vegetation Tornadoes can kill or disrupt wildlife if their habitat is impacted Critical Facilities: All of the Town's natural resources identified as critical facilities may experience damage associated with a Category 1 (or higher) hurricane: Barrington Beach, Hampden Meadows Greenbelt, Latham Park, Osamequin Nature Preserve, Walker Farm; and to a lesser degree, Haines Memorial State Park and Douglas Rayner Wildlife Refuge/Nockum Hill. Refer to Sections 4.4.3.1 – 4.4.3.3 for additional flood-related vulnerabilities
 Winter-Related Hazards (Heavy Snow; Ice; Extreme Cold)	<ul style="list-style-type: none"> Heavy snow and/or ice accumulation can weigh down and damage vegetation and tree limbs Prolonged snow/ice cover and exposure to extreme cold may negatively impact outdoor animals/wildlife and disrupt ecosystems Flooding may occur after the rapid melting of a heavy snowfall
 Infectious Disease (Vector-borne Diseases Transmitted by Ticks and Mosquitoes; Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses)	<p>Mosquitoes & Ticks</p> <ul style="list-style-type: none"> As climate change shortens our winters, ticks and mosquitoes will extend their life cycle and ticks will expand their habitat range <ul style="list-style-type: none"> In the short term, the tick and mosquito populations are not expected to have an appreciable impact on Barrington's natural environment Long-term, if the tick and mosquito populations continue to increase, it may alter the health of local ecosystems Critical Facilities: Many of the Town's public and privately owned open space properties provide a conducive environment for ticks and mosquitoes to breed including some of the natural resources critical facilities: Douglas Rayner Wildlife Refuge/Nockum Hill, Haines Memorial State Park, Hampden Meadows Greenbelt, and Osamequin Nature Preserve <p>Influenza Viruses or Coronaviruses</p> <ul style="list-style-type: none"> The influenza viruses or coronaviruses are not expected to have an impact on Barrington's natural environment
 Other Hazards (Earthquakes; Extreme Heat; Drought; Brush Fires)	<p>Earthquake</p> <ul style="list-style-type: none"> Earthquakes are not expected to have an appreciable impact on Barrington's natural environment <p>Extreme Heat</p> <ul style="list-style-type: none"> Over the long term, extreme heat trends may alter the life cycle of plants and animals and could create a cascading effect to the surrounding environment (Columbia) Sporadic periods of extreme heat may stress plants and dehydrate wildlife/outdoor animals

	<p>Drought</p> <ul style="list-style-type: none"> • Sporadic periods of short-term drought may stress plants and dehydrate wildlife/outdoor animals; there is a relatively small section of Town in agricultural use (George Street area) which is more at risk to short-term droughts • Long-term drought conditions are associated with insect infestations, plant disease, loss of biodiversity, wind erosion of soil, degrading water quality, and decrease in levels of water produced by natural aquifers (NOAA NIDIS. <i>Drought</i>); however as climate change models predict more precipitation for the Northeast, the probability of a long-term drought in the near future is considered low for Barrington <p>Brush Fire</p> <ul style="list-style-type: none"> • Due to the low probability and highly effective Fire Department capability, brush fires are not expected to have an appreciable impact on Barrington's natural environment
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4.4.3.1 Freshwater and Saltwater Resources

As evidenced in **Figure 4-51**, Barrington has a number of freshwater and saltwater resources. The Town's character is intertwined with this important resource and it is essential to understand how natural hazards, exacerbated by climate change and sea level rise, will impact the communities waterbodies.

According to RIDEM, protecting riparian corridors is a key factor in preserving water quality in a watershed. These buffer areas that are adjacent to waterbodies consist of trees, shrubs, and other vegetation. They act as natural filters to remove sediments and pollutants from water as well as helping to reduce flooding. Riparian corridors also provide food, cover, and breeding sites for wildlife (RIDEM. *Riparian*).

The Town's freshwater resources include wetlands, ponds, rivers, and streams. The Comprehensive Plan indicates that Barrington has roughly 200 acres of inland water bodies. The largest bodies of water include Brickyard Pond (105 acres), Echo Lake (22.5 acres), and Prince's/Tiffany Pond (8.3 acres). Significant creeks include Annawamscutt Brook and Mussachuck Creek (Town of Barrington RI. *Comprehensive*, 70).

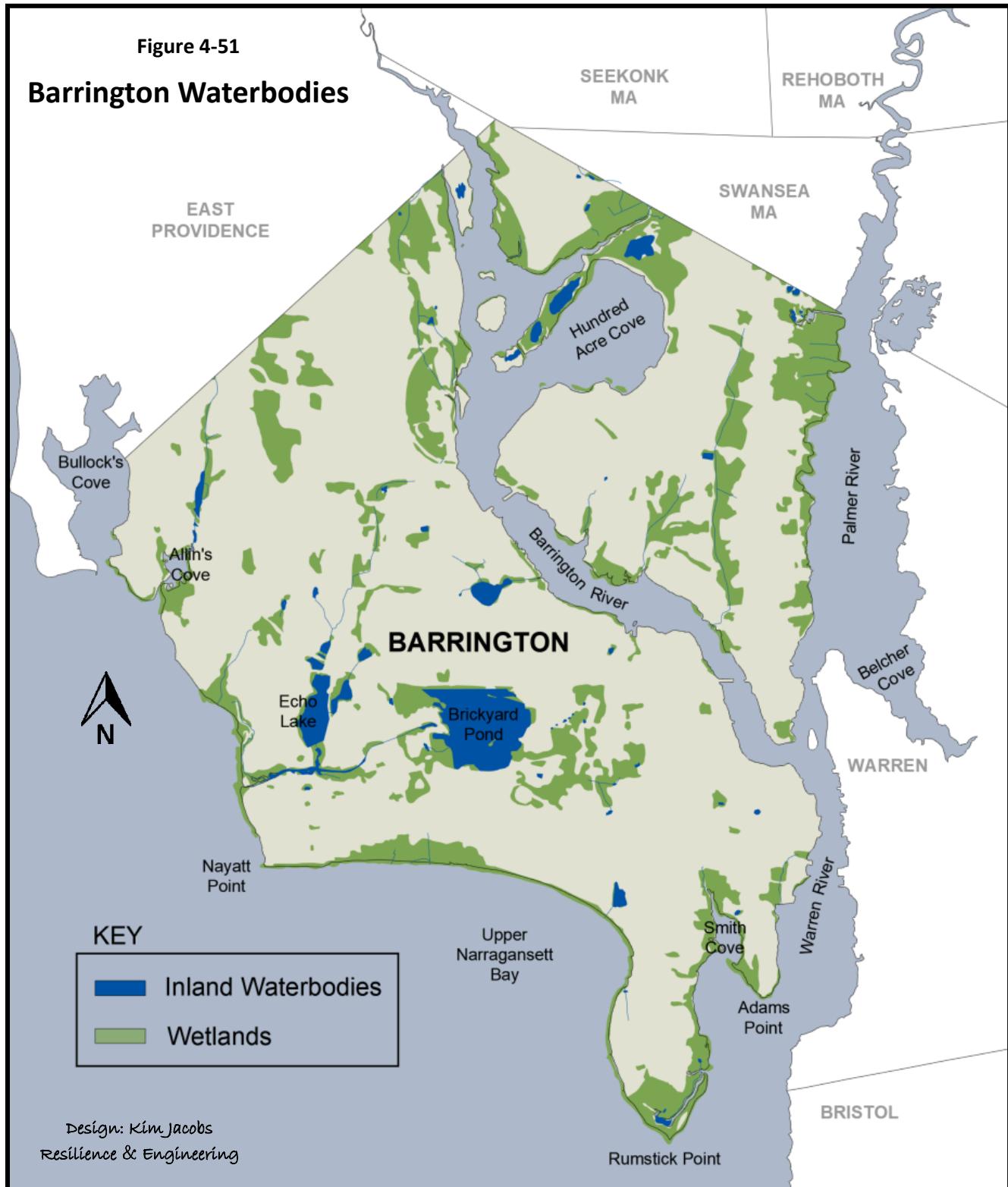
Flood-Related Hazards

There is a high probability that flooding will occur during the upcoming 5-year period. A number of Barrington's natural resources, located on low-lying land along the shoreline, may be impacted. All of the natural resources identified as Critical Facilities are in the SFHA: Barrington Beach and Latham Park are located on parcels with some portion of the property in the VE Zone; Douglas Rayner Wildlife Refuge/Nockum Hill, Haines Memorial State Park, Hampden Meadows Greenbelt, Osamequin Nature Preserve, and Walker Farm have some/all of the property in the AE Zone.

While periodic flooding can have positive impacts on ecosystems including rejuvenating floodplain vegetation and recharging groundwater supplies in aquifers, it can also have negative impacts on waterbodies. Floodwater can cause erosion and it picks up pollutants like oils and salt from roadways, fertilizers and pesticides from lawns, industrial chemicals, sediment, and debris as it makes its way down gradient. If sufficient polluted floodwater flows into a waterbody or inundates well water it can harm wildlife or contaminate drinking water.

Increased runoff from climate impacts may further degrade water quality in the Hundred Acre Cove, and the Barrington, Palmer, and Warren Rivers. To some extent the problem of contamination can be mitigated through education and by limiting the use of fertilizers, pesticides, road salts, and other common contaminants often carried by flood waters.

Figure 4-51
Barrington Waterbodies



As depicted in **Figure 4-52**, CRMC classifies coastal waters in Rhode Island into six water types according to the characteristics of the adjacent shoreline, water use, and density of use. “Conservation, recreation, transportation, and industrial activities all occur along the shore, and influence the shoreline policies and regulations based on water types. Though all areas along classified waters are subject to coastal zone management, properties located along certain water types may have more strict regulations for development” (CRMC. *Rhode Island Coastal*, 4).

“Some of the activities or structures that are regulated in the coastal area include:

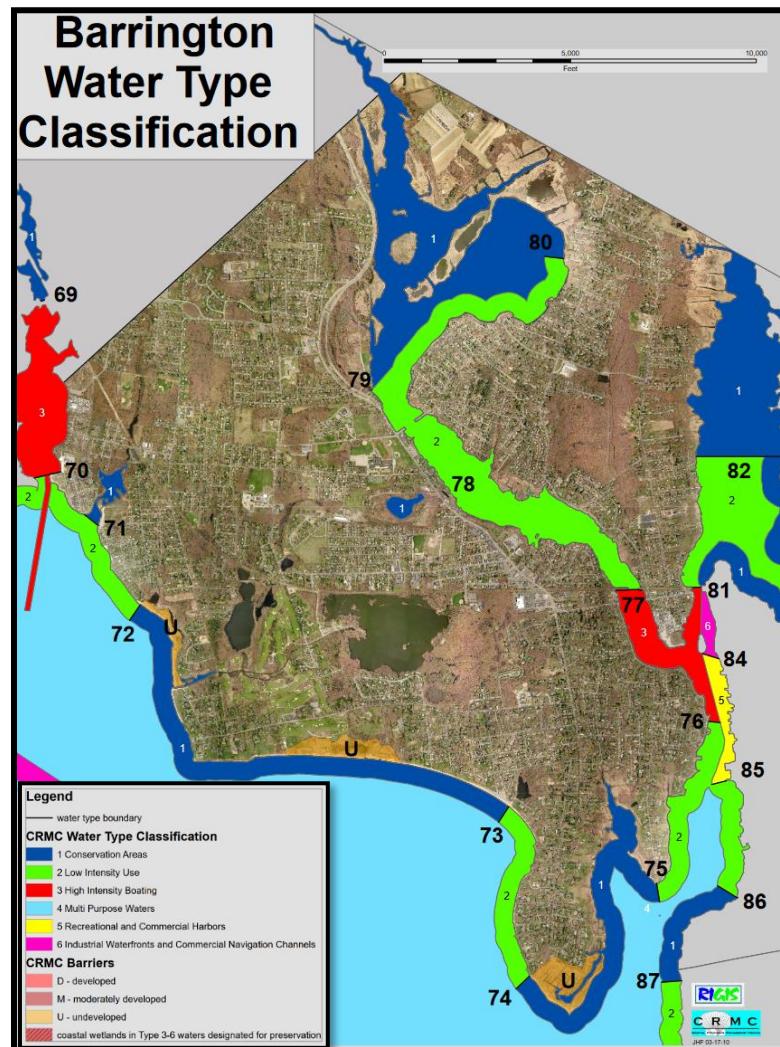
- Filling, removal, and grading along the shoreline
- Construction of residential or recreational structures, including docks
- Construction of public infrastructure
- Individual sewage disposal systems
- Installation of shoreline protection structures
- Beach nourishment (replenishment)
- Prohibition of new construction on undeveloped barriers” (CRMC. *Rhode Island Coastal*, 4).

Regulating these activities helps to protect the health of Barrington’s coastal waters.

Water Resources

In addition to providing scenic beauty, all of Barrington’s aquatic resources provide valuable fish, plant, and wildlife habitats; help control flooding, erosion and pollution; offer year-round active and passive recreation; and accommodate sand and shell shoring.

Figure 4-52
CRMC Coastal Water Type Classification



4.4.3.2 Wetlands and Floodplains

Generally speaking, "A wetland is an area which is persistently (year-round) or pervasively (seasonally) wet, near or at the ground surface. A floodplain is the land adjacent to wetlands or water bodies which may be periodically covered by flood water (Town of Weston, 1).

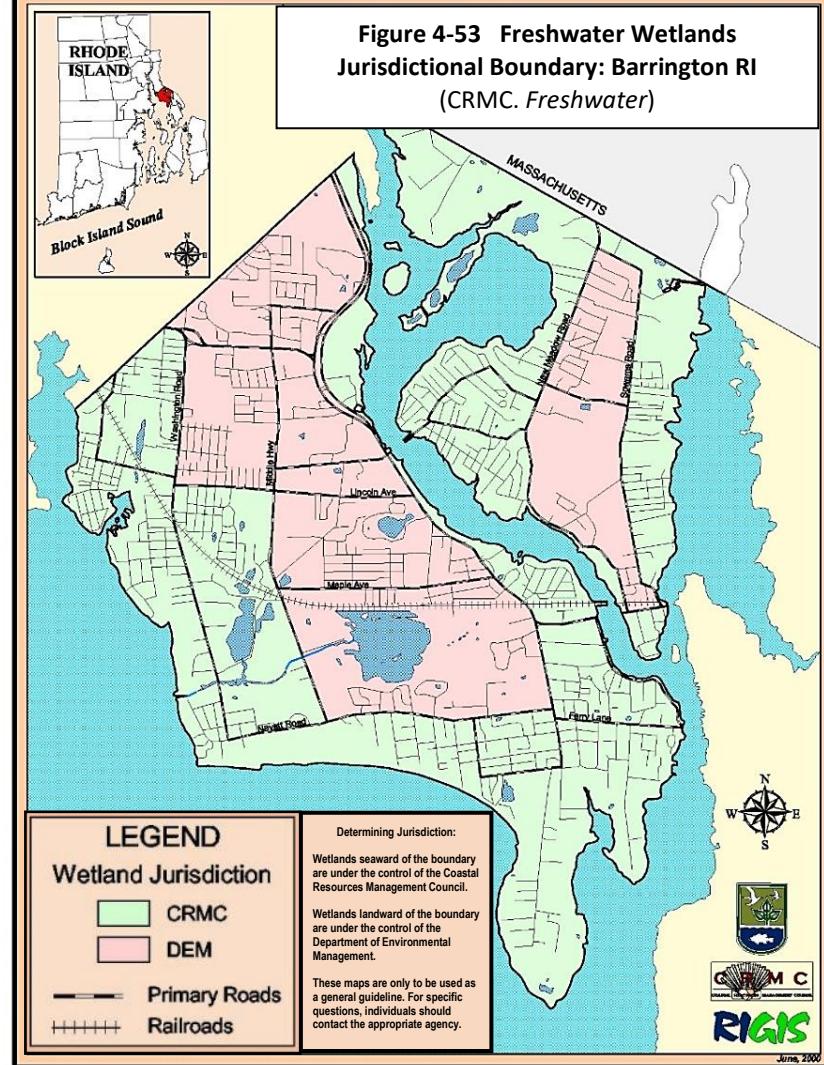
RIDEM has a broader definition of freshwater wetlands. DEM considers freshwater wetlands as "areas that are flooded or that have water at or near the surface for part of most growing seasons. They commonly occur between uplands and water bodies; however, many freshwater wetlands stand alone and are surrounded by upland. Freshwater wetlands are widespread throughout Rhode Island. Swamps, marshes, bogs, ponds, rivers, and streams are considered wetlands in Rhode Island as are other smaller areas and certain adjacent areas known as perimeter wetlands, riverbank wetlands, and floodplain (RIDEM. *Freshwater Wetlands*).

In Rhode Island, construction and development in or near wetlands are subject to permit approval. As shown in **Figure 4-53**, wetlands along the coast fall under CRMC jurisdiction and all others are regulated by RIDEM. New RIDEM rules and regulations governing protection of freshwater wetlands is scheduled to take effect on July 1, 2022. Wetlands (including floodplains) are regulated because of the many important functions they perform. The Town of Barrington appreciates these benefits and will continue to work to protect and preserve these important resources.

Benefits of Wetlands and Floodplains

- Provide flood storage area reducing storm damage to property and structures
- Control stormwater runoff rate reducing erosion
- Maintain surface water flow during dry periods
- Provide natural coastal barriers to dissipate waves and protect upland areas from flooding and erosion
- Filter pollution helping to maintain surface water quality
- Recharge groundwater to preserve water supplies
- Provide fish and wildlife habitat and contribute to biodiversity
- Produce nutrients for organisms that form the base of the food web
- Support large and diverse populations of plants
- Provide recreational opportunities (fishing, bird watching, hiking, etc.)
- Store carbon within their plant communities and soil

Figure 4-53 Freshwater Wetlands Jurisdictional Boundary: Barrington RI (CRMC. Freshwater)



Most of Barrington's 955 acres of wetlands are on conservation land owned by the Town, the State, the Barrington Land Conservation Trust (BLCT), and Audubon Society or otherwise protected. A few of BLCT properties are shown in **Figure 4-54**. There also are several significant areas of wetlands in private ownership. The largest contiguous coastal wetlands are around Hundred Acre Cove, the upper Barrington and Palmer Rivers, on Narragansett Bay at the RI Country Club and Tillinghast Estate, and on Rumstick Point. The most significant freshwater wetlands areas include the Hampden Meadows "Greenbelt" between New Meadow and Sowams Roads, the "Brickyard Wetlands" between the Barrington Shopping Center and the YMCA, those within the Tall Pines conservation area east of Washington Road near County Road, and the Divine Vargas wetlands west of Wampanoag Trail.

The Town recognizes that in addition to their scenic value, Barrington's wetlands and floodplains provide an array of benefits including functioning as a buffer against storms and floods, habitat for important flora and fauna, filtering pollutants, and recharging the groundwater. As such, the Town has and will continue to protect these resources, support development trends that do not hinder the important ecological service they provide, and integrate wetland and floodplain management efforts with other community goals and objectives.

Figure 4-54 Barrington Land Conservation Trust Properties (photo credit: BLCT)



Esther Hill Marsh



Lowe Marsh

Seaview Marsh



In 1994 the Town adopted a **Wetlands Overlay District** Zoning Ordinance that requires a special use permit from the Zoning Board for proposed activities within the 100-foot wetland setback. All Wetlands Overlay District special use permit applications are referred to the Conservation Commission, who reviews the application and provides advisory recommendations to the Zoning Board of Review prior to the Zoning Board's hearing on the application (Town of Barrington RI. Website). The ordinance also prohibits any reduction in flood storage capacity, and the storage of materials or equipment which could cause damage under flood conditions. In addition, the ordinance requires any construction occurring in the Velocity Zone to take place above the mean high tide line. The Town is currently evaluating how the new RIDEM rules and regulations governing protection of freshwater wetlands (scheduled to take effect on July 1, 2022) will impact the Town's Wetlands Overlay District.

Sea Level Rise Impact

CRMC and its partners developed Sea Level Affecting Marshes Model (SLAMM) Maps for the coastal wetlands throughout Rhode Island. “The purpose of these SLAMM maps is to show how coastal wetlands will likely transition and migrate onto adjacent upland areas under projected sea level rise scenarios of 1, 3 and 5 feet in the coming decades. These maps are intended to support state and local community planning efforts and to help decision makers prepare for and adapt to future coastal wetland conditions despite the inherent uncertainties associated with future rates of sea level rise” (CRMC. *Sea Level Affecting*, 1).

According to the technical findings from the SLAMM Project, “Coastal wetlands, especially tidal marshes, are one of the most susceptible ecosystems to climate change and in particular accelerated sea level rise. A considerable percentage of coastal wetlands may be permanently lost by the end of this century unless upland areas directly abutting coastal wetlands are protected or otherwise set aside for the purpose of providing wetland migration in response to sea level rise” (CRMC. *The Rhode*, Executive Summary).

Nine SLAMM Map Panels were created for Barrington. Each Panel has four maps showing the initial (current) wetland condition followed by 1-, 3-, and 5-foot sea level rise scenarios. All thirty-six SLAMM Maps prepared for Barrington can be accessed via the following link: [Barrington SLAMM Maps](#)

There will occur increasing deleterious impacts on the Natural Environment as sea level rises. While a SLR of 5 feet is not projected in the short-term, it is important for the Town to consider the potential impact in order to ensure that improvements and protection of the natural environment – which helps to protect the built environment/infrastructure – take SLR into consideration. Key deleterious impacts of 5 feet of SLR on the Natural Environment include (Town of Barrington RI. *Comprehensive*, 123):

- Inundation of coastal marshes (Palmer River, Hundred Acre Cove, Allin’s Cove, along Narragansett Bay) that serve as wildlife habitat areas as well as provide protective buffers against storm surge for inland areas
- The complete inundation of “Crab Island” and the “Great Tongue” in 100-Acre Cove
- Waters from Narragansett Bay reaching into the coastal marshes at RI Country Club and portions of RISD’s Tillinghast Estate
- The loss of Walker Farm (including a boat ramp, community gardens and a yard waste storage area) and most of Osemequin Park (from SLR of 4 or more feet)
- The potential loss of Town Beach as a recreational asset (from SLR of 4 or more feet)

4.4.3.3 Open Space

According to the Comprehensive Community Plan, “The Town of Barrington, the Barrington Land Conservation Trust, Audubon Society and other private interests have acquired a substantial amount of open space throughout town, totaling more than 900 acres” (Town of Barrington RI. *Comprehensive*, 71). Approximately 110 acres of privately owned open space is protected by deed restriction or other similar mechanism (Town of Barrington RI. *Comprehensive*, 72).

The majority of privately owned open spaces in Barrington are not permanently protected and therefore may be available for development, though environmental constraints such as the presence of wetlands are found on many of these parcels. Privately owned open space properties that have not been protected in perpetuity include institutional sites that also contain significant open space areas with conservation values. These include: the former Zion Bible Institute campus (a section of forested wetlands); St. Andrews School (forested wetlands in the westerly portion of the site); Tillinghast Estate, owned by the RI School of Design (coastal wetlands); and the RI Country Club (coastal wetlands, Mussachuck Creek). Along the shoreline of the Palmer River, Hundred Acre Cove, and Allin’s Cove are open space lots of unknown ownership. These lots, totaling approximately 90 acres, all have severe environmental constraints – including portions underwater. They also are located near protected open space areas owned by the Town, the Land Conservation Trust, and the Audubon Society.

Roughly 190 acres in Town are in agricultural use. The northeast section of Barrington (George Street area) is the largest contiguous agricultural area. The Town has zoned the area, which lacks access to city water and sewer, for single-family detached houses on large lots (Residence 40-Conservation Development) and conservation/resource protection (Wildlife Refuge, Open Space-Passive, and Conservation zoning).

To assist in the management of open space conservation areas, the Conservation Commission has developed or commissioned the following management plans:

- Barrington Town Beach Management Plan (2010)
- Hampden Meadows Conservation Area Management Plan (2010)
- Brickyard Pond Conservation Area Management Plan – DRAFT (2009)
- St. Andrew's Farm Management Recommendations (2009)
- Nockum Hill Wildlife Refuge Management Plan (1994)

LOCAL ECONOMY

4.4.4 Local Economy

Currently the overall economic condition of the Town of Barrington is strong in terms of municipal finances and economic growth. According to the Town's *Comprehensive Annual Financial Report for the Fiscal Year ended June 30, 2021*, most employment opportunities extend outside the Town to the greater Providence and Boston metropolitan areas. In the first quarter of 2021, Barrington had 576 private businesses and 12 government units. The private sector employed an average of 2,198; professional and technical services was the largest sector followed by health care. Governmental jobs employed an average of 707 people (Town of Barrington RI. *Comprehensive Annual Financial*, iii). The Town of Barrington is the community's major employer. Most local businesses have relatively few employees. The major private sector employers include Shaw's Supermarket, Atria Bay Spring Village, East Bay Health Center, and the Bayside YMCA. All of these businesses have been included on the Town's Critical Facilities list. As shown in **Appendix 4-3**, Shaw's is the only one located in the SFHA, and all four are subject to hurricane surge inundation from either a Category 2 or 3 hurricane.

Maintaining a resilient local economy is important to enable providing high quality municipal services, including protecting against natural hazard risks. According to the Town's FY2021 Comprehensive Annual Financial Report, the Town's combined net position (government and business-type activities) totaled \$68,562,073 at the close of FY2020-21 (Town of Barrington. *Certified*). Barrington is primarily a suburban residential community, with property taxes financing most government activities, supplemented by charges for services and state funding. In FY 2021, "Residential property accounts for 91% of the total tax roll. In terms of real estate tax revenue, 90% of the Town's tax revenue is derived from residential real estate" (Town of Barrington RI. *Comprehensive Annual Financial*, iii).

The Town of Barrington's commercial tax base has increased in recent years, growing by \$41.2 million between 2013 and 2020, or 33.9 percent. As of December 31, 2020, commercial properties represented approximately 4.1 percent of the Town's overall tax base (Town of Barrington RI. *Comprehensive Annual Financial*, v). The completion of streetscape improvements (new sidewalks, street lighting, street trees, etc.) in the

early 2000s within the County Road/Maple Avenue business district has helped encourage the redevelopment of several key underutilized parcels in the area. Town officials anticipate additional commercial growth resulting from a second, roughly \$1.4 million, streetscape project completed in 2020 that focused on other areas within the “Village Center,” including Wood Avenue, Waseca Avenue, and West Street.

Each year the Town adopts a six-year Capital Improvement Program to identify projects that should be undertaken during the ensuing six years. “This long-range planning is essential in addressing the future development and growth of the Town. The Town has continually funded its capital requirements aggressively and maintains a pay as you go funding for most of its capital needs, which limits its’ borrowing requests” (Town of Barrington RI. *Comprehensive Annual Financial*, iii).

The impact from most of the predicted hazards is not anticipated to have a long-term economic effect on the Town. Two of the predicted hazards, heavy and sustained precipitation events, which are expected to worsen in the future due to climate change and sea level rise, and the Coronavirus-19 Pandemic (ongoing since December 2019), could have long-term economic consequences for Barrington. In addition to the items identified in **Table 4-32**, the vulnerability to Barrington’s local economy will be further explored in the following subsection: **4.4.4.1 Flood-Related Hazards**

Table 4-32 Local Economy Vulnerability

Hazard Group	Vulnerability (<i>What is at Risk</i>)
 Flood-Related Hazards (Inland Flooding/Dam Failure; Coastal Flooding/Storm Surge; Coastal Erosion)	<ul style="list-style-type: none"> In Barrington, a group at higher risk from flooding are those residing in the Special Flood Hazard Area (SFHA) comprised of the VE and AE Flood Zones; flood damage to homes or businesses may present an economic challenge for residents If residences and businesses are destroyed as a result of flooding, the corresponding decrease in the tax base would need to be shouldered by the remaining property owners The higher concentration of impervious surface due to building size and large parking areas makes commercial properties more susceptible to flooding and snow hazards; the most significant commercial development is within the “Village Center” district (County Road/Maple Avenue area); smaller commercial nodes are in the vicinity of Bay Spring/Washington Road and Sowams Road/Kent Street; waterfront commercial areas (marinas and associated businesses) are in Bay Spring on Bullock Cove and at Tyler Point at the confluence of the Barrington and Warren Rivers Refer to Sections 4.4.4.1 for additional flood-related vulnerabilities
 Wind-Related Hazards (High Winds – Thunderstorms/Lightening/Hail; Tornadoes; Tropical Cyclones)	<ul style="list-style-type: none"> The Town may recognize an increase in municipal spending related to downed tree removal A study conducted in 2010 by Montclair State University suggests that due to the cost of maintaining trees, there may exist a greater potential for damage from tree hazards during wind storms based on socioeconomic lines Although generally short-term, individuals may experience lost revenues due to business closures, inability to get to work, or provide services Loss of electric power due to damaged power lines can interrupt businesses; while disruptions that continue for days, weeks, or longer can impact the normal operation of businesses and even result in closures which would decrease revenues to proprietors, loss of wages to employees, and reduce state and local tax revenues – disruptions to Barrington are expected to be short-term and have minimal impact on the local economy
 Winter-Related Hazards (Heavy Snow; Ice; Extreme Cold)	<ul style="list-style-type: none"> The Town may recognize an increase in municipal spending related to plowing and road surface treatments Although generally short-term, individuals may experience lost revenues due to business closures, inability to get to work, or provide services Loss of electric power due to damaged power lines can interrupt businesses; while disruptions that continue for days, weeks, or longer can impact the normal operation of businesses and even result in closures which would decrease revenues to proprietors, loss of wages to employees, and reduce state and local tax revenues – disruptions to Barrington are expected to be short-term and have minimal impact on the local economy

 <p>Infectious Disease (Vector-borne Diseases Transmitted by Ticks and Mosquitoes; Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses)</p>	<p>Mosquitoes & Ticks</p> <ul style="list-style-type: none"> As needed (or requested), the Town uses mosquito larvicide briquets to control mosquito larvae in catch basins or other areas with standing water <p>Influenza Viruses or Coronaviruses</p> <ul style="list-style-type: none"> Influenza viruses are not expected to have an appreciable impact on Barrington's local economy It is difficult to assess how Coronavirus-19 may impact Barrington's economy over the upcoming 5-year period. Relating to Town finances, over the past two years the pandemic caused some additional burden including staff-related sick leave, and PPE and cleaning supply expenses (some of which was reimbursed through FEMA). Due to the pandemic, Barrington (as was true nationwide) experienced an increase in unemployment rate; based on information from the Town Finance Department, the unemployment rate in 2020 was 7.8%; although the rate decreased to 4.5% in 2021, that is still higher than the preceding non-pandemic years of 2017 (3.0%), 2018 (2.6%), or 2019 (2.4%).
 <p>Other Hazards (Earthquakes; Extreme Heat; Drought; Brush Fires)</p>	<p>Earthquake</p> <ul style="list-style-type: none"> Earthquakes are not expected to have an appreciable impact on Barrington's local economy <p>Extreme Heat</p> <ul style="list-style-type: none"> Although residents may recognize higher energy bills due to increased energy use, primarily associated with AC, extreme heat is not expected to have an appreciable impact on Barrington's local economy <p>Drought</p> <ul style="list-style-type: none"> Droughts are not expected to have an appreciable impact on Barrington's local economy <p>Brush Fires</p> <ul style="list-style-type: none"> Brush fires are not expected to have an appreciable impact on Barrington's local economy

4.4.4.1 Flood-Related Hazards

As climate change exacerbates seasonal flooding, and SLR permanently changes the landscape, properties in FEMA's Special Flood Hazard Area (SFHA) are at high risk. Recognizing that sea levels rise will continue to move the floodplain designations inland, a property's flood zone was categorized based on the highest risk flood zone any portion of the parcel intersected. As summarized in **Table 4-33**, approximately 41% of the tax base is derived from properties that are fully or partially in the SFHA (the V or A Zones).

Table 4-33 Property Vulnerability Based on FEMA Flood Zones (2022 Tax Assessment Data)

Land Use	Special Flood Hazard Area (SFHA)			
	V Zone		A Zone	
	# of Parcels Impacted	Total Value	# of Parcels Impacted	Total Value
Residential	243	\$351,751,000	1652	\$905,942,407
Municipal/Institutional Commercial/Industrial	23	\$17,406,000	188	\$188,551,000
Vacant	24	\$16,629,000	76	\$10,377,100
Other	54	\$8,546,872	137	\$19,212,571
TOTAL	344	\$394,332,872.00 (approximately 11% of tax base)	2053	\$1,124,083,078 (approximately 30% of tax base)

The results of the URI-CI Building Damage Analysis included in **Table 4-26**, indicate that under current sea level conditions 308 principal structures in Barrington (with an assessed valuation of \$87,649,000) will be significantly damaged (sustaining greater than 50% damage) during a 100-year storm event. This is a significant amount of damage and represents an economic drain on impacted community members. However, once the water recedes, damaged structures can be restored. Those with flood insurance will be in an economically more favorable position to restore their home or business. This is important in terms of personal resilience for community members and municipal resilience in terms of sustaining the tax base.

Unlike flooding related to a precipitation event, where the floodwater eventually recedes, sea level rise is a permanent feature. As existing landmass is permanently inundated, structures in those environs will become uninhabitable. As shown in **Table 4-33**, Barrington currently has 2397 parcels, some portion of which, is currently located in the SFHA. Over time as the most vulnerable of these properties are permanently inundated, displacement of the community members residing there will occur and the corresponding decrease in the tax base would need to be shouldered by the remaining property owners.

Based on NOAA's high-curve, sea level rise in Rhode Island by 2030 could be 1.67 feet. Hence in the relative near future SLR could approach 2-feet. The URI-CI analysis determined that a 100-year storm event coupled with 2-feet of SLR would significantly damage (50% or greater) approximately 631 structures in Town (with an assessed valuation of \$106,345,800).

Because such a high percent of Barrington's tax base is from properties in the SFHA, it is important for the Town to share with the community scientific data on flood hazards, information on flood preparedness, and the benefits of flood insurance. In addition the Town should aggressively address effective stormwater management in terms of development policies, such as minimizing impervious surfaces, as well as in protecting wetlands and open space, which help to buffer the built environment from the impacts of flooding. These measures will help to mitigate the impacts of flooding associated with precipitation events.



Figure 4-55 Barrington Town Hall (photo credit: Town of Barrington)

PEOPLE

4.4.5 People

The Town's *Emergency Operations Plan* (EOP) addresses the planned response to extraordinary emergency situations, including those related to natural disasters. The EOP is a preparedness document that outlines the concepts and methods for dealing with potential large-scale disasters which create the necessity for extraordinary responses. The Plan provides procedures for warning and evacuation of residents and visitors should it become necessary. In the event of such an emergency, coordination and cooperation of Town, State, and Federal agencies will be essential.

It is important to know the number of people that are considered to be at a higher risk in a natural hazard event in order to plan for their needs and safety. According to the 2020 census, the population of Barrington is 17,153. Of which, approximately 4,906 residents (28.6%) are under 18 years and almost 2,830 (16.5%) are 65 or older.

To expedite assistance response it is important for the Town to have a registry of those individuals who may require assistance. The Town encourages residents who due to special healthcare needs, chronic conditions, or disabilities may require assistance response to enroll in the Rhode Island Special Needs Emergency Registry. The registry, which is overseen by the RI Department of Health, provides a reliable system for the identification of Rhode Islanders who may require special assistance during emergencies (RIDOH. *Special*). A link to this registry be accessed through the Town's website.

Barrington has several group homes and two senior living complexes which should be evaluated in terms of their capacity and access to evacuation routes, thereby ensuring that any residents of those facilities can be assisted in the event of a natural disaster or evacuation.

An often-overlooked impact of a natural hazard is emotional and physical stress. This is especially the case if residents have witnessed their home or belongings destroyed or people hurt; are forced to evacuate their home; personal finances are compromised; are subject to an extended period without electric power or with a shortage of supplies and necessities ; and are not receiving effective communication regarding the hazard event. To help offset these impacts the Town recognizes the continued need to bring emergency preparedness and response awareness to the community and to provide or support the additional services required as the result of a disaster.

These considerations as well as the vulnerabilities identified in **Table 4-34**, represent risks to people from the identified hazards.

Table 4-34 Human Vulnerability

Hazard Group	Vulnerability (<i>What is at Risk</i>)
 Flood-Related Hazards (Inland Flooding/Dam Failure; Coastal Flooding/Storm	<ul style="list-style-type: none"> Flooding events increase the chance of spreading waterborne diseases, such as hepatitis A and cholera; the health risks to residents impacted may be significant during and after a flood event; at higher risk are those residing in the SFHA, and in areas subject to hurricane surge inundation Water intrusion into buildings can result in mold contamination, leading to indoor air quality problems; populations living in damp indoor environments experience increased prevalence of asthma and other upper and lower respiratory tract symptoms (CDC. <i>Precipitation</i>) Receding floodwaters can create stagnant pools of water, which provide the perfect breeding ground for mosquitoes

<p>Surge; Coastal Erosion)</p>	<ul style="list-style-type: none"> Based on data from Climate Central's Surging Seas Risk Finder (Climate Central. Surging): <ul style="list-style-type: none"> The number of people in Barrington who live on land below 2 feet is approximately 210. This sea level scenario points to a 100% risk of at least one foot over 2 feet taking place between today and 2050 in the Barrington area. The number of people in Barrington who live on land below 5 feet is approximately 1000. This sea level scenario points to a 98% risk of at least one foot over 5 feet taking place between today and 2050 in the Barrington area. The number of people in Barrington who live on land below 7 feet is approximately 1900. This sea level scenario points to a 50% risk of at least one foot over 7 feet taking place between today and 2050 in the Barrington area. The number of people in Barrington who live on land below 10 feet is approximately 4000. This sea level scenario points to a 13% risk of at least one foot over 10 feet taking place between today and 2050 in the Barrington area. Escape routes may be cut off due to flooding, stranding residents in flooded areas, hampering rescue efforts, and limiting life support services; those at higher risk include seniors, those with mobility issues, and lower income who may rely on public transportation
 <p>Wind-Related Hazards (High Winds – Thunderstorms/ Lightning/Hail; Tornadoes; Tropical Cyclones)</p>	<ul style="list-style-type: none"> Barrington residents and businesses in close proximity to the shoreline are generally at higher risk to the impacts from high wind events High wind events, particularly hurricanes, that cause a loss of electricity can result in dangerous conditions including no phone/internet service available for storm advisories and medical emergencies; spoil refrigerated food; lack of heat - and if occurring in conjunction with freezing temperatures can lead to dangerous health conditions and the potential for pipes to freeze and burst If downed power lines are arcing they present a threat to personal safety High winds can cause bodily injury from flying debris or structures collapsing Over the years, building codes have improved the structural integrity of buildings, taking into account the impact of high winds and other factors; those residing in older homes that have not been renovated to meet current building standards may be at higher risk to wind-related damage; there are a few areas of Town along the coastline, particularly the neighborhoods in the vicinity of Narragansett Avenue/Shore Drive and Willow Way/Appian Way, where many of the houses have not been substantially renovated and therefore may not meet current building codes
 <p>Winter-Related Hazards (Heavy Snow; Ice; Extreme Cold)</p>	<ul style="list-style-type: none"> Heavy snow and ice events that cause a loss of electricity can result in dangerous conditions including no phone/internet service available for storm advisories and medical emergencies; lack of heat which can lead to dangerous health conditions and the potential for pipes to freeze and burst Snow, ice, hail, and freezing temperatures may create treacherous driving conditions, cause transportation delays, and create transportation challenges for first responders or others who may need to be on the roads including those trying to access emergency shelters Heavy snow may cause school and business closures Exposure to extreme cold for an extended period can lead to health concerns including frost bite and hypothermia, which is of particular concern for infants and older adults Ice can create dangerous walking conditions – seniors or others who may be less stable are at more risk of falling and injuring themselves Pets may be affected by severe winter weather, especially those that are kept outdoors. There remain a few areas of Town along the coastline, particularly the neighborhoods in the vicinity of Narragansett Avenue/Shore Drive and Willow Way/Appian Way, where many of the houses have not been substantially renovated and therefore may not meet current building codes; these homes may be more susceptible to roof collapse due to heavy snow loads which could put residents at higher risk of injury or death Critical Facilities: Winter-related hazards may impact critical facilities including the bridges in Town, sections of the evacuation route, and both of the park & ride lots (Police Cove and White Church parking lots) making them more dangerous for first responders and other people who need to be on the roads.

 <p>Infectious Disease (Vector-borne Diseases Transmitted by Ticks and Mosquitoes; Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses)</p>	<p>Mosquitoes & Ticks</p> <ul style="list-style-type: none"> Increased tick and mosquito populations resulting from climate change may lead to more vector-borne diseases in people The CDC states that everyone is at risk from mosquito bites (CDC. <i>Mosquito</i>); tickborne diseases are on the rise – according to MedPage Today, in the past two decades tick-borne illnesses have more than doubled in the U.S. (D'Ambrosio); Barrington residents living or engaging in outdoor activities in close proximity to areas more conducive to mosquito breeding (forested areas, and standing water along rivers, ponds, and wetlands) are at higher risk of being bitten; Barrington residents living or engaging in outdoor activities in close proximity to wooded and grassy areas where higher populations of ticks tend to be found are at greater risk of being bitten As mosquitoes lay eggs in standing water conditions conducive for breeding can be found town-wide; residents who minimize standing water on their property (including in outdoor vessels, etc.) will lessen the mosquito population in the vicinity of their homes Pet owners may come in more contact with ticks due to their pets potentially being hosts If infected, elderly residents, children, and anyone with a weakened immune system may suffer more severe illness related to mosquito- and tick-borne diseases Critical Facilities: Several of the Town's natural resources may provide environmental conditions more favorable for tick and mosquito populations, including the Douglas Rayner Wildlife Refuge/Nockum Hill, Haines Memorial State Park, Hampden Meadows Greenbelt, and Osamequin Nature Preserve. Higher populations of ticks and mosquitoes increase the opportunity for residents using those facilities to be bitten and infected. <p>Influenza (Flu)</p> <p>The CDC identifies those highest at risk of getting serious complications from flu as children younger than 5, but especially younger than 2 years old; adults 65 years or older; pregnant women; people with any chronic illness, especially heart, lung (including asthma), or kidney disease; and people with weak immune systems (CDC. <i>Seasonal Influenza</i>).</p> <ul style="list-style-type: none"> Critical Facilities: All of the schools, day care/early learning centers, special population centers, government/emergency centers, and most of the institutional/commercial critical facilities are considered to be places of higher risk for exposure to influenza viruses. <p>Coronavirus Disease 2019 (COVID-19)</p> <ul style="list-style-type: none"> The CDC has indicated that there are a number of factors which increase a person's vulnerable to get severely ill from COVID-19. The severity risk increases for: <ul style="list-style-type: none"> people in their 50s and further increases for people in their 60s, 70s, and 80s; people 85 and older are the most likely to get very sick people with chronic lung diseases, including COPD (chronic obstructive pulmonary disease), asthma (moderate-to-severe), interstitial lung disease, cystic fibrosis, and pulmonary hypertension people who have certain underlying medical conditions including <ul style="list-style-type: none"> Chronic kidney disease COPD (chronic obstructive pulmonary disease) Obesity (BMI of 30 or higher) Immunocompromised state (weakened immune system) from solid organ transplant Serious heart conditions, such as heart failure, coronary artery disease, or cardiomyopathies Sickle cell disease Type 2 diabetes people who have other conditions including <ul style="list-style-type: none"> asthma high blood pressure neurologic conditions such as dementia cerebrovascular disease such as stroke pregnancy <p>(Sources for the preceding list: CDC. <i>COVID-19 Risks</i>; CDC. <i>Press Release</i>; and CDC. <i>People</i>)</p>
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	<ul style="list-style-type: none"> Systemic health and social inequities may increase the risk of getting sick and dying from COVID-19 among certain racial and ethnic minority groups and people with disabilities. Factors affecting health equity include (CDC. <i>Health Equity</i>): <ul style="list-style-type: none"> Discrimination: can lead to chronic and toxic stress, and shapes social and economic factors that increase risk for COVID-19 Healthcare access and use: multiple barriers to accessing health care, for example lack of insurance, transportation, child care, or the ability to take time off of work may increase risk for COVID-19 Occupation: work in essential settings such as healthcare facilities, farms, factories, grocery stores, and public transportation can lead to more chances of exposure to COVID-19 Educational, income, and wealth gaps: less access to high-quality education may limit job opportunities that minimize exposure to COVID-19 Housing: living in crowded conditions can make it very difficult to isolate when you are or may be sick with COVID-19 It should be recognized that the more underlying medical conditions or systemic health and social inequities a person is subject to, the higher their overall risk to COVID-19 A number of factors associated with the COVID-19 Pandemic, including uncertainty, social isolation, closures/disruption to work and school has created significant emotional stress for many Critical Facilities: All of the schools, day care/early learning centers, special population centers, government/emergency centers, and most of the institutional/commercial critical facilities are considered to be places of higher risk for exposure to influenza viruses.
 <p>Other Hazards (Earthquakes; Extreme Heat; Drought; Brush Fires)</p>	<p>Earthquakes</p> <ul style="list-style-type: none"> people who are socially isolated or less mobile may be at greater risk residents who live in older masonry structures that do not meet current earthquake codes may be at greater risk of injury or death should the structure fail; there are a few areas of Town along the coastline, particularly the neighborhoods in the vicinity of Narragansett Avenue/Shore Drive and Willow Way/Appian Way, where many of the houses have not been substantially renovated and therefore may not meet current building codes; these homes may be more susceptible to damage from an earthquake and therefore put residents at higher risk of injury or death Critical Facilities: Although an earthquake of significance is considered a low probability for Barrington, should one occur, older brick/masonry critical structures including the Barrington Town Hall, Barrington Public Library, Barrington Cove Apartments, and some of the buildings on the St. Andrew's campus may be more at risk to damage; structural failure or failing debris may put residents using those facilities at higher risk of injury or death <p>Extreme Heat</p> <ul style="list-style-type: none"> Physical effects of heat can cause major health problems, dehydration, and may lead to death Certain populations are particularly sensitive to extreme heat for various reasons including health conditions such as cardiac or breathing problems, living and working conditions, mobility, and limited financial resources. RIDOH lists the following populations at risk to extreme heat (RIDOH. <i>Extreme Heat</i>): <ul style="list-style-type: none"> Infants and young children People with chronic, long-term medical conditions Disabled Outdoor workers People who use certain medications/illegal drugs Low-income residents People who are overweight/obese Pregnant women Athletes People who are socially isolated

	<ul style="list-style-type: none"> • Critical Facilities: Senior populations may be more at risk from the impacts associated with extreme heat. As such, critical facilities that serve this population should be cognizant of the health impacts associated with extreme heat and the potential benefit of having air conditioning available in some area of the facility. These facilities include Atria Bay Spring Assisted Living Facility (147 Bay Spring Avenue), Barrington Cove Apartments (90 Bay Spring Avenue), and potentially the former Carmelite Monastery (25 Watson Avenue) and former Zion Bible Institute (27 Middle Highway) if they become fully or in part senior living facilities. Also, residents should be aware that a number of the Town's natural resources have limited seating in shaded areas and therefore may expose those enjoying these facilities to the impacts of extreme heat; facilities include the Barrington Town Beach, Douglas Rayner Wildlife Refuge/Nockum Hill, Hampden Meadows Greenbelt, Latham Park, Osamequin Nature Preserve, and Walker Farm. <p>Drought</p> <ul style="list-style-type: none"> • With the majority of water users in Barrington reliant on public water, the community's vulnerability to drought is directly related to the availability of water provided by the Bristol County Water Authority - either from the Scituate Reservoir or from a secondary source • During droughts, dry soils may increase the number of airborne particles, such as pollen, which can irritate the airways and worsen chronic respiratory illnesses such as asthma; those suffering from asthma or other respiratory illnesses may be at higher risk. • Water rationing may be necessary and impact sanitary conditions • The section of Barrington most vulnerable to impacts of agricultural or hydrological drought is the George Street area, which is 100 percent reliant on well water; there are 11 houses in the area and Four-Town Farm which is a heavy user of water for irrigating approximately 60 acres of farmland <p>Brush Fire</p> <ul style="list-style-type: none"> • Smoke particles from fire can cause adverse health effects in people, particularly those with respiratory and cardiovascular conditions
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FUTURE DEVELOPMENT TRENDS

4.4.6 Future Development Trends

According to the Comprehensive Community Plan, “Barrington is classified as a medium-density developed community, with significant areas of wetland, public open space, and recreation land. Based on data from the Land Use element, Barrington is mostly residential, which comprises 55 percent (2,844 acres) of total land area within town. Commercial land comprises just two percent (119 acres), institutions (including government, schools and churches) comprise three percent (148 acres) and transportation and utilities make up 0.6 percent (31 acres) of the land. Wetlands, forest, agricultural areas, vacant/transitional areas, parks and other open space make up most of the remainder of the landscape (38 percent, or 1,970 acres)” (Town of Barrington RI. *Comprehensive*, 114).

Based on the 2021 American Community Survey census data, Barrington has 6,165 housing units, of which approximately 93 percent were one-unit (single-family) structures; the remainder consisted of structures with two or more units. There are no mobile homes in Barrington; these are a prohibited use per the Zoning Ordinance (Sec. 185-12).

The most significant developed commercial area in Barrington is within the “Village Center” district (County Road/Maple Avenue area); this area has the highest concentration of impervious surface due to large parking lots in addition to buildings. Smaller commercial nodes are in the vicinity of Bay Spring/Washington Road and Sowams Road/Kent Street. Waterfront commercial areas (marinas and associated businesses) are located in Bay Spring on Bullock Cove and at Tyler Point at the confluence of the Warren and Barrington Rivers.

Less than 10 percent of the land within Barrington remains available for development. Future land use patterns are not predicted to change significantly, and the preservation of open space and limiting development to non-vulnerable environmental areas continues to be a priority. Issues the Town is facing related to land use planning include:

- ◊ Providing housing options for an aging population and adding to the affordable housing stock.
- ◊ Mitigating impacts of rising sea levels in areas near Barrington’s extensive shoreline and low-lying inland areas.
- ◊ Growing the non-residential tax base.
- ◊ Preserving community character as pressure mounts to redevelop lots in established neighborhoods and build in areas without adequate infrastructure.
- ◊ Providing adequate municipal, school, and recreational facilities.
- ◊ Protecting environmentally sensitive areas.
- ◊ Retaining farming as a viable use in town” (Town of Barrington RI. *Comprehensive*, 133).

In collaboration with the Barrington Planning, Building & Resiliency Department, the Emergency Management Committee/HM&FMP Steering Committee will monitor development trends and determine any resulting changes in vulnerabilities that natural hazards will present. Following is an overview of the changes in development over the past five-years, updating the development trends outlined in the 2017 Barrington Hazard Mitigation Plan, and some potential changes over the ensuing HM&FMP cycle. Each of the projects described below indicate the number of units that were constructed within the SFHA or within a specific Hurricane inundation area. Only six of the 79 units added in the past five years were developed within the SFHA, and those six units are in the town’s “Village Center” district at the inland reach of the AE flood zone, therefore not significantly increasing the vulnerability profile of the jurisdiction since the last plan was adopted.

Development Over the Past 5-Years

- **Palmer Pointe:** The development on Sowams Road, completed in 2019, includes 40 new affordable housing units. As part of the conditions of approval, the developer will construct approximately 700 linear feet of sidewalk on Sowams Road. A portion of this property, closest to the Palmer River, is in the 100-year floodplain. However, none of the units were constructed on that portion of the site. All of the lots are however subject to hurricane surge inundation; with those closest to the river impacted by a Category 1 hurricane and those at the western end of the development impacted by a Category 4 hurricane.
- **Sweetbriar:** In addition to Palmer Pointe, in 2019 the East Bay CDC completed three new duplex buildings (six units) at the existing Sweetbriar Development on Washington Road. The development is not in the SFHA nor subject to hurricane storm surge.
- **Bluemead Farm Plat:** Five of the seven single-family residential lots at the Bluemead Farm Plat at Chachapacassett and Beach Road were constructed in 2019 and 2020. Although a portion of the property is in the AE Zone, the houses are being constructed outside of the 100-year floodplain. However, most of the lots will be subject to Category 3 or 4 hurricane storm surge.

- **55 Wood Ave:** Construction of six new duplex units completed in 2020. Two of the units qualify as affordable housing. The property, at the corner of Waseca and Wood Avenues, includes off-street parking, walkways and landscaping. As part of the project the applicant built a 200-foot public sidewalk, including curbing, along the Waseca Avenue frontage. The property is in the AE flood zone and subject to Category 2 hurricane surge inundation.
- **60 Bay Spring Avenue:** Completed construction of a 12-unit apartment building in 2021. The property is not in the SFHA nor subject to hurricane storm surge.
- **Haines Park Village II:** Construction was completed in 2021 at 187 Washington Road, which includes the addition of a second floor to the commercial building at the northwest corner of Washington Road and Bay Spring Avenue. The building has four occupied housing units: one live-work unit, plus three apartments, including one affordable. The property is not in the SFHA nor subject to hurricane storm surge.

- **Elevation of Structures:** In 2014 the Town successfully applied for a FEMA Hazard Mitigation Grant (\$644,871) on behalf of six property owners who were seeking assistance to elevate their houses out of the flood zone (each private property owner is required to provide the minimum 25 percent match). Four of the property owners who were awarded an elevation grant withdrew from the grant program. The elevation project at the remaining two properties have recently been completed. The Town will make itself available to apply for similar grant opportunities in the future.



Figure 4-56 Edwin Street Elevation Project

A FEMA hazard mitigation grant helped a resident elevate their Edwin Street home
(photo credit: Barrington Patch)

Potential Development Over the Next 5-Years

There remain some residential or mixed-use commercial vacant buildable parcels scattered throughout Barrington, however only a few have 5 acres or more and access to municipal water and sewer. Two of these, the former Zion Bible Institute campus (private) on Middle Highway at Primrose Hill Road and the 25 Watson Avenue Town-owned property (former Carmelite Monastery) are being considered for potential senior and affordable housing units. Both of these properties are considered at low risk for natural hazards, and are located outside of the SFHA and the hurricane surge inundation zones.

On the commercial development side, there have not been any large-scale commercial developments completed since the early 2000s. New commercial and mixed-use buildings have involved redevelopment of infill sites, typically one acre or less in area.

As for industrial land use, the only industrially zoned land (Limited Manufacturing) remaining in Barrington is a 4.8-acre area to the south of Bay Spring Avenue abutting Allin's Cove. The development potential of the site is unknown. The property is constrained by its proximity to the water and wetlands, and floodplain issues, as well as stringent CRMC requirements due to its proximity to Allin's Cove. In 2016, the owner continued to work with the RI Department of Environmental Management to complete the remediation of contaminants that remained following the closing of the old Pilling Chain mill.

Town's Ability to Expand & Improve Capabilities

As further discussed in **Section 5**, and exemplified in the **2022-2027 Action Plan (Section 6)**, the Town has a number of existing ongoing capabilities (authorities, policies, programs and resources) and intends to expand on and improve many of these, including the following which relate to future development:

Building Official/Building Code

The Town's building official is responsible for ensuring new structures meet building code requirements. For example, before a building permit is issued for construction in the AE or VE zone, an elevation certificate that verifies a proposed structure meets the minimum elevation requirements must be submitted to the building official. The Town is interested in expanding the capability of the building official through the requirement of being certified as a floodplain manager. It is the intent that the Building Official will obtain a CFM by the end of 2023.

Regulations and Ordinances

The Town has enacted regulatory restrictions designed to reduce the potential impacts of flooding to property by limiting development in and around wetlands and flood-prone areas. The Town intends to continue to enforce Article XXIII of the Zoning Ordinance which regulates development within areas of special flood hazard. Within the SFHA, all proposed construction or other development requires a permit – not just projects where building permits are required. Construction or other development in the SFHA not covered by a building permit would be subject to approval by CRMC or RIDEM, as applicable.

In 1994 the Town adopted a Wetlands Overlay District Zoning Ordinance that requires a special use permit from the Zoning Board for proposed activities within the 100-foot wetland setback. The ordinance also prohibits any reduction in flood storage capacity, and the storage of materials or equipment which could cause damage under flood conditions. The Town is currently evaluating how the new RIDEM rules and regulations governing protection of freshwater wetlands (scheduled to take effect on July 1, 2022) will impact the Town's Wetlands Overlay District.

A consultant study completed in 2018 produced a set of recommendations to amend zoning in the Bay Spring Avenue corridor. Phase 1 resulted in a new zone, Residence Business Flex, replaced the Neighborhood Business zone on Bay Spring Avenue. In 2019, the Town Council approved the addition of new "developer guidance" in the Comprehensive Plan to establish goals and objectives for rezoning two vacant parcels fronting on Bay Spring Avenue. One lot, on the north side of Bay Spring, is zoned Business; the second lot, on Allin's Cove, is zoned Limited Manufacturing and Residence 10. The amount of estimated developable upland is limited due to regulatory setbacks.

In response to the Covid-19 pandemic, in 2020 the Town relaxed regulatory restrictions that allowed six restaurants to establish outdoor seating, approved the free use of Town open space by businesses, and worked with the State to secure \$50,000 in MicroEnterprise Grants providing up to \$5,000 to qualified businesses. Two grants were approved as of September 1, 2020.

Management of Open Space

The Town recognizes the importance of managing conservation lands held in public and private ownership. "The Conservation Commission and Barrington Conservation Land Trust have advocated adopting and enforcing Management Plans for Town-owned conservation lands across Barrington. Comprehensive management plans are important as they provide site specific objectives and strategies for the continual protection of these areas" (Town of Barrington RI. *Comprehensive*, 80). Management plans developed for Nockum Hill and Hundred Acre Cove, the Hampden Meadows "Greenbelt," and Brickyard Pond have been partially implemented and will continue to be implemented in future years.

In 2012, the Town adopted a new zone for the George Street area of Town. It was rezoned from Residence 40 to Residence 40-Conservation Development. The new zone is “intended to provide more flexible subdivision design, with the goal of preserving important open space and limiting the development footprint. The zone requires subdivisions of five or more lots to meet the requirements of the R40-CD zone, including setting aside at least 35 percent of the site as contiguous open space. To date, no proposals have been submitted that trigger the R40-CD requirements (Town of Barrington RI. *Comprehensive*, 84). In the upcoming 5-years the Town intends to further review if the Residence 40-Conservation Development offers sufficient protection of the agricultural land use.

The Farm Forest and Open Space Program is a tax incentive program that helps to achieve open space protection, but does not provide permanent protection. Property owners enter into an agreement with the Town to keep their properties undeveloped for at least 15 years in exchange for lower property tax assessments. The Town intends to further promote this program and continue to work with properties currently in the program. Lots farmed by Four-Town Farm in the George Street area represent the largest acreage of any property owner in the program, totaling 33 acres (this includes an 8.7-acre parcel to which the Town acquired the development rights). Other properties in the program include three properties on Adams Point totaling approximately 10 acres, and an 11.8-acre property off Half Mile Road with woods, forested wetlands, and an area reserved for residential use. The properties on Adams Point include areas within the 100-year floodplain (AE zone) and the VE zone. Most of the Half Mile Road site falls within the AE zone.

As demonstrated in the Town’s **2022-2027 Action Plan (Section 6)**, during the upcoming 5-years, the Town will continue to work with the State and conservation organizations such as the Barrington Land Conservation Trust (BLCT) and Save The Bay (STB), to restore degraded wetlands and shorelines in critical areas, which helps reduce the risk of damages from flooding events. A few key projects include:

- **Walker Farm Resilience and Adaptation Project:** The Town anticipates completing in 2022/2023 a recreational and resilience improvement project at Walker Farm (through a combination of MRP, RIDEM, and CEHRTF grants plus local funding), which will include raising the gravel roadway to reduce flooding, installing a new floating dock for kayakers and rowers, expanding the parking lot, fixing shoreline erosion, and establishing coastal marsh within a low area that frequently floods.
- **Latham Park/Byway Road:** Utilizing a \$100,000 State grant plus local funds, in 2022/2023 the Town intends to make improvements at Latham Park and to the shoreline along Byway Road. The shoreline stabilization and improvements to these areas will complement previous work. At Latham Park, in 2014 the Town completed improvements including repairs to the existing revetment protecting the shoreline along Bullock Cove, and relocating the parking lot away from the water’s edge, allowing for additional plantings, storm-water retention, and a new public walkway with benches in the park adjacent to the revetment. In 2006 a significant wetland restoration project (\$760,000) was completed that restored approximately 11 acres of degraded coastal wetlands at the mouth of Allin’s Cove (**Figure 4-57**). This project was also critical in helping to manage erosion of the shoreline along Byway Road, which has the potential to undermine the structural integrity of the road. The installation in 2013 of sand-filled coir envelopes provided a base for establishing vegetation needed to stabilize the slope along the Byway Road shoreline. This area is susceptible to damage from wave action, such that the area requires periodic monitoring and repair.
- **Barrington Town Beach:** in 2022/2023 the Town intends to discuss additional dune stabilization and stormwater improvements at the Town Beach. This work will complement previous improvements in 2011 and 2014. In 2011, the Town built a new beach house with restrooms and office space, replacing a 1950s cinderblock restroom building that was located within the VE zone. The new building is built on piles and set back from the shoreline to meet elevation requirements. In 2014 the Town completed site improvements

including the removal of asphalt in the area most vulnerable to impacts from storms and flooding (about 20 parking spaces at the west end of the parking lot were eliminated), which allowed the shifting of the parking lot away from the bay by 10 to 12 feet. Where asphalt was removed, beach grass was planted in an effort to establish new vegetation and, over time, protective dunes. Bioretention swales were built to capture and treat storm-water from adjacent streets, as well as reduce beach erosion.

- **End-of-road Retrofit Projects:** Between 2022 and 2024 the Town anticipates completing a number of end-of-road/shoreline access ROW retrofit projects utilizing funding from the 2019 and 2021 State MRP Action Grants plus local funds. Site locations include: Woodward/Bowden Avenue, Opechee Drive, Woodbine Avenue, Adams Avenue, Watson Avenue, Clarke Road, and Water Way. Improvements may include pavement removal and green infrastructure to manage runoff and erosion.



Figure 4-57 Bank regrading at Allin's Cove
(photo credit: Save The Bay)

SECTION 5

Capability Assessment

Subsections

- 5.1 CAPABILITY INVENTORY
 - 5.1.1 Planning and Regulatory Capabilities
 - 5.1.2 Administrative and Technical Capabilities
 - 5.1.3 Financial Capabilities
 - 5.1.4 Key Local Mitigation Measures Related to Profiled Hazards
- 5.2 PARTNERSHIPS AND PUBLIC OUTREACH
- 5.3 ASSESSMENT OF 2017 HAZARD MITIGATION ACTION PLAN

5 Capability Assessment

The Town of Barrington has the capacity, and has the ability to expand and improve on that capacity, to implement and institutionalize hazard mitigation through its personnel, legal, and fiscal resources; intergovernmental coordination and communication; and academic and analysis tools. In addition, Barrington has a community base - residents, business owners, organizations, and institutional leaders - that support hazard mitigation and other critical issues important to the Town's future.

In **Section 4**, the planning process identified the natural hazards posing a threat to Barrington and described the vulnerability of the Town to those risks. In this Section, the *Capability Assessment* provides the opportunity to evaluate what mitigation mechanisms are already in place. In other words, what policies, programs, regulations, authorities, personnel, funding, and other resources are available to the Town to accomplish mitigation and reduce long-term vulnerability.

The *Capability Assessment* is an important step because understanding what is already in place and the effectiveness of those capabilities provides the opportunity to identify where additional measures or revisions to existing measures are needed. The Town has the capacity to use or improve capabilities through measures included in the *Action Plan*; through the passage and enforcement of additional codes and regulations; by integrating mitigation measures into other Town planning documents; and by continually increasing community and stakeholder engagement, including expanding those involved in the Hazard Mitigation Steering Committee to reflect growth and change in the community.

The *Capability Assessment* is structured in part as an inventory of locally-important existing mitigation capabilities, or support activities, which help decrease the community's hazard risk and/or impact the way pre- and post-hazard events are handled. In addition to the inventory, the *Capability Assessment* includes an overview of the Town's partnerships with various agencies and organizations that support hazard mitigation, public outreach efforts, and the status of the 2017 Hazard Mitigation Action Plan. This information has been provided in the following subsections:

- 5.1 Capability Inventory**
- 5.2 Partnerships and Public Outreach**
- 5.3 Assessment of 2017 Hazard Mitigation Action Plan**

5.1 CAPABILITY INVENTORY

The Capability Inventory identifies existing mitigation capabilities that in some way contribute to or inform the hazard mitigation process in the Town of Barrington. The inventory includes Local, Regional, State, and Federal measures and has been organized into three categories. Although a number of the capabilities overlap between the planning/regulatory and administrative/technical categories, each capability has been included in only one of those categories.

Planning and Regulatory Capabilities

Administrative and Technical Capabilities

Financial Capabilities

As evidenced by the citations throughout the *HM&FMP*, relevant information from a significant number of the resources included in the Capability Inventory have been incorporated into the *Plan*. Familiarization with the Town's existing capabilities helped to shape the mitigation goals and strategy. As documented in the *Action Plan*, a number of *Mitigation Actions*, are taken directly from or build on the good work and priorities identified in other Town planning documents. Some of the proposed mitigation actions were identified to fill gaps within the Town's existing protection matrix in an effort to make the community more resilient.

Over the ensuing five year period, the Town intends and has the ability to further expand on and improve existing policies and programs. This is evidenced in **Appendices 5-1 through 5-3**. Key examples of Barrington's ability to improve their capabilities over the upcoming 5-year period include:

- In 2022 hiring the former Town Planner as the new Town Manager to, amongst other responsibilities, expand over the ensuing years the interdepartmental roles in hazard mitigation
- In 2022 hiring a new Town Planner with a focus on coastal community resilience planning to, amongst other responsibilities, assist the Town in expanding hazard mitigation and floodplain management
- Requiring the Building Official to become a Certified Floodplain Manager (2023)
- Over the ensuing years, expanding the focus of the Resilience Planning Consultant part-time position
- Over the ensuing years, expanding the focus of the EMA Coordinator part-time position
- Expanding EMA related drills and exercises
- Expanding coordination with stakeholders, neighboring jurisdictions, and the local business community
- Expanding community outreach activities and public participation in hazard mitigation related activities
- Reviewing and strengthening existing codes and regulations associated with hazard mitigation
- Improving and expanding the Town's Website
- Improving and expanding the Town's GIS
- Further integrating hazard mitigation into the Strategic Energy Plan update (2023)
- Further integrating hazard mitigation into the Open Space Plan update (2023/2024)
- Further integrating hazard mitigation into the Comprehensive Community Plan update (2025)

5.1.1 Planning and Regulatory Capabilities

As discussed in **Section 2**, an extensive plan integration was undertaken which examined Local, Regional, State, and Federal plans, policies, ordinances, regulations, and programs that support hazard mitigation and flood management goals in the Town of Barrington. While there is always room for improvement, the Town is proud of the efforts made to enact regulatory restrictions and undertake studies and activities which have laid the foundation for the mitigation strategy included herein.

As part of plan integration, and in accordance with CRS Activity 510 Planning Process - Step 7, the Town reviewed preventive activities including zoning, stormwater management regulations, building codes, subdivision ordinances, and the preservation of wetlands and open space. With respect to floodplain management, how to reduce future flood losses and if the Town should adopt or revise these planning tools to better meet current or future conditions was considered. The assessment of these capabilities, including key discussion points and *HM&FMP* integration considerations, has been included in **Appendix 5-1**. Where applicable, a hyperlink for the capability is provided.

In **Appendix 5-1**, the section related to local capabilities also includes a *Level of Effectiveness* rating to assist in determining which measures should continue to be supported or enhanced. Capabilities with a low or moderate rating were further reviewed to determine if the measure should be updated or if the 2025 Comprehensive Plan or another planning document will take the place of the less effective capability.

CRS CREDIT:		
Mitigation Planning Element	CRS Planning Step	Max Pts
Phase III –Mitigation Strategy	7. Review Possible Activities (a & b)	10

CRS Coordinator's Manual – Activity 510: Floodplain Management Planning

Table 5-1 List of Planning and Regulatory Capabilities (Refer to Appendix 5-1 for Assessment details)

LOCAL (the capabilities have been listed in alphabetical order)
Barrington Geographic Information System (GIS)
Bay Spring Neighborhood Resilience Plan (2020)
Comprehensive Community Plan (2015 -Amended July 2019)
Comprehensive Plan to Restore Water Quality in Hundred Acre Cove (2021)
Emergency Operation Plan (2022)
Geospatial Analysis of Sea Level Rise for Rhode Island Municipalities (2021) - <i>including maps & geodatabase</i>
Harbor Management Plan (2018)
Housing-Land Use Study (2008)
*** THIS DOCUMENT - 2022 Hazard Mitigation & Flood Management Plan (2022)
Hazard Mitigation Plan (2017)
Municipal Resilience Program Community Resilience Building Workshop Summary of Findings (2019)
Open Space Plan (2011)
Preparing for Resilience: Barrington and Warren Mixed-Use Climate Response Demonstration Site (2019)
Preparing for Resilience: Barrington, Warren and Bristol Mixed-Use Climate Response Demonstration Site (2021)
Rhode Island General Law, Chapter 23-27.3 State Building Code
Strategic Energy Plan (2011)
Technical Report: A Future with Water: Sea Level Rise in Rhode Island (2019)
The Code of the Town of Barrington RI: Chapter 78 – Outdoor Burning
The Code of the Town of Barrington RI: Chapter 91 Article V – Storm Drainage System: P.C. Stormwater Control
The Code of the Town of Barrington RI: Chapter 185 - Zoning Ordinance
The Code of the Town of Barrington RI: Chapter 200 - Land Development and Subdivision Regulations
REGIONAL/STATE (the capabilities have been listed in alphabetical order)
Coastal Resources Management Council (CRMC)
Eastern Rhode Island Conservation District (ERICD)
Narragansett Bay National Estuarine Research Reserve (NBNERR)
Rhode Island Building Codes
Rhode Island Department of Administration (RIDOA) - Rhode Island Division of Statewide Planning (RIDSP)
Rhode Island Department of Environmental Management (RIDEM)
Rhode Island Department of Health (RIDOH)
Rhode Island Department of Public Safety (RIDPS)
Rhode Island Department of Transportation (RIDOT)
Rhode Island Emergency Management Agency (RIEMA)
Rhode Island Energy - PPL Corporation (formerly National Grid/Narragansett Electric)
Rhode Island Geographic information System (RIGIS)
Rhode Island Office of Energy Resources (RIOER)
Rhode Island Sea Grant
Save The Bay
URI Coastal Institute
FEDERAL (the capabilities have been listed in alphabetical order)
Americans with Disabilities Act Guide for Small Towns
Federal Emergency Management Agency (FEMA)
National Oceanic and Atmospheric Administration (NOAA)

5.1.2 Administrative and Technical Capabilities

The *Administrative and Technical Capabilities* include policies, standard operating procedures, public services, trainings, and tools that can be used for mitigation planning and to implement specific mitigation actions. At the local level, it encapsulates the skills and expertise of the Town of Barrington staff in terms of their ability to effectively undertake hazard mitigation planning and implementation, and the coordination of associated resources.

Table 5-2 provides a list of the *Administrative and Technical Capabilities* that were reviewed at the Local, Regional, State, and Federal level. The full assessment has been provided in **Appendix 5-2**. Where applicable, the capability measure includes a hyperlink.

Table 5-2 List of Administrative and Technical Capabilities (Refer to Appendix 5-2 for Assessment details)

LOCAL (the capabilities have been listed in alphabetical order)	
Barrington Public Library	
Coordination with Area Colleges and Universities	
Coordination with Local Business Community	
Coordination with Neighboring Municipalities	
Drills and Exercises	
Map Information Services	
Municipal Administration and Staff	
Shelters and Evacuation Zones and Routes	
Town of Barrington Website	
Warning and Notification Systems	
REGIONAL/STATE (the capabilities have been listed in alphabetical order)	
Resilient Rhode Island Act	
Resilient Rhody	
Rhode Island Red Cross	
StormSmart Coasts Rhode Island	
FEDERAL (the capabilities have been listed in alphabetical order)	
Clean Water Act	
Federal Disaster Mitigation (some key Acts)	
National Flood Insurance	
National Warning and Alert Systems	
Nationwide Programmatic Environmental Documents	
Pandemic and All-Hazards Preparedness Act	
Voluntary Organizations Active in Disasters (VOAD)	

5.1.3 Financial Capabilities

Barrington will use their Capital Improvement Program (CIP) to schedule funding for implementation of the actions in this *HM&FMP*. In addition, the Town - across all municipal departments - will consider and pursue all applicable Federal, State, and Regional grant opportunities to assist in implementing hazard mitigation programs. The *Financial Capabilities* identified in **Table 5-3** represent potential funding sources the Town has access to, has used in the past, or may be eligible to use in the future for hazard mitigation measures. The full assessment of the financial capabilities has been provided in **Appendix 5-3**.

Table 5-3 List of Financial Capabilities (Refer to Appendix 5-3 for Assessment details)

LOCAL (the capabilities have been listed in alphabetical order)
Town Budget - Capital Improvement Program (CIP)
REGIONAL (the capabilities have been listed in alphabetical order)
Eastern RI Conservation District (ERICD) - Grass Roots Fund
Narragansett Bay Estuary Program (NBEP)
Southern New England Program (SNEP)
STATE (the capabilities have been listed in alphabetical order)
Rhode Island Department of Environmental Management (RIDEM)
Rhode Island Emergency Management Agency (RIEMA)
Rhode Island Foundation
Rhode Island Infrastructure Bank (RIIB) – MRP Action Grant
FEDERAL (the capabilities have been listed in alphabetical order)
Department of Homeland Security Grant Program (HSGP)
Federal Emergency Management Agency (FEMA)
US Army Corps of Engineers Programs
US Department of Agriculture Natural Resources Conservation Service (USDA)
US Department of Housing and Urban Development
US Economic Development Administration

5.1.4 Key Local Mitigation Measures Related to Profiled Hazards

In **Section 4**, the Steering Committee identified and profiled those hazards thought to have a higher likelihood of occurring or potentially having a greater impact on the Town should they occur. **Table 5-4** relates key local capabilities to each of the profiled hazards. The Town will continue to expand and improve these capacities.

Table 5-4 Key Local Mitigation Measures Related to Profiled Hazards

Hazard	Existing Mitigation Measure	Hazard	Existing Mitigation Measure
All Hazards Identified in HM&FM Plan	CodeRED™ Communications Equipment Comprehensive Community Plan Disaster Recovery Plan Emergency Management Committee Emergency Operations Plan Emergency Power Generators Hazard Mitigation & Flood Management Plan (<i>this document</i>) Outreach & Education Professionalism, Expertise, and Dedication of Town Staff Town Website	Wind-Related	Evacuation Plan Local Warming Shelter Regional Red Cross Certified Shelter State Building Codes Tree Maintenance Program
Flood-Related	Barrington GIS CRS Participation (pending) Dam Safety Regulations Evacuation Plan Floodplain Regulations Flood Preparedness Website Harbor Management Plan Implementing Structural and Non-Structural Projects Land Development & Subdivision Regulations National Flood Insurance Program Participation Open Space Plan Regional Red Cross Certified Shelter RIPDES Small MS4 Permit Regulations RI STORMTOOLS Roadway Treatments Site Plan Review for Stormwater and Erosion Control State Building Codes Storm Drainage and Catch Basin Maintenance Street Sweeping Wetlands and Open Space Acquisition Wetlands Overlay District Zoning Ordinance	Vector-borne Diseases Transmitted by Ticks and Mosquitoes	Mosquito Control Maintenance
		Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses	Covid-19 Home Testing Kits made available to public Town Covid-19 Testing Facility Town Website: information on Covid-19
		Earthquakes	Evacuation Plan Regional Red Cross Certified Shelter State Building Codes
		Extreme Heat, Drought, Brush Fires	Local Cooling Shelter Local Fire Safety Education Program Permits Required for Outdoor Fire Pits on Public Land State Fire Building Code Tree Maintenance and Replacement Program Water Use Restriction

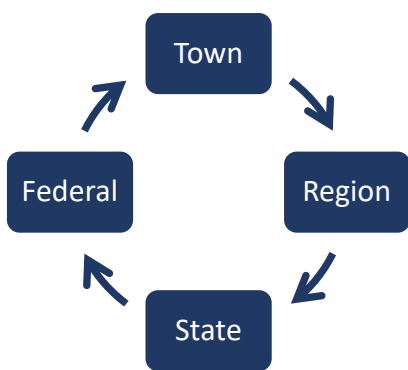
5.2 PARTNERSHIPS AND PUBLIC OUTREACH

The Town of Barrington recognizes the benefit of coordinating and working collaboratively with an array of partners. The list in **Appendix 2-3**, identifies 16 local government & school district groups, as well as 33 agencies and organizations outside of Barrington's governmental structure, that were invited to be part of the *HM&FMP* planning process, are those that the Town has established partnerships with over the years.

As identified in **Appendices 5-1, 5-2, and 5-3**, many of these partners have helped to enhance an array of Town projects and community outreach through their expertise, resources, and funding support. This *HM&FMP* is a prime example of the integral nature of these partnerships. Stakeholders from the RI Department of Health, URI Coastal Institute, and Narragansett Bay National Estuarine Research Reserve are serving on the Steering Committee. Further, as evidenced through the **Bibliography and Work Cited**, resources from many of these partners has been used throughout this *Plan*.

As part of the *Capability Assessment*, it was determined that it would be beneficial for the Town to continue to build upon existing partnerships to ensure the Town remains current with respect to hazard risks and mitigation. Throughout the *Action Plan*, the Steering Committee recognized the benefit of partnerships and informational connections.

The Town is particularly grateful of the partnership with the Rhode Island Emergency Management Agency (RIEMA) and the Federal Emergency Management Agency (FEMA) for their knowledgeable staff, databases, tools to perform local risk assessments and other analysis, resources to support development of mitigation strategies, grant funding opportunities, and for their vast collection of public outreach materials, including those that promote flood risk awareness and flood insurance.



Additionally, over the past several years the Town has worked closely with a number of conservation organizations such as the Barrington Land Conservation Trust, Save The Bay, and The Nature Conservancy to restore degraded wetlands in critical areas, foster habitat restoration, and implement end of road drainage improvements to help reduce the risk of damages from flooding events. In 2017 the Town partnered with the URI Coastal Institute on a Climate Response Initiative. Through this initiative, the Town, Coastal Institute, and other partners have held numerous public outreach events including touring various sites throughout Barrington that are susceptible to the impacts of flooding, storm surge, and SLR; panel discussions on SLR; a land-use planning workshop; buy-out workshops for structures compromised by SLR; a transportation vulnerability workshop; and a presentation by UPenn graduate students on findings from their semester-long planning study of coastal resilience in Barrington and Warren.

Partnerships with government agencies and other organizations to plan and carry out emergency preparedness, emergency response, and hazard mitigation activities has been a successful strategy that the Town will endeavor to expand in the coming years. In particular the Town recognizes the benefit of expanding the role of these partners in public outreach. As evidenced the *Action Plan* (**Section 6**) a number of the measures fall into the **Public Education & Awareness Category**. The Town will look for opportunities to involve their partners in community outreach activities that promote a safer, more disaster resilient community. Successful outreach programs provide accurate data and information that serves to make citizens better prepared for potential hazard events. Public outreach and education also builds an understanding of the concept of hazard mitigation and climate change, therein helping to create a base of support for implementing *Plan* activities.

Within the Town administrative structure, two ongoing outreach and educational programming efforts that support hazard awareness and reinforce individual pro-active hazard mitigation measures include:

Information on the Town Website

The Town Manager's office regularly updates the *Town website* (currently being redesigned to improve navigability and content) to directly inform the public of risks associated with hazard events. Over the course of the Covid-19 Pandemic, the Town has worked hard to provide current information to the community via the Town website.

A critical tool administered by Barrington Public Safety, and promoted in the highly visible "Quick Links" section of the Town website, is the CodeRED™ Emergency Notification System. This system facilitates more rapid citizen notification and warning in advance of or during a disaster.

As part of the *Capability Assessment*, it was determined that it would be beneficial for the Town to continue to improve the scope and breadth of hazard mitigation/emergency preparedness awareness. In the *Action Plan*, the Steering Committee prioritized the need for expanded public education and outreach efforts including through the Town website (refer to **Section 6.4 - Action 2022-4.1**).

A number of Town webpages, including the following have information related to hazard mitigation: **HM&FMP Project webpage**, **Emergency Information webpage**, **Building & Zoning Office webpage**, **Maps webpage**, and **Documents & Forms webpage**. In addition, the Town maintains a **Flood Preparedness Website** to assist the community in becoming more aware of the risks associated with flooding. Topics on the Flood Preparedness Website include:

- **Flood Insurance**

- ◊ How and Why to Buy
- ◊ Flood Damage – Costs and Coverage
- ◊ The Claims Process
- ◊ Lowering Your Insurance Costs

- **Floodplain Parcels**

- ◊ Elevation Certificates
- ◊ Assessing and Repairing Flood Damage
- ◊ Mitigation – Retrofitting Your House for a Flood
- ◊ Federal Mitigation Funding

- **Flood Safety**

- ◊ Protecting Loved Ones
- ◊ Efficient Evacuation

- **Floodplain Info**

- ◊ Maps
- ◊ The Basics of Flood Zones and Floodplains
- ◊ Natural and Beneficial Functions of Floodplains
- ◊ Protecting the Floodplains

As part of the *Capability Assessment*, it was determined that it would be beneficial for the Town to continue to build their GIS capability and provide additional valuable information to the community through this visual mapping tool. In the *Action Plan*, the Steering Committee prioritized the need for enhancing the Town's GIS capabilities (refer to **Section 6.4 - Action 2022-1.5**).

Information on the Town GIS Web Viewer

The Town's on-line *GIS Web Viewer* provides Town departments and the public easy access to Barrington's ArcGIS mapping which includes FEMA flood Insurance Rate Maps (FIRMs). By providing the FIRM flood zone layer, users can navigate to their property and view where flood zones are located in approximate relation to the property lines and building footprints. The flood zone information is beneficial to residents, potential home buyers, insurance agencies, lenders, and Town staff.

Over the ensuing five-year period the Town intends to improve and expand its GIS capabilities.

5.3 2017 HAZARD MITIGATION ACTION PLAN - ASSESSMENT OF ACTIONS

In accordance with 44 CFR § 201.6 and CRS Activity 510 Planning Process - Step 7, the Steering Committee conducted a review of the 2017 Mitigation Actions to determine their status and validity for inclusion in this update. Of the 19 Actions, two have been completed, three have had no action, and the rest are ongoing. As evidenced in **Table 5-5**, the Town has been extremely proactive and made a great deal of progress on many of these actions. After reviewing the work accomplished and what remains to be done, it was determined that all of the non-completed actions remain relevant and are included in the updated *Goals*. These have formed the foundation of the *2022-2027 Action Plan*, with most modified to some extent to account for plan integration of actions from other resources. More specific information on how the 2017 Actions relate to the 2022 Actions can be found in Appendix 6-1.

Table 5-5 Overview of 2017 HMP Actions

Goal 1: Reduce current and future risk of natural hazards and sea level rise to the built environment.	
2017 HMP Action Item	Status
Action 1.A—Complete community-wide storm surge and sea level rise impact assessment. Complete an assessment of potential impacts, including physical and economic, of projected sea-level rise on publicly and privately owned buildings and sites, roads, storm-water systems, sewer systems, and other utilities. The scope would involve mapping vulnerable areas, generating cost estimates and establishing project priorities. Potential available tools for the assessment include STORMTOOLS and the RI e911 Exposure Assessment. In addition, the Town will work with institutions, such as the Coastal Institute at the University of Rhode Island, to identify resources to model economic impacts.	Status: Ongoing (Completed on buildings and roadways) Lead: DPW; Planning, Building & Resiliency <ul style="list-style-type: none"> As part of the Bay Spring Neighborhood Resilience Plan (fall 2019/winter 2020) numerous discussions and brainstorming sessions were held which included climate change/SLR impacts on this area of Town. Public outreach sessions were held at the Barrington Bay Spring Community Center. In 2020/21 an extensive building damage assessment and roadway analysis was undertaken as part of a joint project between the Town of Barrington and the Coastal Institute (CI) at the University of Rhode Island (URI). The analysis was conducted by a Graduate Student in the Masters of Environmental Science and Management Program, Department of Natural Resources at URI. Details on the analysis methodology can be found in the report titled: <i>Geospatial Analysis of Sea Level Rise for Rhode Island Municipalities</i>.
Action 1.B—Complete infrastructure projects in order to protect critical assets. Include in the six-year capital improvement program and work with the State to include in the Transportation Improvement Program critical short-term and long-term projects required to mitigate threats to infrastructure and properties. Priority projects to be identified in the SLR assessment (Action 1.A). Potential projects include the following, as well as those presented by Save the Bay and included in Appendix 7 (2017 HMP): <ul style="list-style-type: none"> Inspect and secure seawalls / revetments on public property in order 	Status: Ongoing Lead: Planning, Building & Resiliency; Planning Board <ul style="list-style-type: none"> In 2010-2019 the DPW rebuilt sections of the Mathewson seawall. DPW allocates funds when available to rebuild the Mathewson seawall to prevent hazards that would be incurred by storm surge/SLR. In FY2020 the Town created a climate mitigation capital reserve for planning and implementation. The Town's 6 primary sewer pump stations have built-in backup generators. However, the remaining 9 sewer pumps and 3 storm drainage pumps are vulnerable to power outages. The DPW had two older mobile backup generators and purchased an additional one in November 2019. In the event of Town-wide power outages, the DPW

<p>to protect infrastructure. Priority areas include Mathewson Road, Shore Drive/ Latham Park and Police Cove Park.</p> <ul style="list-style-type: none"> • Enhanced protection of pump stations in vulnerable areas (shut off, flood-proofing, emergency pumping). • Improvements to State roads threatened by SLR—including Wampanoag Trail and Sowams Road (in the vicinity of the Bike Path bridge) — to the roadway and/or drainage, in response to long-term threat of sea level rise inundating the roadway at high tide. • Installation of larger culverts to accommodate larger tidal flows, such as under County Road at Prince's Pond. 	<p>assessed that an additional two backup generators were warranted to service infrastructure pumps and applied for funding assistance through DEM's Wastewater Treatment Facility Resiliency Fund Grant Program (joint submission with the Town of Warren). In April 2020 the Town was awarded \$65,000 toward the purchase of two generators (Barrington Principal Authors: Resilience Planning Consultant/DPW Engineer).</p> <ul style="list-style-type: none"> • Nayatt Road was resurfaced in 2019 by RIDOT. • The DPW is looking for grant opportunities to re-size/refurbish culverts in Town. Culverts of particular interest are located on Bay Spring Ave and Sowams Road, areas that would be particularly affected by SLR. • RIDOT TIP has slated improvements to the bike path (including new bike path bridges built with increased clearance over the Barrington and Warren/Palmer Rivers) to occur between 2021-2026. • As part of abatement related to the Central Bridge replacement project, end of road stormwater improvements – including pavement removal – were completed on Juniper Street and Virginia Road.
<p>Action 1.C—Revise regulations to reduce future risk of natural hazards. Revise the Town's Zoning Ordinance and Land Development and Subdivision Regulations to lessen encroachment of development into the existing or projected floodplain, to limit future development in the floodplain, and to reduce vulnerability of new construction to coastal flooding and storm surge due to rising sea levels. Potential revisions including allowing flexible lot sizes, such as through a cluster subdivision design, and establishing setbacks or buffers to account for sea level rise.</p>	<p>Status: Ongoing Lead: Planning Board</p> <ul style="list-style-type: none"> • In 2016, the Town rezoned the Zion Bible Institute property to Senior Residential Village. • In 2018 the Town completed a land use study of the Bay Spring area that included creation of a new Residence-Business Flex zone and establishment of developer guidance for two key parcels in Bay Spring that require site planning for new development to take sea level rise projections into account (added to Comp Plan in 2019). • In 2019 the Town rezoned the R-40 zone in George St. area to new Agriculture-Rural zone, designed to protect farmland and open space with larger lot size requirement and allow for more farm-related uses.
<p>Action 1.D—Publish design, site guidelines for elevation projects. Publish illustrated design guidelines to provide recommendations for designing building elevations that are compatible with the surrounding neighborhood while complying with flood elevation requirements. Include best practices to mitigate impacts of elevations that require relief from the height limit.</p>	<p>Status: No action Lead: Planning, Building & Resiliency</p>
<p>Action 1.E—Adopt LID standards to reduce amount of impervious surfaces within new subdivisions and other private development projects. Adopt low-impact development standards to reduce the amount of impervious coverage, such as reduced street widths and a maximum impervious lot coverage percentage. This action would require revisions to the Town's Land Development & Subdivision Regulations.</p>	<p>Status: No action Lead: Planning, Building & Resiliency; Planning Board; Solicitor</p>

<p>Action 1.F—Improve stormwater facilities at public facilities.</p> <p>Provide measures to improve stormwater retention in the planning and design of park improvements and construction of schools and other new public buildings. An example is Phase 1 improvements at Latham Park, where a rain garden was installed in a parking lot after pavement was removed (Figure 6.4 – 2017 HMP). Retrofit existing facilities to include improved stormwater facilities when lots need to be repaved or rebuilt. Priority sites include Latham Park (southern portion of site), where coastal flooding and erosion will worsen over time; and flood zone areas on the grounds of the High School.</p>	<p>Status: Ongoing Lead: DPW; Planning, Building & Resiliency; Planning Board</p> <p>In FY2020 the Town created a climate mitigation capital reserve for planning and implementation.</p> <p>Requiring ongoing maintenance:</p> <ul style="list-style-type: none"> • Cleaning of ditches with mini-excavator • Cleaning of Third Street Culvert <p>Completed (but will require ongoing maintenance):</p> <ul style="list-style-type: none"> • Primrose Hill School – upper parking lot • Primrose Hill School – BMP along Middle Highway (RIDOT) • Raised elevation of Riverview Drive by approximately 3 inches • The Town installed a rain garden and swale at Town Hall off Markwood Drive, and rain gardens at Latham Park • Removal of Phragmites at Kent Street Pond • The new Barrington Middle School (opened in fall 2019) incorporates stormwater management components • The Walker Farm project and Bowden/Opechee ROW sites associated with the 2019 MRP Action Grant (Principal Author: Resilience Planning Consultant - \$201,000 Awarded January 2020) are coastal adaptation projects that include stormwater management. These projects are scheduled to be completed in 2022. The Walker Farm site includes shoreline and habitat restoration and accommodating coastal marsh migration. The shoreline and habitat restoration work at the north end of the Walker Farm site were supported by a CRMC CEHRTF Grant (Principal Author: Resilience Planning Consultant - \$27,400 Awarded March 2020). • The Town was awarded a 2021 MRP Action Grant (Principal Author: Resilience Planning Consultant - \$249,500 Awarded April 2022) for improvements that will address stormwater management, water quality, and ecological health at 5 public rights-of-way that terminate at the edge of waterways (Woodbine Avenue, Adams Avenue, Watson Avenue, Clark Road, and Water Way), and also to increase municipal tree planting. The project is anticipated to be constructed in 2023.
<p>Action 1.G—Improve GIS capabilities, including enhancements to the Town’s web-based mapping program, to help users identify flood risk throughout town.</p> <p>Improve Geographic Information Systems (GIS) capabilities to support property tax revaluations, planning, Department of Public Works activities (including drainage system maintenance plan), and floodplain mapping and flood data for impacted properties.</p>	<p>Status: Ongoing Lead: DPW</p> <ul style="list-style-type: none"> • With the support of an engineering consultant, during the spring and summer of 2017, the DPW undertook an internship program (several BHS students and one college to input sewer data from the engineering plans, as well as scanned images of sewer lateral cards, into the GIS database. • Over the past several years, the DPW Sewer Division has worked with a GIS Consultant to collect GPS field data to provide additional attribute data for the sewer geodatabase. • The Town’s Resilience Planning Consultant along with a GIS Consultant, worked with the DPW to collect GPS stormwater infrastructure data and develop a stormwater geodatabase. The Town was awarded a NBEP Grant (Principal Author: Resilience Planning Consultant - \$33,700 Awarded January 2022) to assist with the completion of the stormwater GPS collection and associated work. When completed the stormwater geodatabase will provide a foundation for a comprehensive analysis of the Town’s stormwater drainage system.

Goal 2: Preserve and enhance the capacity of the natural environment to improve Barrington's resilience against impacts of natural hazards.

Policy 2.1.1: Identify and protect critical open space areas that are vulnerable to natural hazards and sea level rise.

Policy 2.1.2 Plan and implement projects that allow natural systems to adapt over time to changes in sea level rise and the climate.

2017 HMP Action Item	Status
<p>Action 2.A—Prioritize and complete Coastal adaptation projects.</p> <p>Prioritize and implement coastal adaptation projects, working with Save the Bay, the State, and other stakeholders, to reduce flood risk and the potential damage to vulnerable infrastructure and allow the expansion of wetlands. Implement slope stabilization efforts, such as planting brigades in spring, where appropriate. Save the Bay's presentation on potential projects (Appendix 7-2017 HMP) identifies potential projects, including:</p> <ul style="list-style-type: none"> • Retrofit municipal and school paved parking areas and ends of streets (such as Belvedere Avenue) in low-lying areas that have excessive pavement (to include drainage, reduce pavement, etc.). • Allow for salt marsh to become re-established north of the Walker Farm boat ramp. • Cut back pavement at end of Woodbine Avenue; consider relocating drainage outfall. • Provide for stormwater infiltration at edge of Bourne Lane. • Develop plan to allow for marsh migration within low-lying areas at Latham Park. 	<p>Status: Ongoing Lead: DPW; Planning, Building & Resiliency</p> <ul style="list-style-type: none"> • (Annual) Mathewson sea wall maintenance • Working with SOLitude Lake Management to eradicate phragmites from Town properties at Kent Street skating pond and Volpe's pond • Allin's Cove Restoration Project has undergone numerous phases. In 2005 the US Army Corps of Engineers/CRMC conducted a salt marsh restoration project by removing historic fill highly populated by <i>Phragmites</i> and depositing it upland. This area, subsequently became populated with the invasive species. Japanese knotweed also became established in the area along Byway Road, the site of the new entrance to the cove. The plant has also grown along the inner marsh's bank as a result of the mechanical grading during the restoration project. In 2010 the Barrington Land Conservation Trust (BLCT) was awarded \$6,891 through a CRMC CEHRTF Grant to restore 3.5 acres of land abutting Allin's Cove by replacing invasive <i>Phragmites australis</i> and Japanese knotweed with native grasses, shrubs and trees in three locations adjacent to the cove. In July 2020 the Town was awarded a DEM Climate Resilience Grant (Principal Author: Town Planner - \$100K) which will in part provide funds to promote coastal resilience at Allin's Cove. • (Per Action 1.F) The Walker Farm project and Bowden/Opechee ROW sites associated with the 2019 MRP Action Grant (Principal Author: Resilience Planning Consultant - \$201,000 Awarded January 2020) are coastal adaptation projects that include stormwater management. These projects are scheduled to be completed in 2022. The Walker Farm site includes shoreline and habitat restoration and accommodating coastal marsh migration. The shoreline and habitat restoration work at the north end of the Walker Farm site were supported by a CRMC CEHRTF Grant (Principal Author: Resilience Planning Consultant - \$27,400 Awarded March 2020). • Latham Park - Two grants were obtained to assist with shoreline restoration between the southern end of Latham Park and Byway Road. The SAID <i>Design Services</i> Grant (Principal Author: Resilience Planning Consultant - approx. \$15,000 Awarded February 2020) will provide engineering design services and the DEM Climate Resilience Grant (Principal Author: Town Planner - \$100,000 Awarded July 2020) which will assist in implementing the erosion control design. • In FY2020 the Town created a climate mitigation capital reserve for planning and implementation. • (Per Action 1.F) The Town was awarded a 2021 MRP Action Grant (Principal Author: Resilience Planning Consultant - \$249,500 Awarded April 2022) for improvements that will address stormwater management, water quality, and ecological health at 5 public rights-of-way that terminate at the edge of waterways (Woodbine Avenue, Adams Avenue, Watson Avenue, Clark Road, and Water Way), and also to increase municipal tree planting. The project is anticipated to be constructed in 2023.

<p>Action 2.B— Implement tree management program.</p> <p>Implement a tree management program to reduce risk to property due to winds, heavy snow/ice, or other natural hazard impacts, to include:</p> <ul style="list-style-type: none"> Identify native tree species that will be most resilient to climate change and use these species in public projects. Requiring resilient tree species in new subdivisions and land development projects. 	<p>Status: Ongoing Lead: DPW</p> <ul style="list-style-type: none"> DPW Arborist Frank Charrette, with assistance from the Barrington Garden Club, has started a tree reforestation area located behind the Barrington Community Garden off Wampanoag Trail that includes native species that will be most resilient to climate change. The 2021 MRP Action Grant (Principal Author: Resilience Planning Consultant - \$249,500 Awarded April 2022) includes support for the tree nursery, municipal tree planting, and community education on native species with high carbon sequestering rates. The project is anticipated to be implemented in 2023.
<p>Action 2.C—Complete hydrology studies.</p> <p>Complete hydrology study that includes: inventory of ponds on private and public property; assessment of streams, and condition of and impacts of dams; and prioritization of projects needed to maintain/improve water flow.</p>	<p>Status: No action Lead: DPW; Planning, Building & Resiliency</p>
<p>Action 2.D—Develop and complete projects identified in Walker Farm saltmarsh restoration plan.</p> <p>Develop plan to allow restoration of natural areas at Walker Farm. Identify potential new locations for yard waste storage area to clear area for marsh migration and prepare for potential inundation from sea level rise.</p>	<p>Status: Substantial Completion scheduled for fall 2022 Lead: DPW; Conservation Commission</p> <ul style="list-style-type: none"> (Per Action 1.F) The Walker Farm project associated with the 2019 MRP Action Grant (Principal Author: Resilience Planning Consultant - \$201,000 Awarded January 2020) and the CRMC CEHRTF Grant (Principal Author: Resilience Planning Consultant - \$27,400 Awarded March 2020) supports shoreline improvements including salt marsh migration zones, buffer and habitat restoration. The work associated with this project is scheduled to be completed in 2022. Restoration of the natural areas was in part made feasible due to the redesign of the park in associated with the DEM Outdoor Recreation Grant (Principal Author: Town Planner - \$230,700 Awarded April 2020). The work associated with this project is scheduled to be completed in 2022/23.
<p>Action 2.E—Protect vulnerable areas from development through acquisition, easements and other mechanisms.</p> <p>Work with BLCT and other stakeholders to identify and protect from development low-lying land vulnerable to impacts from flooding and sea level rise, and areas adjacent to coastal wetlands susceptible to increased inundation due to sea level rise. This Action will encourage landward migration of other coastal habitats, such as estuarine beaches and dunes, as these features must be allowed to migrate in response to SLR in order to continue to provide some level of natural storm protection. Take advantage of funding opportunities such as DEM open space acquisition grants, and other mechanisms, including conservation easements, to permanently protect these areas. Develop priority list of sites based on open space acquisition evaluation criteria in Comprehensive Plan, in coordination with Land Trust.</p>	<p>Status: Ongoing Lead: Town Council; Town Manager; Land Trust</p> <p>The follow parcels have been acquired in an ongoing effort by the Town to protect vulnerable areas:</p> <ul style="list-style-type: none"> George Street 37-3A: a pond and associated wetland buffer covers about 1/3 of 6.8-acre lot. The upland was used historically as a horse pasture. Acquired in June 2019. The Town rezoned the R-40 zone in George St. area to new Agriculture-Rural zone, designed to protect farmland and open space with larger lot size requirement and allow for more farm-related uses. Harold Gibbs Woods - lot on Sowams Road northeast of Sowams School, extending to Palmer River marsh: Lot 64 on Assessor's Plat 31. Size: 4.64 acres. Majority of the site is wetland. Acquired in July 2020. The Land Trust acquired a small two parcel farm (3.24 acres and 1.1 acres) on Federal Road (now Community Farm School). Acquired in 2018.

Goal 3: Reduce flood risk and the cost of flood insurance within Barrington.

Objective 3.1: Achieve a Community Rating System (CRS) score of "7" or better by 2020.

Policy 3.1.1: Participate in the Community Rating System and provide resources necessary to run an effective program that reduces future risk and results in a CRS score of 7 or better.

Policy 3.1.2: Maintain a FEMA-approved Hazard Mitigation Plan that is based on the latest data and proposes strategies on natural hazards and climate change.

2017 HMP Action Item	Status
<p>Action 3.A: - Complete steps to enroll in Community Rating System.</p> <p>Complete steps required to enroll in the CRS, with an initial target rating of 8. Complete actions as necessary to improve the CRS score and improve the Town's floodplain programs.</p>	<p>Status: Ongoing (Submitted Application to FEMA) Lead: Planning, Building & Resiliency</p> <ul style="list-style-type: none"> In March 2021 the Town submitted a CRS Letter of Intent and Community Self-Assessment to FEMA; next step is the Community Assistance Visit (CAV) with FEMA staff
<p>Action 3.B— Engage/provide training for Certified Flood Manager.</p> <p>Engage a consultant or provide staff training for a certified floodplain manager to coordinate implementation of Community Rating System activities and implementation of the Town's Hazard Mitigation Plan.</p>	<p>Status: Ongoing Lead: Building Official</p> <ul style="list-style-type: none"> The Town's Building Official anticipates taking the certified flood plain manager test in 2022. (related) In 2020 the Town's Building Official completed the FEMA workshop on elevation certificates. (related) In November 2021, the Town held a workshop (Operation Recover Barrington) focused on recovery from a natural hazard. Former FEMA Administrator, Peter Gaynor, was the Guest Speaker. Other speakers included Robert Grimley, FEMA Region I Recovery Division Director; Armand Randolph, RIEMA Recovery Branch Chief; and Ray Laprad with ARMADA Ltd. There were roughly 60 attendees including Barrington Town staff, staff from neighboring municipalities, and other stakeholders.
<p>Action 3.C—Develop and enact tracking system to monitor HMP implementation progress, with updates on a semi-annual basis.</p> <p>Develop a tracking system to monitor progress implementing the Hazard Mitigation Strategy, updated by lead department/agency/organization team to include budget status, staffing assignments and other relevant information. This update will include status reports on activities resulting in CRS credit including floodplain management planning.</p>	<p>Status: Ongoing Lead: Planning, Building & Resiliency</p> <ul style="list-style-type: none"> The Town undertakes an annual HMP review to discuss and assess the progress on the goals and activities in the Plan As part of the 2022 HMP update, the Town will undertake an extensive plan integration review in order to better assist departments in identifying and implementing short- and long-term mitigation priorities.
<p>Action 3.D—Work with property owners to mitigate properties in areas at risk of flooding, including acquisition and elevation projects.</p> <p>The Town will provide the staffing resources needed to identify and apply for outside funding sources, such as the Hazard Mitigation Grant, to elevate or relocate structures out of the floodplain, and acquire property within the floodplain. This effort also will include pursuing opportunities to acquire upland areas to relocate residences if the option of retreat is selected. The Town will consider putting in place mechanisms such as tax incentives to encourage property owners to adopt resilience measures (elevation, retreat landward, etc.).</p>	<p>Status: Ongoing Lead: Planning, Building & Resiliency</p> <ul style="list-style-type: none"> In 2014 the Town was awarded a \$644,871 FEMA Hazard Mitigation Grant to elevate 6 residences in Barrington. The Town has worked with applicants to complete two house elevations – on Edwin Street and one on Lillis Avenue. The two projects cost \$491,150 total, with FEMA covering \$368,362 of the total cost. The other four properties that were awarded funding have withdrawn from the program. The grant has been closed out, per a closeout letter from FEMA to the Town dated July 1, 2021.

Goal 4: Improve the community's awareness of threats to minimize risk to the public due to natural hazards.

Policy 4.1.1: Inform the public on the concept of community resilience and the risk of impacts from natural hazards, with an emphasis on stream and coastal flooding, including storm surge, and winter storms.

2017 HMP Action Item	Status
<p>Action 4.A—Initiate program such as “High Water Mark” initiative to increase public awareness of flooding risk and potential future high tide levels from sea level rise.</p> <p>Develop and implement an outreach program consistent with the National Flood Insurance Program’s High-Water Mark initiative to include creating and posting informational signs and markers at public properties (such as Latham Park, Police Cove Park, and the Bay Spring Community Center) showing images of flood damage and high-water marks based on historic flood levels. The initial focus will be the hurricanes of 1938 and 1954. Provide markers showing elevations based on projected increases in sea level.</p> <p>Commission and install public art in public spaces near coastal waters that illustrate these high-water marks. Work with RIDOT to mark projected sea level rise on bridges.</p>	<p>Status: Ongoing Lead: DPW; Planning, Building & Resiliency</p> <ul style="list-style-type: none"> The Resilience & Energy Committee has been researching options to complete a high-water mark (HWM) project for Barrington. It is anticipated that several HWM signs/markers will be installed in 2023.
<p>Action 4.B—Conduct community outreach to increase awareness and improve preparedness for impacts of natural hazards.</p> <p>Conduct community outreach, including public forums, publication/posting of information at Town facilities and the website, and mailings, on natural hazard mitigation initiatives, preparedness and response. Program should include:</p> <ul style="list-style-type: none"> Preparedness for emergency situations, especially during hurricane season. Training prior to and/or during hurricane season for volunteers to work as shelter workers. Public workshops and publications on threats of natural hazards, including impacts of flooding and long-term sea level rise projections. Publicity of spaces (shelters, “warming centers,” etc.) available to the public in times of power outages, loss of heat, and other secondary impacts resulting from natural hazards. Dissemination of information on opportunities property owners can take to mitigate future impacts; include “how-to” sessions on mitigation activities including house elevation projects. 	<p>Status: Ongoing Lead: DPW</p> <ul style="list-style-type: none"> The Town of Barrington uses CodeRED™ to inform Barrington residents, who choose to sign up for the program, of local emergencies including natural hazards. As of April 2022, the Town has 18,791 individuals signed up to receive CodeRED™ alerts. Please note that you do not have to be a Barrington resident to sign up for Barrington CodeRED™ alerts. This allows family members not residing in Barrington, or residents of other local jurisdictions that do not use CodeRED™, to be serviced by this automated process. In 2017, Barrington and Warren began an ongoing partnership with URI’s Coastal Institute as part of the Climate Response Initiative (mixed-use climate response demonstration site). This ongoing program brought together a team of experts, as well as a group of graduate students from the University of Pennsylvania (UPenn) School of Design, to evaluate natural hazard threats, in particular sea level rise, coastal flooding, coastal erosion, and storm surge. As discussed in the fall 2019 Report, and subsequent 2022 report, throughout this program there have been numerous opportunities for public participation. Extensive outreach was conducted in August 2018 as part of the Town’s Emergency Preparedness Week Workshops which was funded in part by an RIDOH Mini Grant (Principal Author: Civil Engineer & Resilience Planning Consultant - \$4,900 Awarded May 2018). Six public workshops were developed and overseen by Ms. Jacobs and included involvement of numerous town departments and stakeholders. As part of the Town’s CRS efforts, a Program for Public Information (PPI) ad hoc committee was created to develop outreach strategies associated with flood hazards – this committee assisted with the 2018

<ul style="list-style-type: none"> • Distribution of brochures (including those on CRS and Flood Insurance) and other information. • Distribution of information for real estate agents on flood prone areas, etc. that can be passed onto potential purchasers. • Communication to the public on water restrictions, as applicable, during drought conditions; consider direct mailing of information to residents/property owners who rely on well water. • Alerts posted on the website/social media, etc. about impacts from ice due to winter storms, including risks associated with ice dams on houses. • Utilization of text messaging to communicate the public prior to, during and after natural hazard events that impact or threaten to impact the town. 	<p>Emergency Preparedness Week Workshops and review of the Flood Protection Website.</p> <ul style="list-style-type: none"> • A Flood Protection Website for the Town was developed by a four member BHS student team under the pro-bono mentorship of a local Civil Engineer & Resilience Planning Consultant. The Website, which went live in December 2018, provides information to residents on what to do before, during, and after a flood event. • In 2019 the Town formed the Planning, Building & Resiliency Department and added a part-time resilience planning consultant position. These changes represented a Town focus on community resilience. • In September 2019, the Towns of Barrington and Warren jointly hosted an MRP Community Resilience Building Workshop which included representation from town departments, town boards, stakeholders, and the public. Funding for the workshop which was facilitated by the RIIB and TNC, was awarded through the Resilient Rhody: Municipal Resilience Program (Principal Author: Resilience Planning Consultant - Awarded April 2019). • Beginning in 2020, the Town of Barrington uses iContact to inform Barrington residents, who choose to sign up for the program, about emergencies, elections, boards & commissions, and announcements/events. As of April 2022, the Town has 6,743 individuals signed up to receive iContact notices. This program is duly administered by the Department of Planning, Building & Resiliency and the Department of Senior Services. • In February 2020, as part of the Bay Spring Neighborhood Resilience Project, two public outreach sessions (facilitated by Fuss & O'Neill and Save The Bay) were held at the Bay Spring Community Center, to identify projects and actions that can be implemented to increase Barrington's resilience to climate change. • In 2019, the Town's Communications Manager, in conjunction with the Fire Chief, created a CodeRED™ handout to encourage participation in the Code RED program. • As part of the 2022 HMP update (HM&FMP) the Town undertook numerous outreach activities aimed to inform and engage the community in hazard mitigation (articles in Barrington Times, project webpage, public opinion survey, public informational meetings, kiosk at the Barrington Library, public review period with draft HM&FMP on Town website, and public hearing).
<p>Action 4.C—Establish process to inform vulnerable populations about procedures in place before and after a natural hazard event.</p> <p>The Town will establish a process to expeditiously contact special populations, focusing on those who are particularly vulnerable, due to location or age or infirmity, to ensure their understanding of procedures immediately before and after an event.</p>	<p>Status: Completed Lead: Town Manager; EMA Director</p> <ul style="list-style-type: none"> • (per Action 4.B) The Town of Barrington uses CodeRED™ to inform Barrington residents, who choose to sign up for the program, of local emergencies including natural hazards. As of April 2022, the Town has 18,791 individuals signed up to receive CodeRED™ alerts. Please note that you do not have to be a Barrington resident to sign up for Barrington CodeRED™ alerts. This allows family members not residing in Barrington, or residents of other local jurisdictions that do not use CodeRED™, to be serviced by this automated process. • (per Action 4.B) A Flood Protection Website for the Town was developed by a four member BHS student team under the pro-bono mentorship of Civil Engineer & Resilience Planning Consultant. The Website, which went live in December 2018, provides information to residents on what to do before, during, and after a flood event. • (per Action 4.B) Beginning in 2020, the Town of Barrington uses iContact to inform Barrington residents, who choose to sign up for the

	program, about emergencies, elections, boards & commissions, and announcements/ events. As of April 2022, the Town has 6,743 individuals signed up to receive iContact notices. This program is duly administered by the Department of Planning, Building & Resiliency and the Department of Senior Services.
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SECTION 6

Mitigation Strategy

Subsections

- 6.1 MISSION STATEMENT
- 6.2 GOALS
- 6.3 DEVELOPMENT OF ACTION PLAN
 - 6.3.1 Review Possible Activities
 - 6.3.2 Choose Possible Actions
 - 6.3.3 Prioritize Actions - STAPLEE Analysis
 - 6.3.4 Actions Supporting Community Rating System
 - 6.3.5 Action Descriptors
- 6.4 ACTION PLAN (2022-2027)

6 Mitigation Strategy

Hazard Mitigation Plan: The Town of Barrington has successfully met the following requirement ➔

44 CFR Subsection D §201.6(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

CRS - Flood Management Plan: The Town of Barrington has successfully met the following Mitigation Strategy requirements based on the 10-step planning process for CRS Activity 510 ➔ Set Goals (Step 6); Review Possible Activities (Step 7); and Draft an Action Plan (Step 8)

The *Mitigation Strategy* is the culmination of the mitigation planning process. It provides the Town with the basis for action to reduce the risk to people and property from hazards and assists the Town in achieving compatible economic, environmental, and social objectives. The *Mitigation Strategy* stems from the comprehensive *Planning Process* used in creating this document, and the findings of the *Risk Assessment, Vulnerability Analysis, and Capability Assessment*.

The *Town of Barrington 2022 Hazard Mitigation & Flood Management Plan (HM&FMP)* Steering Committee used the information outlined in the previous Sections to update and create a broad-based mission statement, goals, and actions which are intended to guide the Town's day-to-day operations and long-term approach to reduce the impacts of hazards and improve flood management. This updated strategy builds upon the extensive mitigation, climate adaptation, and flood management work the Town of Barrington has previously implemented and will serve as a roadmap for the next 5 years.

FEMA's Mitigation Strategy is comprised of the three main components represented in **Figure 6-1** and described below:

- ❖ **Goals** – General guidelines explaining what the plan proposes to achieve. These are usually broad statements with long-term applicability that provide the framework for achieving the intent of the mission statement.
- ❖ **Actions** – Specific projects for achieving the goals.
- ❖ **Action Plan** – A plan for implementing the actions. The Action Plan establishes priorities, assigns responsible parties, defines the type of action, and provides a magnitude of cost, potential funding sources, and an estimated timeframe for completion.

It was important to the Town of Barrington to develop a comprehensive and aggressive *Mitigation Strategy* that will lead to a safer and more sustainable community. The Town has and will continue to implement and institutionalize hazard mitigation and flood management through its human, legal, and fiscal resources; effective coordination and communication with the state, neighboring jurisdictions, stakeholders, community members, and across Town departments; and use of knowledge and tools to analyze and cope with hazard risks.

Figure 6-1 Mitigation Strategy Components



FEMA Local Hazard Mitigation Planning Handbook, Page 6-1

As the Town has undertaken to develop a combined hazard mitigation and flood management plan, the *Mitigation Strategy* includes a mix of mitigation and non-mitigation actions. Non-mitigation actions include activities that are emergency response or operational preparedness in nature.

6.1 MISSION STATEMENT

The Town of Barrington is striving to become a disaster resilient community and achieve sustainable development by mitigating hazard impacts before disaster strikes and by restricting infringement on sensitive lands. The following *Mission Statement* forms the foundation upon which the *Mitigation Strategy* is built.

Mission Statement

It is the mission of the *2022 Hazard Mitigation & Flood Management Plan (HM&FMP)* to reduce Barrington's vulnerability to impacts of natural hazards, including safeguarding against the increased threats from climate change and sea level rise. By identifying areas at risk and sustainable, cost-effective mitigation measures, the *HM&FMP* seeks to reduce the adverse impacts of natural hazards on Barrington's people, critical facilities, built & natural environment, and economy.

6.2 GOALS

DMA Requirement §201.6(c)(3)(i):

The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

CRS CREDIT:		
Mitigation Planning Element	CRS Planning Step	Max Pts
Phase III –Mitigation Strategy	6. Set Goals	2

CRS Coordinator's Manual – Activity 510: Floodplain Management Planning

The *Mitigation Strategy* consists of a coordinated set of goals for reducing or minimizing human and property loss, major economic disruption, and the degradation of ecosystems and environmentally critical habitats from natural disasters by integrating policy and action across functional areas and working with the citizenry to maintain the delicate balance with nature.

As discussed in **Section 2.3**, the Town of Barrington recognizes the benefit of plan integration. The Steering Committee was therefore cognizant that the *HM&FMP* goals be consistent with and complement the goals and objectives of the Town's Comprehensive Community Plan and other planning efforts (refer to **Appendix 5-1** for a list of local planning documents reviewed as part of the *HM&FMP* planning process).

In an effort to effectively review the 2017 HMP goals for relevancy, and as appropriate modify or add new goals, the Steering Committee envisioned what they would want the community to look like in the future in terms of resilience to flooding and other hazards, and updated the *Goals* as follows:



Goal 1: Reduce impacts from current and future natural hazards to the built environment.

Policy 1.1: Consider the effects of projected sea level rise and flooding in the site selection and planning of parks, buildings, and other public projects.

Policy 1.2: Reduce the impact of development within the floodplain and other vulnerable areas.

◆ Goal 2: Preserve and enhance the capacity of the natural environment to improve Barrington's resilience against impacts of natural hazards.

Policy 2.1: Identify and protect critical open space areas that are vulnerable to natural hazards and sea level rise (SLR).

Policy 2.2: Plan and implement projects that allow natural systems to adapt over time to changes in sea level rise and the climate.

Policy 2.3: Preserve existing tree canopy and maintain public trees for their value as green infrastructure and their ability to mitigate natural hazards such as stormwater, flooding, erosion, and extreme heat.

◆ Goal 3: Protect public health, safety, and existing properties against impacts of flooding through implementation of Community Rating System (CRS) Activities, with emphasis on expanding flood insurance coverage and reducing NFIP flood insurance premiums for Barrington property owners.

Policy 3.1: Continue to comply with National Flood Insurance Program (NFIP) requirements.

Policy 3.2: Actively participate in the Community Rating System Program.

Policy 3.3: Maintain a FEMA-approved hazard mitigation plan that is based on current, scientifically-based data and proposes mitigation strategies on natural hazards and climate change.

◆ Goal 4: Through communication and educational outreach, improve the community's awareness and capacity to reduce or adapt to impacts from natural hazards.

Policy 4.1: Inform the public on the concept of community resilience and the risk of impacts from natural hazards, with an emphasis on stream and coastal flooding; storm surge; tropical storms, hurricanes, and other high wind events; and winter storms.

Policy 4.2: Educate the public on the value of trees to mitigate hazards such as stormwater, flooding, erosion, and extreme heat; and encourage tree protection and planting in the community.

6.3 DEVELOPMENT OF ACTION PLAN

The Steering Committee considered a wide-range of mitigation and non-mitigation actions to incorporate into the *2022 Action Plan*.

DMA Requirement §201.6(c)(3)(ii):

The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.

CRS CREDIT:



Mitigation Planning Element	CRS Planning Step	Max Pts
Phase III –Mitigation Strategy	7. Review Possible Activities (c-g)	25

CRS Coordinator's Manual – Activity 510: Floodplain Management Planning

6.3.1 Review Possible Activities

As discussed in **Section 5**, the Town reviewed possible preventive activities, such as zoning, building codes, and subdivision ordinances, as well as the status of the actions included in the Town's 2017 HMP for potential inclusion in the updated *Action Plan*. To further support CRS Activity 510 Planning Process - Step 7, an array of additional possible activities was also reviewed.

The broad-based list of possible activities was generated from the Steering Committee, public engagement via the Public Opinion Survey, and through key planning documents. The list of possible mitigation and non-mitigation activities compiled from the documents and Public Opinion Survey is included in **Appendix 6-1**. The possible activities were reviewed based on the following criteria:

- supports the 2022 *HM&FMP* Goals
- mitigation category
- potential funding capability
- staff and implementation capability
- activity previously completed or no longer a priority
- supports CRS program

The *Risk Assessment* identified flood- and wind-related damage as the most prevalent threats to the Town of Barrington, with the coastal areas the most vulnerable due to the risk of coastal flooding, damage from wave action and wind, and shoreline erosion. Additionally, in the Public Opinion Survey (**Appendix 2-2**), when asked to rank how concerned you are about the list of identified natural hazards, 71.53% of the respondents indicated they are extremely or moderately concerned about flood-related hazards and 66.14% indicated they are extremely or moderately concerned about wind-related hazards. As such, a number of the possible activities focused on mitigating these impacts.

Under consideration were measures that would reduce flood damage to buildings and infrastructure through preservation of open space, revisions to zoning and subdivision ordinances, and implementation of green infrastructure and structural projects. Outreach actions to promote awareness and encourage property owners and the private sector to take preventative action to mitigate risks associated with flooding and other hazards was also discussed. Further, as the Town of Barrington recognizes the importance of regional coordination and cooperation, consideration was also given to actions that would extend beyond the Town's jurisdictional boundary.

A systematic review of a wide range of possible activities, including actions from all six of the following mitigation categories was conducted.

Mitigation Categories:

- **Prevention:** Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection:** Actions that involve the modification of existing buildings or infrastructure to protect them from a hazard or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, flood proofing, storm shutters, and shatter resistant glass.
- **Public Education & Awareness:** Actions to inform and educate citizens, elected officials, and property owners about the potential risks from hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.

- **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, tree planting and maintenance, and wetland restoration and preservation.
- **Structural Projects:** Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include storm water controls (e.g., culverts), floodwalls, seawalls, retaining walls, and safe rooms.
- **Emergency Services:** Actions that will protect emergency services before, during, and immediately after an occurrence. Examples of these actions include protection of warning system capability, protection of critical facilities, and protection of emergency response infrastructure.

6.3.2 Choose Possible Actions

Due to budgetary and other constraints it would be impossible over the ensuing 5-year period to implement all of the possible actions the Committee reviewed. As such, potential actions were considered based on a number of parameters including: action would reduce the impact of one or more of the hazards identified in the risk assessment; compatibility in terms of the Town's vulnerabilities and capabilities; action supported one or more of the *Mitigation Goals*; continued compliance with the NFIP; and possible crossover CRS activity. The importance of including actions that can be funded using a wide range of resources and across a number of mitigation categories was also recognized.

For reference, the actions compiled and reviewed by the Committee which originated from other Town planning documents or from the 2022 Public Opinion Survey, have been included in **Appendix 6-1**, and for cross-referencing have been identified as either being included or not in the *Action Plan*. As there was some overlapping between a number of the selected activities, similar ones were grouped together and rewritten as individual *Actions*. A total of 25 potential actions underwent the STAPLEE analysis by the Steering Committee as a prioritization mechanism for ranking and inclusion in the *2022-2027 Action Plan*.

6.3.3 Prioritize Actions - STAPLEE Analysis

In accordance with the *Disaster Mitigation Act 2000 (DMA)*, the Steering Committee undertook a process to prioritize actions in order to develop an implementation guideline toward mitigating risks. Each of the actions reviewed received a priority score based upon a general set of criteria common to public administration officials and planners, known as STAPLEE. The acronym stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental.

The STAPLEE method includes a general benefit-cost review as part of prioritizing actions. The Committee considered the probable benefits that would result from an action versus a general magnitude of cost. This review was done based on experience and judgment but is not considered a full benefit-cost analysis. When seeking funding assistance or inclusion in the capital improvement program (CIP), a more detailed analysis can be conducted.

Prior to undertaking the STAPLEE Analysis, the Steering Committee discussed the scoring scale to be applied to the criterion. A description of the criterion and the STAPLEE evaluation can be found in **Appendix 6-2**. A discussion took place whether to maintain or eliminate the actions which received lower priority rankings. It was determined that since there was not a wide-range in the scoring and that actions receiving lower rankings may gain wider support in the future, lower-ranked actions would be included in the *Action Plan*, but weighted accordingly.

6.3.4 Actions Supporting Community Rating System

The most common and the most destructive natural disaster in the United States is floods; the damage from which is not covered under a standard homeowner's policy. To protect lives and property and to reduce the financial burden of providing disaster assistance, in 1968, Congress created the National Flood Insurance Program (NFIP) which is administered by the Federal Emergency Management Agency (FEMA). The NFIP offers flood insurance to communities that comply with minimum standards for floodplain management. All Rhode Island municipalities, including the Town of Barrington, currently comply with the minimum standards allowing residents to purchase federal flood insurance through the NFIP.

As discussed in **Section 2.3**, beyond the minimum NFIP requirements, communities can choose to participate in a voluntary incentive program known as the Community Rating System (CRS) to further improve flood mitigation and achieve discounts on flood insurance premiums for property owners. A community's CRS classification is based on credit points earned for its activities. Any combination of activities that reduce flood losses through better mapping, regulations, public information, flood damage reduction, and flood warning and preparedness programs can be implemented. The discounts on flood insurance premiums range from 5% (rate class 9) up to 45% (rate class 1). It has been shown that CRS incentives have encouraged communities to broaden mitigation programs and keep them going even during periods of budgetary challenges (FEMA. *National Flood*).



As previously indicated, the Town of Barrington is not only committed to continued compliance with the NFIP, but intends to participate in the CRS program.

In anticipation of becoming a CRS community, the Town has chosen to integrate CRS Activity 510 (Floodplain Management Planning) into their Hazard Mitigation planning process therein creating a *Hazard Mitigation & Flood Management Plan*. Throughout this document both HMP and CRS requirements have been noted.

In the *Action Plan*, cross-over actions that could potentially garner CRS credit, depending on how they are implemented and documented, have been identified.

Participation in the National Flood Insurance Program (NFIP) is voluntary and is based on a community's agreement to adopt and enforce, at a minimum, the Federal standards for building within a Special Flood Hazard Area (SFHA). In exchange, the Federal Government makes flood insurance available as a financial protection against flood losses.

The Town of Barrington participates in the NFIP and oversees the following:

- Issuing or denying floodplain development/building permits
- Inspecting all development to assure compliance with the local ordinance
- Maintaining records of floodplain development
- Assisting in the preparation and revision of floodplain maps
- Helping residents obtain information on flood hazards, floodplain map data, flood insurance, and proper construction measures

6.3.5 Action Descriptors

The *Action Plan* includes the following descriptors:

- **Action Number and Description.** The description is a brief overview of the action. The Action Number has been assigned based on the STAPLEE priority ranking (from highest to lowest) under each identified Goal.

For example:

2022 Action 1.1 represents the highest prioritized action associated with Goal 1

2022 Action 2.3 represents the third highest prioritized action associated with Goal 2

If two or more actions received the same priority score, they have been arbitrarily listed one after the other.

- **Lead & Support.** The lead identified is the proposed authority responsible for overseeing implementation of an action. It is likely that most actions will require interdepartmental and stakeholder support. In **Table 6-1**, the anticipated lead has been listed first with some potential supporting partners listed in parenthesis.
- **Cost & Funding Source.** The magnitude of cost was estimated based on analysis of similar initiatives completed in Town and elsewhere. It is recognized that some degree of municipal staff time will be necessary for the successful implementation of all actions. Hence, staff time is represented within each category. As funding is often an obstacle to implementing mitigation actions, preliminary funding sources have been identified in **Table 6-1**.

Costs are categorized as follows:

- ◊ Minimal: less than \$50,000
- ◊ Moderate: between \$50,000 and \$250,000
- ◊ Significant: over \$250,000

- **Timeframe & Kickoff.** The timeframe was based on a combination of factors including STAPLEE priority, complexity of the action, and the current phase of the action (e.g., conceptual, preliminary design, final design). The kickoff indicates in which year of this five-year Plan the action is proposed to commence.

Timeframes are categorized as follows:

- ◊ Short-term: less than 2-years
- ◊ Medium-term: between 2 and 4-years
- ◊ Long-term: over 4-years

- **Priority Ranking & CRS Activity.** The priority ranking was determined by the Steering Committee through the STAPLEE analysis (**Appendix 6-2**). A numeric ranking has been provided for each action and the actions have been listed in order of ranking under each *Goal*. As the Town intends to participate in the CRS program, cross-over actions that could potentially garner CRS credit, depending on how they are implemented and documented, have been identified.

- **Action Category.** In developing the *Action Plan*, the Steering Committee sought to include a wide-range of actions to comprehensively address the established hazard mitigation *Goals*. The following categories, described in **Section 6.3.1**, were used:

- ◊ Prevention
- ◊ Property Protection
- ◊ Public Education & Awareness
- ◊ Natural Resource Protection
- ◊ Structural Projects
- ◊ Emergency Services

- **Hazard Addressed.** Which hazard(s) a particular action addresses has been recorded in **Table 6-1**. The *Action Plan* has at least one action for each of the hazard categories identified in **Section 4.2** and listed below:

- ◊ Flood-Related
- ◊ Wind-Related
- ◊ Winter-Related
- ◊ Infectious Disease:
 - ◆ Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses
 - ◆ Vector-borne Diseases Transmitted by Ticks and Mosquitoes
- ◊ Other:
 - ◆ Earthquake
 - ◆ Drought
 - ◆ Brush Fire
 - ◆ Extreme Heat

- **Reference.** Actions from the following planning documents were considered for inclusion in the 2022-2027 *Action Plan*. The *Action Plan* identifies which of the following sources reference the measure. A more detailed crossover assessment has been included in **Appendix 6.1**.

- ◊ 2017 HMP: Town of Barrington Hazard Mitigation Plan (2017)
- ◊ 2015 CCP: Town of Barrington Comprehensive Community Plan (2015 – Amended 2019)
- ◊ 2019 RI-SHMP: Rhode Island State Hazard Mitigation Plan (2019)
- ◊ 2019 SOF: Town of Barrington - MRP Community Resilience Building Workshop Summary of Findings (2019)
- ◊ 2019 TR: Technical Report: A Future with Water: Sea Level Rise in Rhode Island (2019)
- ◊ 2019 CRDS: Preparing for Resilience: Barrington & Warren Mixed-Use Climate Response Demonstration Site (2019)
- ◊ 2020 BSR: Bay Spring Resilience Plan (2020)
- ◊ 2021 CRDS: Preparing for Resilience: Barrington & Warren Mixed-Use Climate Response Demonstration Site (2021)
- ◊ 2021 HAC: Comprehensive Plan to Restore Water Quality in Hundred Acre Cove (2021)
- ◊ 2022 POS: Public Opinion Survey (*HM&FMP Outreach Activity #3*)

6.4 ACTION PLAN (2022-2027)

All of the elected *Actions* support the *Mission Statement* and *Goals*. They reflect updated priorities, including response to climate change and accelerated sea level rise, and address the Town's current and projected future needs. The *Action Plan* is organized by *Goal* and includes a summary of the action, along with other descriptors including the STAPLEE priority ranking, which may assist the Town as a guideline for implementation. As the Planning Department and Department of Public Works will be tasked with leading the majority of the actions, providing adequate staff and financial resources to enable these departments to implement the *HM&FM Action Plan* is essential. To augment local funding, the Town should aggressively pursue grants to support these actions.

DMA Requirement

§201.6(c)(3)(iii):

The mitigation strategy section shall include an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

CRS CREDIT:			NFIP/CRS
Mitigation Planning Elements	CRS Planning Steps	Max Pts	
Phase III –Mitigation Strategy	8. Draft an Action Plan	60	

CRS Coordinator's Manual – Activity 510: Floodplain Management Planning

The following list of acronyms is provided as reference for the *Action Plan*:

BLCT: Barrington Land Conservation Trust	OSC: Open Space Committee
CC: Conservation Commission	PB&R: Department of Planning, Building & Resiliency
CIP: Capital Improvement Program	PSIC: Providence Stormwater Innovation Center
CRMC: Coastal Resources Management Center	R&E: Resilience & Energy Committee
CRS: Community Rating System	RIDEM: Rhode Island Department of Environmental Management
DPW: Department of Public Works	RIDOT: Rhode Island Department of Transportation
EDC: Economic Development Commission	RIDSP: Rhode Island Department of Statewide Planning
EMA: Emergency Management Agency	RISD: Rhode Island School of Design
ERICD: Eastern Rhode Island Conservation District	ROW: right of way
FEMA: Federal Emergency Management Agency	SFHA: Special Flood Hazard Area
FHWA: Federal Highway Administration	SLR: sea level rise
GIC: Green Infrastructure Center, Inc.	SSAB: Senior Services Advisory Board
GIS: Geographic Information Systems	STB: Save The Bay
HBT: Housing Board of Trustees	STIP: State Transportation Improvement Program
HWM: High-Water Mark	TRC: Technical Review Committee
LID: low-impact development	UNH-SC: University of New Hampshire Stormwater Center
NBEP: Narragansett Bay Estuary Program	URI-CI: University of Rhode Island Coastal Institute
NFIP: National Flood Insurance Program	USACE: United States Army Corps of Engineers

Table 6-1 Town of Barrington 2022-2027 Action Plan

Goal 1: Reduce impacts from current and future natural hazards to the built environment. <p>Policy 1.1: Consider the effects of projected sea level rise and flooding in the site selection and planning of parks, buildings, and other public projects.</p> <p>Policy 1.2: Reduce impact of development within the floodplain and other vulnerable areas.</p>							
Action Number & Description	Lead & Support	Cost & Funding Source	Time-frame & Kickoff	Priority Ranking & CRS Activity	Action Category	Hazard Addressed	Reference
Action 2022-1.1 Assess Hurricane Evacuation Route Vulnerabilities. Conduct an assessment to understand the impact on travel should sections of the hurricane evacuation route be inundated by flood water; identify potential alternate evacuation routes; identify opportunities to raise or protect roadways; perform a risk assessment of trees located along these routes for defects or failures; and strengthen evacuation route awareness and way finding via more robust and prominent signage installation.	PB&R (RIDOT, RIDSP, DPW, R&E, URI-CI, USACE)	Minimal Operating Budget, CIP	Short- to Long-term Year 1	Ranking Score 24 CRS Activity 330	Prevention	Flood-Related; Wind-Related	2019 SOF; 2019 TR; 2020 BSR; 2022 POS
Action 2022-1.2 Complete infrastructure projects in order to protect critical assets including roadways. Include in the six-year Capital Improvement Program (CIP), and for projects under State jurisdiction work with the State to include in the State Transportation Improvement Program (STIP), critical short- and long-term projects required to mitigate threats to infrastructure and properties. Implement best practices and look to agencies and other stakeholders, as well as other jurisdictions (including from other states and countries) that have had success in implementing projects to protect critical assets. <p>Potential projects include:</p> <ul style="list-style-type: none"> • Work with RIDOT to complete drainage improvements on roadways under their jurisdiction, through the installation of innovative water catchments and removal technology, in areas subject to severe flooding (immediate corrective action should be taken on evacuation routes, including Route 114 and Sowams Road; encourage RIDOT to comprehensively address the need 	PB&R (DPW, Planning Board, R&E, RIDOT, RIDSP, National Grid-PPL, Verizon)	Minimal to Significant CIP, RIDOT, FHWA, RIDSP	Short- to Long-term Year 3	Ranking Score 21 CRS Activity 530	Structural Projects	Flood-Related; Wind-Related	2017 HMP; 2015 CCP; 2019 SOF; 2020 BSR; 2022 POS

<p>for a resilient transportation network that incorporates SLR projections</p> <ul style="list-style-type: none"> • Enhance protection of pump stations in vulnerable areas (shut off, flood-proofing, emergency pumping) • Conduct a culvert and stream assessment; install larger culverts to accommodate greater tidal flows (ex. potentially under County Road at Prince's Pond, under Bay Spring Avenue, and under Haines Park Road) • Inspect and secure existing seawalls/revetments on public property in order to protect infrastructure (ex. Shore Drive/Latham Park, Mathewson Road, Police Cove Park) • Evaluate location of utility poles in vulnerable areas (ex. New Meadow Road, Mathewson Road) • Seek to identify and install remediation projects for the neighborhoods in the vicinity of, and approaches to, the White Church Bridge • As appropriate, relocate High School utilities to the second floor or roof 							
Action Number & Description	Lead & Support	Cost & Funding Source	Time-frame & Kickoff	Priority Ranking & CRS Activity	Action Category	Hazard Addressed	Reference
<p>Action 2022-1.3</p> <p>Increase DPW capacity to allow for more aggressive stormwater management for public facilities and roadways.</p> <p>Identify best management practices for stormwater management with emphasis on green infrastructure, which includes the planting and maintenance of trees. Provide measures to improve stormwater retention in the planning and design of park improvements and construction of schools and other new public buildings. Increase the amount of tree canopy on these sites through required tree plantings. Retrofit existing public facilities, to reduce the amount of hardscape and improve stormwater measures, when parking lots or roadways need to be repaved or rebuilt (consider permeable materials where applicable). Strengthen maintenance on the storm drainage system town-wide; clean out waterways and drainage areas to help increase conveyance and minimize localized flooding from</p>	<p>DPW (PB&R, CC, Schools, STB, PSIC, UNH-SC, ERICD, GIC)</p>	<p>Moderate CIP, School Budget, RIDOT</p>	<p>Short- to Long-term Year 1</p>	<p>Ranking Score 21 CRS Activity 540</p>	<p>Natural Resource Protection; Structural Projects</p>	<p>Flood-Related</p>	<p>2017 HMP; 2015 CCP; 2019 SOF; 2019 TR; 2020 BSR; 2022 POS</p>

<p>stormwater runoff. Seek to reduce stormwater runoff into wetlands and waterways via the use of low-impact nature-based stormwater infrastructure (ex. rain gardens, bioswales, tree planting) across municipality.</p> <p>Potential projects include:</p> <ul style="list-style-type: none"> • Implement end-of-road retrofit projects which may include pavement removal and green infrastructure to manage runoff and erosion (potential sites include: Woodward Avenue, Opechee Drive, Woodbine Avenue, Adams Avenue, Watson Avenue, Clarke Road, Water Way, Belvedere Avenue, Green Avenue); due to high-water table or other site limitations, stormwater management for some of these sites may prove impractical and the Town should instead/in-conjunction consider upgradient control measures such as tree trench BMPs • Retrofit municipal and school paved parking areas to incorporate stormwater measures and tree plantings • Address flood zone areas on the grounds of the High School • Continue stormwater management for Town Beach • Evaluate and identify options to address the vulnerable section of Reed Avenue between Lake and Spring Avenues • Evaluate opportunities to promote stormwater infiltration in the areas of Bourne Lane, Spindrift Way, Wallis Avenue, and Lillis Avenue • Identify areas of the Town that could be designed to hold more water • Continue and strengthen Town management of public trees to mitigate hazards such as stormwater, flooding, erosion, and extreme heat • Identify tree species appropriate for planting underneath utility lines 							
Action Number & Description	Lead & Support	Cost & Funding Source	Time-frame & Kickoff	Priority Ranking & CRS Activity	Action Category	Hazard Addressed	Reference
<p>Action 2022-1.4 Coordinate with RIDOT/RIDSP on Route 114 Corridor Study. Route 114 is part of the hurricane evacuation route and used by roughly 25,000 vehicles per day. Sections of the corridor, which is under State</p>	PB&R (RIDOT, RIDSP, DPW, R&E, URI-CI)	Minimal Operating Budget, CIP, RIDSP	Short- to Long-term Year 1	Ranking Score 20	Prevention	Flood-Related; Wind-Related	2019 SOF; 2019 TR; 2021 CRDS; 2022 POS

jurisdiction, are vulnerable to flooding from sea-level rise and storm surge. In coordination with RIDOT/RIDSP to assess existing and future vulnerabilities and options to reduce risk including rerouting and raising, amongst others.							
Action Number & Description	Lead & Support	Cost & Funding Source	Time-frame & Kickoff	Priority Ranking & CRS Activity	Action Category	Hazard Addressed	Reference
<p>Action 2022-1.5</p> <p>Continue to improve GIS capabilities. Improve Geographic Information Systems (GIS) capabilities to support property tax revaluations, planning, DPW activities (including infrastructure mapping and maintenance plans), and community use. Create a GIS layer identifying public trees along road ROWs; and shoreline access points. Hire a consultant to conduct a GIS based tree canopy assessment to identify areas for greater stormwater infiltration, mitigation of urban heat island effects, and reducing inequities in canopy distribution. Enhance the process to allow users to easily identify flood risk throughout Town. Purchase software and hardware to support programmatic improvements. The Town should hire a part-time GIS coordinator to facilitate this activity or adding funding to DPW/ Planning budget for GIS consultants.</p>	PB&R (DPW, Tax Assessor, URI-CI, NBEP)	Minimal Operating Budget, CIP	Short- to Long-term Year 1	Ranking Score 19 CRS Activity 330, 440	Prevention; Public Education & Awareness	Flood-Related; Wind-Related; Extreme; Heat	2017 HMP; 2015 CCP; 2019 SOF
<p>Action 2022-1.6</p> <p>Revise regulations to reduce future risk of natural hazards. Revise the Town's Zoning Ordinance and Land Development and Subdivision Regulations to lessen encroachment of development into the existing or projected floodplain; limit future development in the floodplain; reduce vulnerability of new construction to coastal flooding and storm surge due to rising sea levels; evaluate grading guidelines around buildings in the SFHA; and to rezone properties with conservation value (consistent with the Future Land Use Map in the Comprehensive Community Plan). Potential revisions include allowing flexible lot sizes, such as through a cluster subdivision design, establishing setbacks or buffers to account for SLR, and creating Coastal Risk Overlay Districts.</p>	PB&R (Building Official) (Planning Board, Zoning Board, Town Manager, Solicitor)	Moderate CIP	Short- to Long-term Year 3	Ranking Score 19 CRS Activity 430, 450	Prevention	Flood-Related; Wind-Related	2017 HMP; 2015 CCP; 2019 TR; 2019 CRDS; 2020 BSR

<p>An objective of the Coastal Overlay District would be to make current and future owners aware of the possible flood scenarios (integrate with CRMC's Coastal Hazard Application and Viewer process); serve as areas where new building codes or Flood Resilient Building Guidelines (Code Plus) could be recommended; and provide support for property owners to help take advantage of funding opportunities, such as FEMA and Homeland Security Grants, that assist with elevating, acquisition and relocation of structures outside high-risk zones, or government sponsored buyout programs. Overlay Districts could be neighborhood based and support best practice guidelines for designing building elevations that are compatible with the surrounding neighborhood, while complying with flood elevation requirements.</p>							
Action Number & Description	Lead & Support	Cost & Funding Source	Time-frame & Kickoff	Priority Ranking & CRS Activity	Action Category	Hazard Addressed	Reference
<p>Action 2022-1.7 Complete neighborhood scale flood, storm surge, and sea level rise (SLR) impact assessments. Through a partnership with the URI Coastal Institute, a town-wide building and roadway SLR exposure assessment has been completed. Using the mapping and data from that project, in conjunction with the Coastal Environmental Risk Index Maps and STORMTOOLS Design Innovation, the Town will assess the potential impacts of projected SLR on high-risk neighborhoods. The assessment will include the impact on publicly and privately owned buildings and sites, roads, stormwater drainage system, sewer system, and other utilities. The scope will involve generating cost estimates for mitigation projects, establishing project priorities, and identifying the intersection of residential homes in current and projected future flood zones to proactively educate the community on potential future remediation strategies such as home elevation, voluntary buyouts, and/or relocation.</p> <p>Potential priority areas include:</p> <ul style="list-style-type: none"> • Route 114 corridor • Vicinity of High School • Bay Spring Avenue neighborhoods 	PB&R (DPW, R&E, URI-CI)	Moderate CIP, URI-CI, Grants (FEMA, CRMC)	Short-term Year 1	Ranking Score 18 CRS Activity 440	Prevention	Flood-Related; Wind-Related	2017 HMP; 2015 CCP; 2019 SOF

<ul style="list-style-type: none"> Appian Way neighborhoods Vicinity of Public Safety Building Bowden Avenue/Massasoit neighborhoods Hampden Meadows areas Sowams areas Ferry Lane neighborhoods South Lane/Taylor Point Road neighborhoods 							
Action 2022-1.8 Review and adopt Barrington appropriate LID standards to reduce amount of impervious surfaces within new subdivisions and other private development projects. <p>Although Barrington's high-water table may preclude some low-impact development (LID) measures, the Town will review (using GIC or other audit tools) and adopt pragmatic LID standards to lessen impervious coverage, such as reduced street widths and establishing a maximum impervious lot coverage percentage. Adopt tree planting standards for increased stormwater absorption and water quality treatment (<i>trees as BMPs</i>). These actions will require revisions to the Town's Land Development & Subdivision Regulations.</p>	PB&R (Planning Board, Solicitor)	Minimal CIP, RIDEM	Medium -term Year 1	Ranking Score 18 CRS Activity 450	Prevention	Flood-Related; Extreme Heat	2017 HMP; 2015 CCP

Goal 2: Preserve and enhance the capacity of the natural environment to improve Barrington's resilience against impacts of natural hazards.

Policy 2.1: Identify and protect critical open space areas that are vulnerable to natural hazards and sea level rise (SLR).

Policy 2.2 Plan and implement projects that allow natural systems to adapt over time to changes in sea level rise and the climate.

Policy 2.3: Preserve existing tree canopy and maintain public trees for their value as green infrastructure and their ability to mitigate natural hazards such as stormwater, flooding, erosion, and extreme heat.

Action Number & Description	Lead & Support	Cost & Funding Source	Time-frame & Kickoff	Priority Ranking & CRS Activity	Action Category	Hazard Addressed	Reference
Action 2022-2.1 Increase DPW capacity to allow for more aggressive tree maintenance and management program. <p>Improve program to further reduce risk to people or property due to winds, heavy snow/ice, extreme heat, or other natural hazard impacts. Identify native tree species that will be more resilient to climate change and have higher carbon sequestering rates, for use in public projects, and new subdivisions and land development projects. Elevate the importance of forests and trees; and increase community-based planting opportunities, including partnering with</p>	DPW (PB&R, CC, BLCT, GIC)	Moderate Operating Budget, CIP, RIDEM Grants	Short- to Medium -term Year 1	Ranking Score 20	Property Protection, Natural Resources Protection, Public Education & Awareness	Flood-Related; Wind-Related; Winter-Related; Extreme Heat	2017 HMP; 2015 CCP; 2019 SOF; 2022 POS

BLCT to implement tree planting projects on their properties. Complete a town-wide tree inventory, planting plan using native tree species, and updated debris management plan. Create a list of undesired species which are prone to breakage or failure and identify these on the tree inventory for potential replacement. Develop a long-term urban forest recovery plan post-disaster which includes potential planting spots and identifies community partners to support the urban forest's recovery. Investigate incentives for developers to save mature trees or plant more on development sites.							
Action Number & Description	Lead & Support	Cost & Funding Source	Time-frame & Kickoff	Priority Ranking & CRS Activity	Action Category	Hazard Addressed	Reference
<p>Action 2022-2.2</p> <p>Prioritize and complete adaptation projects.</p> <p>Prioritize and implement adaptation and shoreline stabilization projects. Work with STB, the State, and other stakeholders, to reduce flood risk and the potential damage to vulnerable infrastructure, and allow the expansion of wetlands and other areas that can hold more water. Prioritize nature-based green infrastructure solutions such as tree plantings, and implement slope stabilization efforts, for example planting brigades in spring, where appropriate.</p> <p>Potential projects include:</p> <ul style="list-style-type: none"> • Reinforce Byway Road (coir envelopes to protect sewer line and roadway) and stabilize the embankments to address erosion • Improve water flow at RISD Beach to allow impounded water to drain into marsh area • Accommodate marsh migration at Walker Farm; on west side of Route 114 - area adjacent to Barrington Community Garden's parking lot and further north; and at Osamequin Nature Preserve • Evaluate Arvin Avenue for marsh retreat opportunities • Reduce shoreline erosion at Latham Park for protection of infrastructure; consider establishing an oyster reef to dissipate wave action; and allow for marsh migration • Install living shoreline projects and other shoreline stabilization efforts 	PB&R (DPW, CC, OPC, R&E, BLCT, STB, URI-CI, PSIC, UNH-SC, ERICD, GIC)	Minimal to Significant CIP, Grants (RIIB, RIDEM, CRMC)	Short- to Long-term Year 1	Ranking Score 19	Prevention; Natural Resource Protection; Structural Projects	Flood-Related; Natural Resource Protection; Wind-Related	2017 HMP; 2015 CCP; 2019 SOF; 2019 TR; 2019 CRDS; 2020 BSR; 2021 HAC; 2022 POS

<p>in Hundred Acre Cove</p> <ul style="list-style-type: none"> • Protect and stabilize western shore beaches • Continue to support STB & BLCT efforts to enhance Mussachuck Beach and marsh system with further consideration of living shoreline projects to reduce erosion and improve shoreline stabilization • Where possible, include tree plantings in living shoreline projects • Where possible, replace invasive species with native species • Explore longer-term options for maintaining public beach/shoreline access facilities in Town 							
Action Number & Description	Lead & Support	Cost & Funding Source	Time-frame & Kickoff	Priority Ranking & CRS Activity	Action Category	Hazard Addressed	Reference
<p>Action 2022-2.3</p> <p>Promote Water Conservation.</p> <p>Develop and implement programs to promote water conservation practices.</p> <p>Potential programs include:</p> <ul style="list-style-type: none"> • Developing a policy for Town and School properties to reduce water usage through watering practices and use of xeriscaping on public grounds, including cemeteries • Implementing a program to offer rain barrels at reduced cost to Barrington residents and businesses • Working with area farms that lease public or BLCT property to develop and implement conservation plans for their water use operations 	<p>PB&R (BCWA, R&E)</p>	<p>Minimal Operating Budget</p>	<p>Short-term Year 3</p>	<p>Ranking Score 19</p>	<p>Public Education & Awareness</p>	<p>Drought, Extreme Heat</p>	<p>2015 CCP</p>
<p>Action 2022-2.4</p> <p>Protect vulnerable areas from development through acquisition, easements, and other mechanisms.</p> <p>Work with the BLCT and other stakeholders to identify and protect from development low-lying land vulnerable to impacts from flooding and sea level rise, and areas adjacent to coastal wetlands, creeks, and streams susceptible to increased inundation due to flooding and SLR. This Action will also encourage beach ecosystem preservation and landward migration of other coastal habitats, such as estuarine beaches and dunes, and coastal forests, as these features must be allowed to migrate in response to sea-level rise in order to continue to provide some level of natural storm protection. Take advantage</p>	<p>PB&R (Town Council, Town Manager, Solicitor, BLCT)</p>	<p>Moderate to Significant CIP, Bond, RIDEM Grants</p>	<p>Short- to Long-term Year 2</p>	<p>Ranking Score 19 CRS Activity 420</p>	<p>Prevention, Property Protection, Natural Resource Protection</p>	<p>Flood-Related; Wind-Related</p>	<p>2017 HMP; 2015 CCP; 2019 RI-SHMP; 2019 SOF</p>

of funding opportunities such as DEM open space acquisition grants, and other mechanisms, including conservation easements, to permanently protect these areas. In coordination with BLCT, develop a priority site list based on open space acquisition evaluation criteria in the Comprehensive Plan.							
<p>Action 2022-2.5 Complete hydrology studies.</p> <p>Outfall Catchment Area Assessments: Delineate catchment areas for stormwater outfalls and provide a catchment area layer to the Town's geodatabase. For catchment areas with known flood issues, field inspect associated drainage system and streams, and complete a hydrology study to determine potential stormwater/water quality improvements. Prepare detailed plans as necessary to determine estimated costs; capitalize on funding opportunities available through the State or other sources.</p> <p>Watershed Assessments: Barrington's land falls within four sub-watersheds (Seekonk & Providence Rivers, Barrington & Warren Rivers, Palmer River, and Upper Narragansett Bay). As watersheds traverse jurisdictional boundaries, consider partnering with other municipalities and stakeholders to form watershed coalitions; seek funding opportunities to comprehensively assess watersheds and develop prioritized list of stormwater management and water quality projects.</p>	DPW (PB&R, RIDOT, RIDEM, NBEP, STB, URI-CI, PSIC, UNH-SC)	Moderate CIP, Grants (RIDEM, NBEP, EPA)	Short- to long-term Year 2	Ranking Score 18 CRS Activity 450	Prevention	Flood-Related	2017 HMP; 2015 CCP

Goal 3: Protect public health, safety, and existing properties against impacts of flooding through implementation of Community Rating System (CRS) Activities, with emphasis on expanding flood insurance coverage and reducing NFIP flood insurance premiums for Barrington property owners.

Policy 3.1: Continue to comply with National Flood Insurance Program (NFIP) requirements.

Policy 3.2: Actively participate in the Community Rating System Program.

Policy 3.3: Maintain a FEMA-approved hazard mitigation plan that is based on the latest data and proposes mitigation strategies on natural hazards and climate change.

Action Number & Description	Lead & Support	Cost & Funding Source	Time-frame & Kickoff	Priority Ranking & CRS Activity	Action Category	Hazard Addressed	Reference
<p>Action 2022-3.1 Develop and enact tracking system to monitor HM&FMP implementation progress, with updates twice a year.</p>	PB&R (Building Official)	Minimal Operating Budget	Short- to Long-term	Ranking Score 22	Public Education & Awareness	All Hazards	2017 HMP; 2015 CCP

Develop a tracking system in compliance with CRS Activity 510-Step 10, to monitor progress implementing this Plan's <i>Mitigation Strategy</i> and <i>Action Plan</i> . Semi-annual meetings will be held with updates provided by each department that include the status of action items completed/in-progress, potential CRS credit allocation, and any requirements for future prioritized actions (staffing, budget, etc.).	(DPW, Fire & Police Depts, local EMA Director, Harbor Master)		Year 1	CRS Activity General			
Action Number & Description	Lead & Support	Cost & Funding Source	Time-frame & Kickoff	Priority Ranking & CRS Activity	Action Category	Hazard Addressed	Reference
Action 2022-3.2 Support Community Rating System activities. The Town has submitted an application to participate in the CRS program and awaiting FEMA to schedule a Community Assistance Visit. Complete CRS activities that will improve the Town's floodplain programs and correspondingly improve Barrington's CRS rating.	PB&R (DPW, R&E)	Minimal Operating Budget	Short- to Long-term Year 1	Ranking Score 21 CRS Activity General	Prevention, Property Protection, Public Education & Awareness, Natural Resource Protection, Structural Projects, Emergency Services	Flood-Related; Wind-Related	2017 HMP; 2015 CCP
Action 2022-3.3 Work with property owners to mitigate properties in areas at risk of flooding, including acquisition, flood-proofing, and elevation projects. The Town will provide the staffing resources needed to identify and apply for outside funding sources, such as the Hazard Mitigation Grant Program, to elevate or relocate structures out of the floodplain, and acquire property within the floodplain. Grant funding applications will be supported by the Town's 2021 URI-CI exposure mapping, CRMC's CHA process, Army Corps RI Coastline Coastal Risk Management Project, and other stakeholder tools and research. The Town will create a green infrastructure plan to inform buyouts, acquisitions, easements, etc., and consider mechanisms such as tax incentives to encourage property owners to adopt resilience measures (elevation, retreat landward, etc.). This effort also will include pursuing opportunities to acquire upland areas to relocate residences if the option of retreat is selected.	PB&R (Building Official) (Tax Assessor, URI-CI, ERICD, NBEP)	Minimal to Significant Operating Budget, CIP, USACE, Grants (FEMA, RIIB, NBEP)	Short- to Long-term Year 2	Ranking Score 20 CRS Activity 520, 530	Property Protection; Public Education & Awareness	Flood-Related; Wind-Related	2017 HMP; 2022 POS

Action 2022-3.4 Engage/provide training for Certified Floodplain Manager. Engage a consultant or provide staff training for a certified floodplain manager to coordinate implementation of CRS activities and implementation of the Town's HM&FMP.	PB&R (Building Official)	Minimal Operating Budget	Short-term Year 1	Ranking Score 20 CRS Activity General	Prevention	Flood-Related	2017 HMP; 2015 CCP
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Goal 4: Through communication and educational outreach, improve the community's awareness and capacity to reduce or adapt to impacts from natural hazards.

Policy 4.1: Inform the public on the concept of community resilience and the risk of impacts from natural hazards, with an emphasis on stream and coastal flooding, storm surge, and winter storms.

Policy 4.2: Educate the public on the value of trees to mitigate hazards such as stormwater, flooding, erosion, and extreme heat; and encourage tree protection and planting in the community.

Action Number & Description	Lead & Support	Cost & Funding Source	Time-frame & Kickoff	Priority Ranking & CRS Activity	Action Category	Hazard Addressed	Reference
Action 2022-4.1 Conduct community outreach to increase awareness and improve preparedness for impacts of natural hazards. Conduct community outreach, including public forums, publication/posting of information at Town facilities and the website, and mailings, on natural hazard mitigation initiatives, preparedness, and response. Engage stakeholders such as URI-CI, STB, CRMC, NBEP, RIEMA, RIDOH, RIDOT, etc. to participate in outreach activities. Target audiences include: general public; property owners in higher-risk hazard areas; seniors; middle & high school students; local businesses; and elected officials/decision-makers/boards. Potential programs include: <ul style="list-style-type: none">• Publicize signing up for the <i>CodeRED™ Emergency Notification System</i> to receive communication prior to, during, and after natural hazard events that impact or threaten to impact the Town• Post alerts on the website/social media/etc. about impacts from impending/occurring hazards, including risks associated with Covid-19/Influenza, extreme heat days, icy conditions/ice dams on houses from winter storms• Publicize spaces, such as shelters and warming centers, available to the public in times of power outages, loss of heat, and other secondary impacts resulting from natural hazards• Emergency preparedness outreach for the following hazards: flood-related, wind-related, and winter-related;	PB&R (DPW, local EMA Director, R&E, Library, Schools, BLCT, STB, URI-CI, PSIC, UNH-SC, ERICD, GIC)	Minimal Operating Budget, CIP	Short-to Long-term Year 1	Ranking Score 26 CRS Activity 330, 340, 350, 370, 440	Public Education & Awareness, supports Emergency Services	All Hazards	2017 HMP; 2015 CCP; 2019 SOF; 2019 TR; 2020 BSR; 2021 CRDS; 2022 POS

<p>address CodeRED™ system, building regulations, property protection, home/business insurance coverage, services available at sheltering facilities, and how climate change/SLR will exacerbate these hazards; include the topic of pet care in the event of natural hazards and evacuations</p> <ul style="list-style-type: none"> • How businesses (including marinas) can prepare for emergency events (removing moored/docked boats, status of hazardous materials, etc.) • Conduct outreach regarding public health risks associated with extreme heat, drought, brush fires, earthquakes, and vector-borne diseases transmitted by ticks & mosquitoes; highlight connections between these hazards; address health and safety issues • Conduct workshop to promote the benefit of shade structures on public property to protect from extreme heat and to determine potential location, types, and configuration of shade structures to be installed • Publicize the Town's <i>Flood Preparedness Website</i> and the tools available to assist residents in understanding potential risks to their property; maintain and update site on a regular basis • Provide EMA publications on flood topics at the Barrington Public Library • Impacts of flooding and long-term sea level rise projections • Awareness of evacuation routes • Disseminate information on opportunities property owners can take to mitigate future impacts; include "how-to" sessions on mitigation activities including house elevation projects, tree planting, etc. • Engage with marina owners and operators to ensure the best available information about extreme weather and climate change is provided in hopes of more informed decisions about operations and longer-term investments • Distribute brochures (including those on CRS and Flood Insurance) • Distribute information on flood prone areas to local real estate agencies, that can be passed onto potential purchasers • Increase awareness amongst residents about the benefits of green infrastructure such as trees, parks, and wetlands that can absorb and store stormwater and floodwaters and is a part of the Town's stormwater system 						
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<ul style="list-style-type: none"> Educate the public on tree species appropriate for property protection and proper upkeep (<i>right tree/right place</i>) and the benefit of trees with respect to flooding and heat index; discuss how to deal with invasive species Communicate water restrictions to the public, as applicable, during drought conditions; consider direct mailing of information to residents/property owners who rely on well water 							
Action Number & Description	Lead & Support	Cost & Funding Source	Time-frame & Kickoff	Priority Ranking & CRS Activity	Action Category	Hazard Addressed	Reference
<p>Action 2022-4.2 Increase awareness of resilience and adaptation actions being implemented by the Town. Develop and implement programs to increase awareness of the Town's resilience and adaptation actions.</p> <p>Potential programs include:</p> <ul style="list-style-type: none"> Develop a publicly accessible online tracking program (ex. <i>ArcGIS StoryMap</i>) identifying the Town's hazard mitigation and climate adaptation projects so the public and board members are aware of progress that has been made and future plans toward enhancing resilience of residences, businesses, infrastructure, and ecosystems Include updates on all resilience and adaptation actions that have been taken by the Town in the annual <i>State of the Town</i> presentations and reports 	PB&R (R&E, STB, URI-CI, PSIC, UNH-SC, ERICD, GIC)	Minimal Operating Budget	Short- to Long-term Year 1	Ranking Score 26 CRS Activity 330	Public Education & Awareness	Flood-Related; Wind-Related	2021 CRDS
<p>Action 2022-4.3 Covid19 Response. Conduct a review of the regulatory and legal changes necessary to effectively respond to a pandemic; update Town Plans, Policies, and Procedures accordingly to lessen the impact of an infectious disease outbreak.</p>	Town Manager (local EMA Director, PB&R, Finance Dept, Solicitor)	Moderate Operating Budget, FEMA Grants	Short-term Year 1	Ranking Score 23	Preventive, Supports Emergency Services	Covid-19	New
<p>Action 2022-4.4 Conduct annual emergency preparedness exercises. Building on the 2021 Operation Recover Barrington Workshop, the Town will conduct tabletop exercises or other emergency management exercises/drills on an annual basis.</p>	local EMA Director (PB&R, Town Manager)	Minimal Operating Budget, RIEMA Grants	Annually Year 1	Ranking Score 19	Supports Emergency Services	Flood-Related; Wind-Related; Winter-Related	2022 POS

Action Number & Description	Lead & Support	Cost & Funding Source	Time-frame & Kickoff	Priority Ranking & CRS Activity	Action Category	Hazard Addressed	Reference
Action 2022-4.5 Continue to Integrate Resilience into Local Boards. Work with the local boards and commissions to encourage integrating resilience, to the extent practical, into their programs and activities. Involved boards may include: <ul style="list-style-type: none"> • Conservation Commission • Economic Development Commission • Harbor Commission • Housing Board of Trustees • Open Space Committee • Planning Board • Resilience & Energy Committee • Senior Services Advisory Board • Technical Review Committee 	PB&R (CC, EDC, Harbor Comm, HBT, OSC, Planning Board, R&E, SSAB, TRC)	Minimal Operating Budget	Short-term Year 1	Ranking Score 19 CRS Activity 330	Prevention	All Hazards	2019 SOF
Action 2022-4.6 Support Emergency Preparedness and Recovery for local social service sector businesses. Increase outreach to the local social service sector business community (including senior living facilities and group homes) to ensure continuity and recovery plans are in place; and they have emergency equipment, such as generators, if deemed critical for their continued operations.	local EMA Director (PB&R)	Minimal Operating Budget	Short-term Year 2	Ranking Score 19 CRS Activity 330	Prevention, Public Education & Awareness, supports Emergency Services	Flood-Related; Wind-Related; Winter-Related; Covid-19, Extreme Heat	2019 SOF
Action 2022-4.7 Establish a process to support vulnerable populations before, during, and after a natural hazard event. Establish a mechanism such as an <i>Adopt a Neighbor Program</i> or similar, to assist those who may require additional support (due to location, age, infirmity, etc.) before, during, or after a natural hazard event.	local EMA Director (PB&R, R&E, Town Manager)	Minimal Operating Budget, RIEMA Grants	Short-term Year 2	Ranking Score 19	Public Education & Awareness, Emergency Services	Flood-Related; Wind-Related; Winter-Related; Covid-19, Extreme Heat	2019 SOF; 2020 BSR; 2022 POS
Action 2022-4.8 Initiate High-Water Mark (HWM) and roadway signage programs to increase public awareness of flooding risk and potential future high tide levels from sea level rise. Develop and implement a program consistent with NFIP's HWM initiative to include posting informational signs and markers at public properties (ex. Town Beach, Walker Farm, Latham Park, Police Cove Park, and the Bay Spring Community	PB&R (DPW, local EMA Director, R&E)	Minimal CIP, FEMA Grants	Medium-term Year 1	Ranking Score 18 CRS Activity 330	Public Education & Awareness, supports Emergency Services	Flood-Related	2017 HMP; 2015 CCP; 2019 SOF

<p>Center) showing images of flood damage and high-water marks based on historic flood levels (hurricanes of 1938 and 1954, and possibly the 2010 flooding), and projected SLR elevations. Signage could include Coastal Cradle's to support photo documentation of shoreline change over time.</p> <p>Consider commissioning and installing public art in public spaces near coastal waters that illustrate these high-water marks; working with RIDOT to mark projected sea level rise on bridges; and installing signage and flood sensors on roads that routinely flood to alert residents of flooding issues.</p>						
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SECTION 7

Plan Adoption, Implementation, and Maintenance

Subsections

7.1 ADOPT THE PLAN

7.2 IMPLEMENT AND MAINTAIN
THE PLAN

7.2.1 Implement the Plan

7.2.1.1 Incorporate the
Plan into Existing Planning
Mechanisms

7.2.2 Evaluate and Revise
the Plan

7.2.2.1 Continued Public
Involvement

7.2.2.2 Funding
Opportunities

7.2.3 5-Year Plan Update

7 Plan Adoption, Implementation, and Maintenance

Hazard Mitigation Plan: The Town of Barrington has successfully met the following requirements →
44 CFR Subsection D §201.6(c)(4): [The plan shall include] a plan maintenance process.

44 CFR Subsection D §201.6(c)(5): [The plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan.

CRS - Flood Management Plan: The Town of Barrington has successfully met the following Mitigation Strategy requirements based on the 10-step planning process for CRS Activity 510 → Adopt the Plan (Step 9); and Implement, Evaluate, Revise (Step 10)

The Town of Barrington has completed a lengthy community-based process to update their 2017 Hazard Mitigation Plan and expand it to encompass flood management planning in accordance with CRS Activity 510. In doing so, the Steering Committee has sought to embrace all aspects of the process and create a broad-based *Action Plan* including prevention, property & natural resource protection, structural projects, public education & awareness, and emergency service protection activities. As has been demonstrated through the inclusion of the Code of Federal Regulations (CFR) Local Mitigation Plan requirements throughout this document and further demonstrated through the use of FEMA's Local Mitigation Plan Review Tool (**Appendix 7.1**), the *Town of Barrington 2022 Hazard Mitigation & Flood Management Plan* meets all 44 CFR §201.6 requirements.

The Town of Barrington and the HM&FMP Steering Committee are committed to the implementation of this *Plan* and recognize that successful hazard mitigation is an ongoing process that requires:

- ❖ endorsement and support from Town Officials and the community
- ❖ a strategy for monitoring, evaluating, and updating the *Plan*
- ❖ incorporating the mitigation goals and activities into other local planning mechanisms
- ❖ continued public participation



Figure 7-1 October Nor'easter takes down trees, damages homes (2021)
Image credit: WPRI.com



Figure 7-2 Warren River breaches Mathewson Road seawall (2015)
Image credit: RhodyBeat

7.1 ADOPT THE PLAN

The *HM&FMP* went through an extensive iterative process before formal adoption by the Barrington Town Council. Throughout the development of the Plan, the Steering Committee followed FEMA's CRS floodplain management 10-step planning process which aligns with Disaster Mitigation Act (DMA) 2000 regulations. The CRS planning process was beneficial as it helped to ensure that the opportunity for public input and feedback occurred throughout the process.

CRS CREDIT:		
Mitigation Planning Elements	CRS Planning Steps	Max Pts
Phase IV – Plan Maintenance	9. Adopt the Plan	2
CRS Coordinator's Manual – Activity 510: Floodplain Management Planning		

As documented in Section 2, during the development of the *Plan*, the Steering Committee met numerous times to provide input, feedback, and guidance on the document. Once satisfied that all provisions had been successfully met, the Steering Committee authorized the Town's Consultant, Kim Jacobs, to finalize the *DRAFT Plan* and disseminate it for public review. The public review period occurred from May 24 to June 14, 2022. During this 3-week public review period, the Town posted the *Public Review DRAFT* on the Town's website, and a hard copy was made available for viewing at the Town Clerk's Office. The Town advertised the *DRAFT Plan* and the Public Hearing on the Town's website, in an article and two Public Hearing notices in the Barrington Times, and through a Project kiosk at the Public Library. Additionally, the Town sent an email publicizing the *Draft Plan* and Public Hearing to the groups and organizations listed in **Appendix 2-3**, which includes the Town Council and other Town Boards and Commissions, neighboring jurisdictions, and numerous other local, regional, and State stakeholders.

At the end of the *Public Review Period*, on June 14, 2022, a **Public Hearing** was held by the Barrington Conservation Commission. At the Public Hearing, the Town's Consultant directed a Power Point presentation providing an overview of the benefits of a *HM&FMP*, how the *Plan* was prepared, the hazards included, what is at risk, the actions identified to help mitigate the risks, and how the *Plan* is to be implemented. A public comment/question-and-answer session followed the presentation providing the public the opportunity to give input and feedback. During the Public Review Period the Town did not receive any comments from members of the public. At the Public Hearing several Conservation Commission members asked questions and provided feedback; no members of the public spoke. The Conservation Commission voted unanimously in support of the *Plan* being submitted to RIEMA/FEMA for review and approval.



Figure 7-3 Town Council Members
Image credit: Town of Barrington Website

On xxx, 2022, the *Plan* received an *Approval Pending Adoption (APA)* notice from FEMA, which confirmed that the *HM&FMP* met all requirements. The *Plan* was then presented to the Barrington Town Council for adoption.

Formal adoption of the *Town of Barrington 2022 Hazard Mitigation & Flood Management Plan* took place at the Town Council's xxxxx, 2022 meeting. The vote to adopt the *Plan* was xxx. The Resolution adopting the *Plan* has been included in **Appendix 7.2**.

The adopted *HM&FMP* will be maintained on the Town's website and replace the 2017 HMP.

7.2 IMPLEMENT AND MAINTAIN THE PLAN

DMA Requirement §201.6(c)(4)(i):

[The plan maintenance process shall include] a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

CRS CREDIT:



Mitigation Planning Elements	CRS Planning Steps	Max Pts
Phase IV – Plan Maintenance	10. Implement, Evaluate, Revise	26

CRS Coordinator's Manual – Activity 510: Floodplain Management Planning

The success of the *HM&FM Plan* lies in the ability to effectively implement the mitigation actions, and on an ongoing basis evaluate and revise the *Plan* for continued relevancy. In doing so Barrington will continue building a resilient community; one in which critical lifeline systems, including roads, utilities, infrastructure, and other support facilities, will function in the midst of natural hazards, helping to ensure the safety of the community.

7.2.1 Implement the Plan

Implementation of the mitigation activities will be more successful if they are incorporated into the day-to-day functions and priorities of Barrington's government. A number of action descriptors were included in the *Action Plan* (**Table 6-1**), which will aid implementation. For each mitigation action, the descriptors provide a clear course for the actions to be incorporated into departmental and committee-based work plans and budgets.

Over the ensuing 5-years, the *Action Plan* outlines a substantial amount of mitigation measures the Town could implement. The timeframe for each action is provided as a guide and recognized as flexible due to staff and funding availability. It is also recognized that the identified lead for an action may shift from one party to another, or become a shared responsibility.

7.2.1.1 Incorporate the Plan into Existing Planning Mechanisms

State regulations require that hazard mitigation be addressed within Comprehensive Community Plans (CCP). The Town of Barrington's 2015 Comprehensive Community Plan contains a Natural Hazards Element. It is the intent of the Town to further integrate hazard mitigation into all applicable elements during the CCP 2025 update. Incorporating pertinent aspects of the *HM&FMP* throughout the CCP will strengthen the Town's position to implement hazard mitigation as it will carry the full legal weight and authority of the Comprehensive Community Plan.

In addition to the CCP, the *HM&FMP* will be incorporated, where appropriate, into other Town planning mechanisms. These include, but are not limited to the Open Space Plan, Strategic Energy Plan, and the Town's Geographical Information System (GIS). **Appendix 5-1** includes plan integration considerations for key existing planning mechanisms. Further integration will occur as land use plans & regulations, mutual aid agreements, and such are updated or developed.

DMA Requirement

§201.6(c)(4)(ii):

[The plan maintenance process shall include] a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

7.2.2 Evaluate and Revise the Plan

As directed by FEMA, “To be useful, planning must be ongoing and plans must be dynamic. Therefore, the community must have an evaluation and update process” (FEMA. *National Flood*, 510-25).

Success of Barrington’s 2022 *Hazard Mitigation & Flood Management Plan* will be measured by the degree to which actions are sustainably implemented and the *Plan* is maintained. Barrington’s Emergency Management Committee (EMC) is the primary body tasked with overseeing hazard mitigation in the Town. For the development of this *Plan*, an ad hoc Steering Committee was created by the Town Council. The Steering Committee is comprised of the 6 EMC members and 7 members of the public. It is proposed that the Steering Committee, or its successor committee with a similar membership, be charged with monitoring and evaluating implementation of the *Plan*. Doing so will maintain public representation in the implementation process and will afford the Town more CRS credit points for Activity 510-Step 10.

The Director of Planning , Building & Resiliency will serve as the 2022 *Hazard Mitigation & Flood Management Plan* lead, reviewing actions on an ongoing basis in order to initiate grant applications as opportunities arise, and also coordinating **semi-annual HM&FMP Evaluation Meetings**. Should the Committee choose to convene on a quarterly basis, additional CRS credit points can be achieved. At a minimum, conducting an annual review is critical to ensure the *Plan* reflects current information and continues to meet the needs of the Town. The annual meeting should align with Barrington’s annual municipal budget process in order to identify where capital improvement funding will be required. All meetings will be publicly noticed in accordance with Town and State open meeting laws and the public will be encouraged to attend and participate.

During the annual review, an assessment of progress on each of the goals and activities in the *Plan* will be discussed and documented in an Evaluation Report. Recommendations will be made concerning the various aspects of *Plan* implementation, including timeframes for completion of activities, funding and staffing resources, responsible entities, stakeholder engagement, coordination efforts, and priority standings of activities. Some activities that are found to be unachievable may be removed from the *Plan* and activities addressing problems unforeseen during plan development may be added. Implementation successes, hurdles, and lessons learned will also be identified. Further, the Committee will consider whether there have been any changes to the nature, magnitude, or type of risks and whether the goals remain current and appropriate. The meeting also provides an opportunity to discuss new recommendations or findings from other planning initiatives, policy changes, studies, research, etc. that may influence plan implementation. Once Barrington is formally a CRS participating community, the annual Evaluation Report must be submitted to the Town Council, released to the media, made available to the public, and submitted with the community’s annual CRS recertification.

The Committee will also convene within a month after a natural disaster to discuss the effectiveness of implemented actions, and if deemed appropriate revise the *Plan* to reflect lessons learned from Town officials and community members based on their experiences during and after the hazard event.



7.2.2.1 Continued Public Involvement

For the *Plan* to be effective and relevant over time, continued community involvement throughout the implementation and maintenance process will be essential. Ongoing community engagement continues the hazard risks discussion and builds support for mitigation activities. Community members will be given the opportunity to affect the content and outcomes of the *HM&FM Plan* through outreach, public meetings, and community forums. Barrington residents, local and regional stakeholders, neighboring community members, and the public-at-large will be encouraged to participate in the process through advertised meetings and events.

DMA Requirement

§201.6(c)(4)(iii):

[The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

The semi-annual *Plan* Evaluation Meetings, which will provide updates and findings on the progress and implementation of the *Plan*, will be open to the public. The public can also stay involved through the use of the **Town's website**, where updates to the *Plan* as well as other hazard mitigation information is posted.

7.2.2.2 Funding Opportunities

An array of funding can be used to finance improvements that mitigate hazards. The Town of Barrington can budget for such projects in its Capital Improvements Plan (CIP) and finance improvements locally through bonds. Grants such as the Rhode Island Infrastructure Bank (RIIB) Municipal Resilience Program (MRP) Action Grant and the Coastal and Estuarine Habitat Restoration Trust Fund (CEHRTF) Grant programs have already funded storm water management and buffer conservation projects in Barrington, and can be utilized in the future. The State Department of Transportation projects (often through the Federal Highway Administration), can address storm water runoff and flood management as part of their scope. Further, local University and College programs may be able to donate resources to help plan, communicate risks, or implement mitigation activities. Private entities, such as The Nature Conservancy and the Champlin Foundation, are also good resources as they routinely fund acquisition of natural buffer easements.



Figure 7-4 FEMA Grant Programs
Image credit: FEMA

Adoption of this *Plan* by the Barrington Town Council will also assist the Town in eligibility and application priority for certain federal and state level grants to be utilized in mitigation efforts. FEMA prioritizes municipalities that have completed a risk assessment and established mitigation projects with detailed information on the timeline, cost, and municipal department responsible for completing the project. FEMA grant opportunities for mitigation activities include FEMA's Flood Mitigation Assistance (FMA) Grant Program, Pre-Disaster Mitigation (PDM) Grant Program, and post-disaster Hazard Mitigation Grant Program (HMGP). Additional information on grant opportunities has been provided in **Appendix 5-3**.

7.2.3 5-Year Plan Update

The *Town of Barrington 2022 Hazard Mitigation & Flood Management Plan* is a dynamic document and as discussed in **Section 7.2.2**, over the 5-year implementation period there will be an ongoing plan maintenance schedule. Additionally, in accordance with 44 CFR §201.6(d)(3), to maintain eligibility for mitigation project grant funding, the plan needs to undergo a full update every five years to reflect changes in development, progress in local mitigation efforts, changes in priorities, and updated science-based data and tools on hazard tracking, climate change, etc. To ensure that the revised plan will be approved within the five-year cycle, it is proposed that the Town commence the update on the fourth anniversary of the *Plan* adoption date.

It is proposed that the 5-year update follow the CRS Activity 510 - 10 Step Planning Process, as was done for the development of this document. This will ensure that both the 44 CFR §201.6 and CRS Activity 510 requirements are met. The Town appreciates the emphasis placed on public participation in the 10-Step Planning Process. As was part of this planning effort, public meetings will be held and public comments will be solicited on the 5-year plan update.

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GLOSSARY

Glossary

Action Plan – A sequence of steps to achieve specific goals, including identification of responsible parties, resources required, and a timeline.

American Community Survey – The framework by which the Census Bureau collects and publishes demographic, social, housing, and economic data.

Base Flood Depth (BFD) – The depth shown on the Flood Insurance Rate Map (FIRM) for Zone AO that indicates the depth of water above highest adjacent grade resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year.

Base Flood Elevation (BFE) – The computed elevation to which floodwater is anticipated to rise during the base flood. BFEs are shown on Flood Insurance Rate Maps (FIRMs) and on the flood profiles. The BFE is the regulatory requirement for the elevation or floodproofing of structures. The relationship between the BFE and a structure's elevation determines the flood insurance premium.

Beaufort Scale – Created in 1805, a scale still used today as a standardized scale for characterizing wind.

Bristol County Water Authority (BCWA) – A public water authority which has been operational since 1984 serving Barrington, Warren, and Bristol.

Brush Fire – A fire burning in vegetation that is predominantly shrubs, brush, and scrub growth. Peak fire season in Rhode Island is typically between mid-March and mid-May when dry windy weather can occur increasing the potential for fires.

Building Code – The Rhode Island State Building Code.

Built Environment – Manmade surroundings including buildings, infrastructure, parks, lawns, etc.

Climate – An area's typical or average weather.

Climate Change – A change in the typical or average weather of a region or city. This could be a change in a region's average annual rainfall, for example. Or it could be a change in a city's average temperature for a given month or season. Climate change is also a change in Earth's overall climate. This could be a change in Earth's average temperature, for example. Or it could be a change in Earth's typical precipitation patterns.

Coastal Barrier – A naturally occurring island, sandbar or other strip of land, including coastal mainland, that protects the coast from severe wave wash.

Coastal Erosion – The process of the gradual wearing away of land masses along the coast.

Coastal Flooding – Inundation of areas along the coast resulting from storm surge, wave action.

Coastal High Hazard Areas – Special Flood Hazard Areas (SFHAs) along the coasts that have additional hazards due to wind and wave action. These areas are identified on Flood Insurance Rate Maps (FIRMs) as zones V, V1-V30 and VE.

Coastal Resources Management Council (CRMC) – The Coastal Resources Management Council is a State of Rhode Island management agency with regulatory functions. Its primary responsibility is for the preservation, protection, development and where possible the restoration of the coastal areas of the state via the implementation of its integrated and comprehensive coastal management plans and the issuance of permits for work with the coastal zone of the state.

Code of Federal Regulations (CFR) – The Code of Federal Regulations (CFR) is the codification of the general and permanent rules and regulations published in the Federal Register by the executive departments and agencies of the federal government.

Community Assets – The people, structures, facilities, and systems that have value to the community.

Community Rating System (CRS) – A voluntary program developed by FEMA to provide incentives for NFIP compliant communities who want to implement extra measures to provide protection from flooding.

Comprehensive Community Plan – A municipal-level plan written in accordance with requirements of the Rhode Island Comprehensive Planning and Land Use Regulation Act.

Coronavirus Disease 2019 (COVID-19) – is a virus strain that has only spread in people since December 2019. On March 11, 2020 the Coronavirus Disease was declared a pandemic by the World Health Organization and on March 13, 2020 the United States declared the outbreak a national emergency.

Critical Facilities – A structure or other improvement that, because of its function, size, service area, or uniqueness, has the potential to cause serious bodily harm, extensive property damage, or disruption of vital socioeconomic activities if it is destroyed or damaged or if its functionality is impaired.

Drought – A natural climatic condition which occurs in virtually all climates, the consequence of a natural reduction in the amount of precipitation experienced over a long period of time, usually a season or more in length. High temperatures, prolonged winds, and low relative humidity can exacerbate the severity of drought.

Earthquake – A sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of the earth's tectonic plates.

Elevated Building – A building that has no basement and that has its lowest elevated floor raised above ground level by foundation walls, shear walls, posts, piers, pilings, or columns. Solid (perimeter) foundations walls are not an acceptable means of elevating buildings in V and VE zones.

Erosion – The collapse, undermining or subsidence of land along the shore of a lake or other body of water. Erosion is a covered peril if it is caused by waves or currents of water exceeding their cyclical levels which result in flooding.

Extent – The strength or magnitude of the hazard. Extent can be described in a combination of ways depending on the hazard.

Farm, Forest, and Open Space Program – A tax incentive program that helps to achieve open space protection, but does not provide permanent protection. The program is intended to encourage property owners to manage their land for forestry, agriculture, and open space. Property owners enter into an agreement with the Town to keep their properties undeveloped for at least 15 years in exchange for lower property tax assessments.

Federal Emergency Management Agency (FEMA) – An agency within the U.S. Department of Homeland Security charged with responding to Presidential declared disasters.

Flash Flood – A flood that occurs when excessive water fills normally dry creeks or river beds along with currently flowing creeks and rivers, causing rapid rises of water in a short amount of time. They can happen with little or no warning.

Flood – A general and temporary condition of partial or complete inundation of normally dry land areas from: the overflow of inland or tidal waters; the unusual and rapid accumulation of runoff of surface water from any source.

Flood Insurance Rate Map (FIRM) – Official map of a community on which FEMA has delineated the Special Flood Hazard Areas (SFHAs), the Base Flood Elevations (BFEs) and the risk premium zones applicable to the community. A FIRM that has been made available digitally is called a Digital Flood Insurance Rate Map (DFIRM).

Floodplain – Any land area susceptible to being inundated by floodwaters from any source.

Floodplain Management – The operation of an overall program of corrective and preventive measures for reducing flood damage, including but not limited to, emergency preparedness plans, flood-control works and floodplain management regulations.

Floodproofing – Any combination of structural and nonstructural additions, changes or adjustments to structures, which reduce or eliminate risk of flood damage to real estate or improved real property, water and sanitation facilities or structures with their contents.

Flood Zone A (1% annual chance): Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study (FIS) by approximate methods. Mandatory flood insurance purchase requirements apply. For areas within the A Zone where detailed hydraulic analyses has been performed and Base Flood Elevations (BFEs) identified, additional classifications (VE, V1-V30) are made.

Flood Zone V (1% annual chance): Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Mandatory flood insurance purchase requirements apply. For areas within the V Zone where detailed hydraulic analyses has been performed and Base Flood Elevations (BFEs) identified, additional classifications (AE, AH, AO, AR, A1-A30, A99) are made.

Flood Zone X (0.2% annual chance): Zone X is the flood insurance rate zone that corresponds to the 500-year floodplains that are determined in the Flood Insurance Study (FIS) by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs (base flood elevations) or depths are shown within this zone.

Foundation Walls – Masonry walls, poured concrete walls or precast concrete walls, regardless of height, that extend above grade and support the weight of a building.

Freeboard (FEMA Definition for Flood Zones) – An additional amount of height above the Base Flood Elevation (BFE) used as a factor of safety (e.g., 2 feet above the Base Flood) in determining the level at which a structure's lowest floor must be elevated or floodproofed to be in accordance with state or community floodplain management regulations.

Freeboard (bridge clearance) – The space between the bottom of a bridge's structure and the surface of the water underneath the bridge.

Freshwater Wetlands (Per RIDEM) – areas that are flooded or that have water at or near the surface for part of most growing seasons. They commonly occur between uplands and water bodies; however, many freshwater wetlands stand alone and are surrounded by upland. Freshwater wetlands are widespread throughout Rhode Island. Swamps, marshes, bogs, ponds, rivers, and streams are considered wetlands in Rhode Island as are other smaller areas and certain adjacent areas known as perimeter wetlands, riverbank wetlands, and floodplain.

Fujita Scale – An intensity scale which rates tornadoes with numeric values from F0 to F5 based on tornado wind speed and damage sustained. An F0 rating indicates light damage such as broken tree limbs or signs, while an F5 rating indicates incredible damage was sustained.

Geographic Information System (GIS) – A computer system that analyzes and displays geographically referenced information. It uses data that is attached to a unique location.

Greenhouse Gas Emissions – Gases that trap heat in the atmosphere, including carbon dioxide and methane.

Hazard – A natural or man-made source or cause of harm or difficulty.

Hazard Identification – The process of identifying hazards that threaten an area.

Hazard Mitigation – Sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards.

Hazard Mitigation Plan – A plan, written to comply with FEMA requirements, that identifies local policies and actions that can be implemented over the long term to reduce risk and future losses from hazards. These mitigation policies and actions are identified based on an assessment of hazards, vulnerabilities, and risks and the participation of a wide range of stakeholders and the public in the planning process.

Hazard Profiles – Profiles of each identified hazard.

Hurricane – A tropical cyclone in which the maximum sustained surface wind is 74 mph or more. The term hurricane is used for Northern Hemisphere tropical cyclones east of the International Dateline to the Greenwich Meridian. (The term typhoon is used for Pacific tropical cyclones north of the Equator west of the International Dateline).

Hydrology – The science of dealing with the waters of the earth. A flood discharge is developed by a hydrologic study.

Impact – The effect of a hazard on the community and its assets.

Inland Flooding – Flooding that presents a risk within inland (non-coastal) areas, including riverine flooding and shallow flooding.

Inundation – The total water level that occurs on normally dry ground as a result of the storm tide, and is expressed in terms of height of water, in feet, above ground level.

Letter of Map Amendment (LOMA) – An amendment to the currently effective FEMA map which establishes that a property is not located in a Special Flood Hazard Area (SFHA). A LOMA is issued only by FEMA.

Letter of Map Revision (LOMR) – An official amendment to the currently effective FEMA map. It is issued by FEMA and changes flood zones, delineations and elevations.

Location – The geographic areas within the planning area that are affected by the hazard, such as a floodplain.

Lowest Floor Elevation (LFE) – The measured distance of a building's lowest floor above the National Geodetic Vertical Datum (NGVD) or other datum specified on the FIRM for that location.

Magnitude – A measure of the strength of a hazard event. The magnitude (also referred to as severity) of a given hazard is usually determined using technical measures specific to a hazard.

Mission Statement – A statement that drives the process and describes in a short, simple statement the intended outcome.

Mitigation – An effort to reduce the impact or loss from an incident.

Mitigation Strategy – The heart of the mitigation plan is the mitigation strategy, which serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The mitigation strategy describes how the community will accomplish the overall purpose, or mission, of the planning process.

Modified Mercalli Intensity (MMI) Scale – An intensity scale created to evaluate the effects of earthquakes, the MMI is the one currently used in the United States. Developed in 1931 by seismologists this scale is composed of increasing levels of intensity that range from imperceptible shaking to catastrophic destruction. Each level is designated by Roman numerals. It does not have a mathematical basis; instead it is an arbitrary ranking based on observed effects.

National Centers for Environmental Administration Information – Formerly the National Climatic Data Center, a division of the National Oceanic and Atmospheric Administration responsible for “preserving, monitoring, assessing, and providing public access to the Nation’s treasure of climate and historical weather data and information.”

National Flood Insurance Program (NFIP) – A program that makes federally-backed flood insurance available in those states and communities that agree to adopt and enforce floodplain management ordinances to reduce future flood damage.

National Geodetic Vertical Datum (NGVD) of 1929 – National standard reference datum for elevations, formerly referred to as Mean Sea Level (MSL) of 1929. NGVD 1929 may be used as the reference datum on some Flood Insurance Rate Maps (FIRMs).

National Weather Service – A component of NOAA that provides weather, water, and climate data, forecasts and warnings for the protection of life and property and enhancement of the national economy.

Natural Disaster – A natural hazard event, such as a flood or tornado, which results in widespread destruction of property or caused injury and/or death.

Natural Environment – Natural systems with limited human influence. Examples: freshwater wetlands, coastal marshes, woodlands.

Natural Grade – The grade unaffected by construction techniques such as fill, landscaping or berming.

Natural Hazard – An unexpected or uncontrollable natural event of unusual magnitude that threatens the activities of people or people themselves.

Nor'easter – A storm along the East Coast of North America, so called because the winds over the coastal area are typically from the northeast. These storms may occur at any time of year but are most frequent and most violent between September and April.

North American Vertical Datum (NAVD) of 1988 – The vertical control datum established for vertical control surveying in the United States of America based upon the General Adjustment of the North American Datum of 1988. It replaces the National Geodetic Vertical Datum (NGVD) of 1929.

Repetitive Loss Structure – Any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling 10-year period, since 1978 (claims made within 10 days of each other are counted as one claim). A repetitive loss property may or may not be currently insured by the NFIP (FEMA. Repetitive Loss Structure).

Resilience – The ability of systems, infrastructures, government, business, communities and individuals to resist, tolerate, absorb, recover from, prepare for, or adapt to an adverse occurrence that causes harm, destruction or loss.

Richter Scale – The Richter magnitude scale, developed in 1935 by Charles F. Richter, is a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for the variation in the distance between the various seismographs and the epicenter of the earthquakes.

Risk – The potential for an unwanted outcome resulting from an incident, event, or occurrence, as determined by its likelihood and the associated consequences.

Risk Assessment – A product or process that collects information and assigns values to risks for the purpose of informing priorities, developing or comparing courses of action, and informing decision making.

Riverine Flooding – Surface water runoff introduced into streams and rivers exceeds the capacity of the natural or constructed channels to accommodate the flow; as a result, water overflows the stream banks, spilling out into adjacent low-lying areas.

Save the Bay – A Providence-based nonprofit organization whose mission is to “protect and improve Narragansett Bay.”

Sea, Lake and Overland Surges from Hurricanes (SLOSH)

Model – A computerized numerical model developed by the National Weather Service (NWS) to estimate storm surge heights resulting from historical, hypothetical, or predicted hurricanes by taking into account the atmospheric pressure, size, forward speed, and track data. These parameters are used to create a model of the wind field which drives the storm surge. The SLOSH model consists of a set of physics equations which are applied to a specific locale's shoreline, incorporating the unique bay and river configurations, water depths, bridges, roads, levees, and other physical features.

Sea Level Rise – The upward trend in average sea level height.

Severe Repetitive Loss: Any NFIP-insured single-family or multi-family residential building that has incurred flood-related damage for which four or more separate claims payments have been made, with the amount of each claim (including building and contents payments) exceeding \$5,000; or for which at least two separate claims payments (building payments only) have been made, with the cumulative amount exceeding the market value of the building. In both instances, at least two of the claims must be within any rolling 10-year period, since 1978, and claims made within 10 days of each other are counted as one claim.

Shallow Flooding – For purposes of the National Flood Insurance Program (NFIP), shallow flooding is defined as that with a depth limited to 3.0 feet or less where no defined channel exists.

Shear Walls – Walls used for structural support but not structurally joined or enclosed at the ends (except by breakaway walls). Shear walls are parallel or nearly parallel, to the flow of the water and can be used in any flood zone.

Sheet Flow Hazard. A type of flood hazard with flooding depths of 1 to 3 feet that occurs in areas of sloping land. The sheet flow hazard is represented by the zone designation AO on the FIRM.

Special Flood Hazard Area (SFHA) – The shaded area on the Flood Insurance Rate Map (FIRM) which identifies an area that has a one percent chance of being flooded in any given year (100-year floodplain). The FIRM identifies these shaded areas as FIRM Zones A, AO, AH, A1 -A30, AE, A99, V, V1 -30, and VE.

Shelter – A place of refuge that provides life-sustaining services in a congregate facility for individuals who have been displaced by an emergency or a disaster.

State Hazard Mitigation Plan (SHMP) – A Plan that provides comprehensive guidance for hazard mitigation in the State of Rhode Island.

Storm Surge – The abnormal rise of water generated by a storm, over and above the normal astronomical tide, and is expressed in terms of height above predicted or expected tide levels. Since storm surge represents the deviation from normal tide levels, it is not referenced to a vertical or tidal datum.

Tornado – A violently rotating column of air extending ground-ward.

Tropical Cyclone – A generic term for a cyclonic, low-pressure system over tropical or sub-tropical waters.

Tropical Storm – A tropical cyclone with maximum sustained winds greater than 39 miles per hour and less than 74 miles per hour.

Variance – A grant of relief by a participating community from the terms of its floodplain management regulations.

Vector-borne diseases – Infections transmitted to humans and other animals by blood-feeding arthropods, such as mosquitoes and ticks.

Vertical Datum - A base elevation used as a reference from which to measure heights (or depths).

Vulnerability – Characteristics of community assets that make them susceptible to damage from a given hazard.

Vulnerability Analysis – An analysis of the risk of hazards impacting community assets.

Wildfire – A wildfire is an unplanned, unwanted fire burning in a natural area, such as a forest, grassland, or prairie. Wildfires can damage natural resources, destroy homes, and threaten the safety of the public and the firefighters who protect forests and communities.

Wildland Urban Interface (WUI) Zone – As building development expands into natural areas, homes and business may be situated in or near areas susceptible to wildfires.

Wind Chill Index – Wind chill index is an attempt to quantify the cooling effect of wind with the actual outside air temperature to determine a wind chill temperature that represents how cold people and animals feel, based on the rate of heat loss from exposed skin.

Zoning Ordinance – Regulations that define how property can be used within zones as mapped on a Zoning Map. Regulations specify how property may be used and establish dimensional requirements including lot size, building placement, bulk (or density) and the height of structures.

Sources

Centers for Disease Control and Prevention

[Https://www.cdc.gov/nchs/data/icd/Announcement-New-ICD-code-for-coronavirus-3-18-2020.pdf?fbclid=IwAR1W4E21-xZbEJdSG-RFewVZmuM72GGhiE2QIRyur_CPSstp14uAa8gzhRXw#:~:text=On%20March%2011%2C%202020,COVID%2D19%20outbreak](https://www.cdc.gov/nchs/data/icd/Announcement-New-ICD-code-for-coronavirus-3-18-2020.pdf?fbclid=IwAR1W4E21-xZbEJdSG-RFewVZmuM72GGhiE2QIRyur_CPSstp14uAa8gzhRXw#:~:text=On%20March%2011%2C%202020,COVID%2D19%20outbreak)

Coastal Resources Management Council

[Http://www.crmc.ri.gov/aboutcrmc.html](http://www.crmc.ri.gov/aboutcrmc.html)

Federal Emergency Management Agency

[Https://www.fema.gov/about/glossary](https://www.fema.gov/about/glossary)
[Https://www.fema.gov/pdf/nfip/manual201205/content/22_definitions.pdf](https://www.fema.gov/pdf/nfip/manual201205/content/22_definitions.pdf)
[Https://www.fema.gov/sites/default/files/2020-05/fim_appendix-i-severe-repetitive-loss-properties_apr2020.pdf](https://www.fema.gov/sites/default/files/2020-05/fim_appendix-i-severe-repetitive-loss-properties_apr2020.pdf)
[Https://www.fema.gov/sites/default/files/2020-06/fema-local-mitigation-planning-handbook_03-2013.pdf](https://www.fema.gov/sites/default/files/2020-06/fema-local-mitigation-planning-handbook_03-2013.pdf)

National Oceanic and Atmospheric Administration (NOAA)

[Https://forecast.weather.gov/glossary.php?](https://forecast.weather.gov/glossary.php?)
[Http://www.nhc.noaa.gov/aboutgloss.shtml](http://www.nhc.noaa.gov/aboutgloss.shtml)
[Http://www.nhc.noaa.gov/news/20130806_pa_defineSurge.pdf](http://www.nhc.noaa.gov/news/20130806_pa_defineSurge.pdf)
[Https://www.weather.gov/safety/winter-noreaster](https://www.weather.gov/safety/winter-noreaster)

National Park Service

[Https://www.fs.fed.us/nwacfire/home/terminology.html](https://www.fs.fed.us/nwacfire/home/terminology.html)

RI Department of Environmental Management

[Http://www.dem.ri.gov/programs/benviron/water/wetlands/pdfs/scoop.pdf](http://www.dem.ri.gov/programs/benviron/water/wetlands/pdfs/scoop.pdf)

Save the Bay

[Https://www.savebay.org/](https://www.savebay.org/)

Statewide Planning (RI Dept. of Administration)

[Http://www.planning.ri.gov/documents/sea_level/2016/TP167.pdf](https://www.planning.ri.gov/documents/sea_level/2016/TP167.pdf)

United States Geological Survey (USGS)

[Http://earthquake.usgs.gov/](http://earthquake.usgs.gov/)
[Https://www.usgs.gov/faqs/what-geographic-information-system-gis](https://www.usgs.gov/faqs/what-geographic-information-system-gis)
[Https://www.usgs.gov/programs/earthquake-hazards/modified-mercalli-intensity-scale](https://www.usgs.gov/programs/earthquake-hazards/modified-mercalli-intensity-scale)

Town of Barrington Rhode Island

Hazard Mitigation & Flood Management Plan

2022



APPENDICES

APPENDIX 2-1

CRS Credit for Activity 510

Appendix 2-1

CRS Credit for Activity 510

The Community Rating System (CRS) is a voluntary incentive program designed to encourage communities to engage in various community focused activities which promote a comprehensive approach to floodplain management beyond the minimum National Flood Insurance Program (NFIP) requirements. As the Town of Barrington is in the process of becoming a FEMA Community Rating System (CRS) program participant, the Steering Committee followed the 10-Step planning process associated with CRS Activity 510, Floodplain Management Planning. The following Table outlines the 10-Step planning process and references the Section(s) within this *Plan* where that step has been addressed. The maximum and anticipated CRS Credit has also been provided.

CRS Activity 510 Planning Process - Credit Checklist

CRS Planning Steps	CRS Credit Point Criteria Corresponding Section within Barrington HM&FMP	Maximum CRS Credit	Estimated CRS Credit
1. Organize to Prepare the Plan	a. The office responsible for community land use and comprehensive planning was involved throughout the entire planning process (Steering Committee Chair) Refer to Section 2.1.2/Table 2-2 and Table 2-3	4	4
	b. The department staff on the Steering Committee represented offices responsible for all six categories of flood mitigation activities Refer to Section 2.1.2/Table 2-2 and Table 2-3	9	9
	c. The planning process was formally created by the community's governing board (March 7, 2022 Town Council meeting) Refer to Section 2.1.2	2	2
2. Involve the Public	a. Members of the public comprise half of the planning committee membership; the Steering Committee met 7 times and was engaged in all aspects of plan development; all meetings were publicized and open to the public Refer to Section 2.1.2/Table 2-2 and Section 2.2.2/Table 2-4	60	60
	b. A public meeting (Outreach Activity #6) was held within the first 2 months of the planning process to obtain public input on the natural hazards, problems, and possible solutions Refer to Section 2.2.2/Table 2-4	15	15
	c. A public meeting (Public Hearing) was held at the end of the planning process to obtain input on the recommended plan (Outreach Activity #10); the <i>Plan</i> and its findings and recommendations were explained and people were provided the opportunity to ask questions and submit their comments for review, consideration, and potential modification of the <i>Plan</i> Refer to Section 2.2.2/Table 2-4	15	15
	d. In addition to the Public Information Meeting and Public Hearing, eight (8) other outreach activities were conducted Refer to Section 2.2.2/Table 2-4	30	30
3. Coordinate	a. The Town conducted an extensive review of existing studies, reports, and technical information (REQUIRED for Step 3 credit) Refer to Section 2.3.1 and Section 5.1.1; and Appendix 5-1	5	5
	b. The Town coordinated with 33 agencies and organizations outside the community's governmental structure through emails at the beginning of the planning process as well as at the onset of the Public Review Period Refer to Section 2.3.2; and Appendix 2-3	30	30

CRS Planning Steps	CRS Credit Point Criteria Corresponding Section within Barrington HM&FMP	Maximum CRS Credit	Estimated CRS Credit
4. Assess the Hazard	<p>a. The <i>Plan</i> includes an assessment of the flood hazard, including the SFHA, repetitive loss areas, areas not mapped on the FIRM that have flooded in the past, and other surface flooding identified in other studies</p> <p>Maps of the flood hazard areas have been included Figures 4-11, 4-15, 4-43, 4-44, 4-45, 4-46, 4-47, 4-48, 4-49; and maps included in Appendices 4-2 and 4-4</p> <p>A description of the known flood hazards has been included for: Inland Flooding (Riverine Flooding, Shallow Flooding, and Dam Failure) – Refer to Section 4.3.1.1; Coastal Flooding/Storm Surge – Refer to Section 4.3.1.2; and Coastal Erosion – Refer to Section 4.3.1.3; for additional information regarding Critical Facilities – Refer to Appendix 4-3</p> <p>A discussion of past floods has been included Refer to Section 4.2.1 and 4.3.1</p>	15	15
	<p>b. The <i>Plan</i> includes an assessment of less-frequent flood hazards. An inventory was conducted and concluded that there are 2 dams, but no levees in Town. The inventory also identified that only one of the seven special flood-related hazards identified in CRS Coordinator's Manual (401) is applicable – coastal erosion. Inland flooding, coastal flooding/storm surge, dams, and coastal erosion have all been described and the SFHA has been mapped.</p> <p>Refer to Section 4.3.1; and Appendix 4-2</p>		
	<p>c. The risk assessment identifies areas likely to be flooded and flood problems that are likely to get worse in the future as a result of changes in floodplain development and climate change or sea level rise.</p> <p>Refer to Section 4.1 and 4-4; and Appendices 4-2, 4-3, and 4-4</p>		
	<p>d. The <i>Plan</i> includes a description of the magnitude or severity, history, and probability of future events for other natural hazards; the natural hazards identified are those included in the RI-SHMP</p> <p>Refer to Section 4.1, 4.2, 4.3.2, 4.3.3, 4.3.4, and 4.3.5</p>		
5. Assess the Problem	<p>a. The <i>Plan</i> includes an overall summary of the jurisdiction's vulnerability to each hazard identified in the hazard assessment and the impact on the community. (REQUIRED for Step 5 credit)</p> <p>Refer to Executive Summary (Major Findings); Section 4.2.2/Table 4-4; and Appendix 4-1</p>	2	2
	<p>b. The <i>Plan</i> includes a description of the impact that the identified hazards have on the following features: life safety and public health – Refer to Section 4.4.5; critical facilities and infrastructure – Refer to Section 4.4.1- 4.4.5; and Appendix 4-3; the community's economy and major employers – Refer to Section 4.4.4; and the number and types of affected buildings – Refer to Section 4.4.2; and Appendices 4-2, 4-3, and 4-4</p>	25	25

CRS Planning Steps	CRS Credit Point Criteria Corresponding Section within Barrington HM&FMP	Maximum CRS Credit	Estimated CRS Credit
5. Assess the Problem	c. The assessment includes an estimate of the potential damage and dollar losses to vulnerable structures Refer to Section 4.4.2	5	5
	d. The assessment describes areas within the floodplain that provide natural functions Refer to Section 4.4.3	5	5
	e. The assessment includes a description of development trends Refer to Section 4.4.6	7	7
	f. The assessment includes a description of the impact of the future flooding conditions on people, property, and natural floodplain functions Refer to Section 4.4.2, 4.4.3, 4.4.4, and 4.4.5	8	8
6. Set Goals	The <i>Plan</i> includes a statement of the community's goals for their hazard mitigation & floodplain management program which addresses all identified flood-related problems (inland flooding, coastal flooding/storm surge, and coastal erosion) Refer to: Section 6.2	2	2
7. Review Possible Activities	<p>Please Note: For items a-g, the <i>Plan</i> includes a wide array of possible activities that were considered for inclusion in the <i>Action Plan</i> as well as if existing regulatory measures should be revised (Section 5.5.1; and Appendices 5-1 and 6-1).</p> <p>Additionally, Section 5-3 includes an overview of the status of the 2017 HMP actions. Each possible activity has been reviewed and determined appropriate or not appropriate for inclusion in the updated <i>Action Plan</i>. Those activities determined appropriate were further discussed and as there was some overlapping between the various planning documents, similar activities were grouped together and rewritten. Based on an extensive review of the possible activities, the Committee selected 25 actions to undergo the STAPLEE analysis (Appendix 6-2). Those activities selected have been included in the Action Plan (Section 6-4). The Action Plan includes a number of descriptors including magnitude of cost and potential funding source.</p>	5	5
	a. The <i>Plan</i> reviewed preventive activities including zoning, stormwater management regulations, building codes, subdivision ordinances, and the preservation of wetlands and open space Refer to Section 5.5.1; and Appendices 5-1 and 6-1		
	b. The <i>Plan</i> reviewed whether the community's floodplain management regulatory standards are sufficient for current and future conditions Refer to Section 5.5.1; and Appendix 5-1 and 6-1	5	5
	c. The <i>Plan</i> reviewed property protection activities, such as acquisition and flood insurance Refer to Appendix 6-1	5	5
	d. The <i>Plan</i> reviewed activities to protect the natural and beneficial functions of the floodplain, such as wetlands protection Refer to Appendix 6-1	5	5
	e. The <i>Plan</i> reviewed emergency services activities Refer to Appendix 6-1	5	5
	f. The <i>Plan</i> reviewed structural projects Refer to Appendix 6-1	5	5
	g. The <i>Plan</i> reviewed public information activities, such as outreach projects and environmental education programs Refer to Appendix 6-1	5	5

CRS Planning Steps	CRS Credit Point Criteria Corresponding Section within Barrington HM&FMP	Maximum CRS Credit	Estimated CRS Credit
8. Draft an Action Plan	a. The Action Plan includes a balanced program, with flood-related activities from all six floodplain management categories; at least one action for each Goal; and all required descriptors, including a prioritized ranking Refer to Section 6.4/Table 6-1	45	45
	b. The Action Plan includes an item that addresses post-disaster redevelopment and mitigation policies and procedures Refer to Section 6.4/Table 6-1 (Action 2022-1.6)	10	10
	c. In addition to public information activities, the Plan includes action items to mitigate the effects of the other natural hazards identified in the hazard assessment Refer to Section 6.4/Table 6-1	5	5
9. Adopt the Plan	The <i>Plan</i> was officially adopted by the Barrington Town Council on xxxx, 2022. Refer to Appendix 7-2	2	2
10. Implement, Evaluate, and Revise the Plan	a. The Town intends to monitor implementation, review progress, and recommend revisions to the <i>Plan</i> in an annual evaluation report which will be submitted to the governing body, released to the media, and made available to the public. (REQUIRED) Refer to Section 7.2.2	2	2
	b. The Town intends that the annual evaluation report is prepared by the same planning committee that prepared the <i>Plan</i> or by a successor committee with a similar membership. Barrington intends to meet twice a year. If the committee meets only once a year (6 points) If the committee meets twice a year (12 points) If the committee meets at least quarterly (24 points) Refer to Section 7.2.2	24	12

Summary of Points

CRS Activity 510 Planning Process	Maximum CRS Points (Total = 382)	Estimated CRS Points
Phase I – Planning Process		
Step 1. Organize to Prepare the Plan	15	15
Step 2. Involve the Public	120	120
Step 3. Coordinate	35	35
Phase II – Risk Assessment		
Step 4. Assess the Hazard	35	35
Step 5. Assess the Problem	52	52
Phase III – Mitigation Strategy		
Step 6. Set Goals	2	2
Step 7. Review Possible Activities	35	35
Step 8. Draft an Action Plan	60	60
Phase IV – Plan Maintenance		
Step 9. Adopt the Plan	2	2
Step 10. Implement, Evaluate, and Revise the Plan	26	14
Total Points	382	370

APPENDIX 2-2

Outreach Activities

Outreach Activity 1: Newspaper Article

The following was published in the Barrington Times March 2, 2022 Edition.

Volunteers need to help town plan for natural disasters

Committee will develop hazard mitigation plan

You can help Barrington prepare for natural disasters.

Town officials are forming a steering committee to oversee the development of the 2022 Hazard Mitigation Plan. The committee will assess impacts of flooding and other natural hazards on Barrington. It will also establish goals and objectives, and develop a mitigation strategy and action plan “aimed at reducing the impacts from future disasters on the people and property in Barrington.”

The committee will consist of town staff and up to six residents, business owners, or other interested stakeholders. The committee will meet approximately six times starting in mid-March and running through the end of May. Each meeting will be held on a weekday at the town hall, starting at 9 a.m. and last no longer than one hour.

The first meeting of the committee is tentatively set for Wednesday March 23 at 9 a.m. at the town hall. All committee meetings will be open to the public – meeting dates, times and locations will be posted on the town’s website. There will be several opportunities for public input during the planning process.

Anyone interested in joining the committee should contact Barrington Director of Planning, Building & Resiliency, Teresa Crean at 401-247-1900, ext. 347, or tcrean@barrington.ri.gov, by March 16, 2022.

Outreach Activity 2: Project Webpage

A HM&FMP webpage was created on the Town's website as a mechanism to provide the community and other stakeholders with information about the planning process and promote upcoming meetings and outreach activities. The webpage was maintained throughout the duration of the Project and updated on several occasions. Following is a snapshot of the material posted on the webpage at one point during the Project.

Hazard Mitigation and Flood Management Plan

While there are many aspects of coastal life in Barrington to celebrate, it does leave us vulnerable to several natural hazards. Tides are pushing waters onto our streets with more regularity and we are on the frontlines for sea level rise. The next Hurricane of 1938 could be around the corner.

The Town is working hard to be prepared and to that end is developing a 2022 Hazard Mitigation and Flood Management Plan (HMFMP) to strengthen our resiliency to a number of natural hazards, including flooding and hurricanes. The HMFMP will update the Town's 2017 Hazard Mitigation Plan (as required by FEMA), and expand the focus on flood management. The Plan is being overseen by a Steering Committee comprised of Town staff, residents, and other stakeholders. The Steering Committee meetings are posted below and are open to the public.

The Plan will assess the likely impacts of natural hazards that historically have or are reasonably anticipated to impact the people and property of the Town. The Plan will establish updated goals and objectives and develop a mitigation strategy and action plan with a list of prioritize projects. It is being developed in accordance with Federal Emergency Management Agency's (FEMA) requirements, and includes Community Rating System (CRS) Flood Management provisions.

We need to all work together to understand local risks, make hard choices, and invest in long-term community well-being.

Your Input is Important!

Community involvement is important to the planning process.

STEERING COMMITTEE MEETINGS:

Development of the Plan is overseen by a Steering Committee made up of Town staff, residents, and other stakeholders. All meetings are open to the public. If a zoom link is available, it will be posted below prior to the meeting and, on the Town's **UPCOMING MEETINGS** calendar (website homepage).

Upcoming meetings: Meetings are scheduled from 9:00 - 10:15 am on the following dates:
Tuesdays April 26th and May 3rd

PUBLIC OPINION SURVEY:

Thank you to all who participated in the online survey. We had a tremendous community response with 442 people participating. The survey results will be reviewed by the steering Committee and provided as an Appendix to the Plan.

PUBLIC INFORMATION MEETING:

April 26, 2022 at 6:30 pm - Hosted by the Resilience and Energy Committee:

There will be a brief project presentation followed by an open discussion on the past occurrence of natural hazards and potential future areas/issues of concern. The location and zoom link (if available) will be posted prior to the meeting.

What is Hazard Mitigation?

FEMA defines hazard mitigation as, "any sustained action taken to reduce or eliminate long-term risk to life and property from natural hazards." Good planning before, during, and after disasters can protect our health, our daily ways of life, and promote equity in our community.

Why is Hazard Mitigation & Flood Management Plan Important?

As one of Rhode Island's communities most vulnerable to the impacts of climate change and sea level rise, the Town of Barrington understands that a well-developed Hazard Mitigation & Flood Management Plan is an important planning tool that can:

- identify goals to prepare and adapt to changing hazards and vulnerabilities
- engage community and regional stakeholders and link local and regional planning efforts
- educate community to increase personal safety and resiliency
- improve opportunities for mitigation funding

While we can't prevent natural hazard events, such as hurricanes and nor'easters, pre-disaster planning and investments in preventative measures can reduce the impact of these events and improve post-disaster recovery.

Strengthening Community Resilience

These are the steps we are using to develop the 2022 HMFMP:

- **Hazard Profiles:** identify natural hazards that may have a significant impact on Barrington should they occur (such as floods, hurricanes, and nor'easters)
- **Vulnerability Assessment:** determine who and what are at risk from natural hazard events (including people, structures, infrastructure, economy, and natural environment)
- **Capability Assessment:** understand what measures the Town currently implements in terms of hazard mitigation
- **Hazard Ranking:** recognizing that the Town has limited fiscal and staffing resources, rank the natural hazards to identify where the Town should focus resources
- **Action Plan:** identify projects, initiatives, policies that will help to fill the gap between what has been done and what still needs to be done

Want to Learn More?

Following are some links that will provide additional information related to the HM&FM Plan Project.

- [Barrington Hazard Mitigation Plan \(2017 -FEMA Approved\)](#)
- [Bay Spring Neighborhood Resilience Plan \(2020\)](#)
- [Open Space Plan \(2011\)](#)
- [Housing-Land Use Study \(2008\)](#)
- [Conservation Commission: Barrington Goes Green \(2007\)](#)
- [RI BeachSAMP and STORMTOOLS](#)
- [Preparing for Resilience: Barrington and Warren Mixed-Use Climate Response Demonstration Site](#)
- [A Future with Water-Sea Level Rise in Rhode Island](#)
- [FEMA - Guide to Expanding Mitigation: Making the Connection with Public Health](#)
- [RIDOH - Climate Change and Your Health](#)

Questions?

Questions regarding the plan update can be directed to Teresa Crean, Director of Planning, Building and Resiliency (247-1900, extension 347; tcrean@barrington.ri.gov)

Outreach Activity 3: Public Opinion Survey Results

An integral element in hazard mitigation planning is broad public participation. Information provided by residents and stakeholders can illuminate local hazard concerns, gauge a community's awareness and preparedness for hazards, and inspire innovative solutions to reduce impacts of future hazard events. As online public opinion surveys are a highly accessible mechanism for gathering qualitative and quantitative data to inform the planning process, the Town's Consultant with input from the Steering Committee created and published an on-line survey hosted by SurveyMonkey.com.

The survey was promoted through the Town's website, a newspaper article, project posters hung in high pedestrian traffic areas in Town and sent out to the School Community and other groups, and e-blasted to the Town's over 6000 i-Contact followers. The survey was also publicized through an email sent to the 16 local government & school district groups and the 33 agencies and organizations outside of Barrington's governmental structure listed in **Appendix 2-3**.

The survey was accessible from March 29 through April 19, 2022 and had a total of 442 respondents. Survey results were used by the Committee to help guide and focus their mitigation planning efforts.

Summary of Survey Results:

The vast majority (97%) of the survey respondents were Barrington residents, and they were fairly distributed throughout the Town. Most people were extremely concerned about Flood-Related hazards (40%) and then Wind-Related hazards (32%). When combining those who are either extremely or moderately concerned, the top five hazards are:

- Flood-Related – 71%
- Wind-Related – 66%
- Contagious Respiratory Illness (Flu/Covid-19) – 49%
- Vector-Borne Diseases (Ticks/Mosquitoes) – 45%
- Winter-Related – 46%

The majority of participants (344 out of 442 – or 78%) indicated that either they or someone in their household had been negatively impacted by a natural disaster while living or doing business in the Town of Barrington. More people were impacted by Wind-Related hazards (69%) compared to Winter-Related (54%), Infectious Disease- Related (42%), or Flood Related (35%).

Roughly half of the respondents live within the SFHA – the VE or AE Flood Zone (46%).

The survey generated 247 responses to the question of what should the Town of Barrington do to mitigate the impacts from natural hazards. These responses have been included in their entirety (refer to Question 7).

With regard to which of the Town's resources might be most at risk in terms of climate change/sea level rise over the next two decades, when ranking extreme vulnerability, respondents ranked the following from most to least at risk:

1. Infrastructure (46%)	5. Cultural/Historic (14%)
2. Environmental (35%)	6. Governance (11%)
3. Structural (34%)	7. People (10%)
4. Economic (16%)	

Respondents indicated that they do take a number of steps to prepare for natural hazard events. Over half of the respondents indicated their house or business has:

- Installed smoke/carbon monoxide detectors (89%)
- Purchased a homeowners/renter's insurance policy (84%)
- Kept gutters clean and pointed down-spouts away from house/business (81%)
- Regularly removed dead/dying trees or vegetation from the yard (74%)
- Purchased and know how to use ABC class fire extinguishers (54%)
- Not allowed mulch to sit up against the siding (54%)
- Installed a backup generator (52%)
- Signed up for CodeRED (50%)

In terms of communication preference, respondents indicated their highest preference is to receive information about a hazard event via emails and text messaging. Post those methods, they identified their next communication preferences as the Town's Website, and then the Barrington Times or direct mailings.

Barrington RI - 2022 Hazard Mitigation & Flood Management Plan

Public Opinion Survey Results

We need your help! The Town of Barrington is working to become more resilient to flooding and other natural hazards. The Town is currently preparing a Hazard Mitigation & Flood Management Plan to identify and assess our community's risks, and determine ways to effectively minimize and manage those risks. More information about the Plan can be found on the Town's website: <https://www.barrington.ri.gov/hazard-mitigation-flood-management>

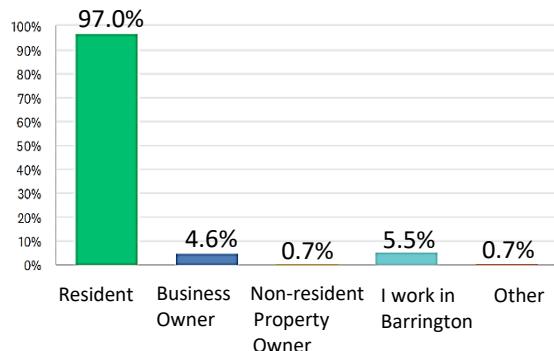
We'd like you to share your opinions and participate in the planning process. Take this quick SURVEY to help us better understand your hazard concerns. Your input will guide and focus our mitigation activities to help lessen the impacts of future hazard events for you and your family.

The survey is anonymous and should take less than 10 minutes to complete. Although we encourage you to answer all of the questions, the survey does allow for questions to be skipped.

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. Effective mitigation requires that we all understand local risks, make hard choices, and invest in long-term community well-being. Good planning before, during, and after disasters can protect our health, our daily ways of life, and promote equity.
- FEMA

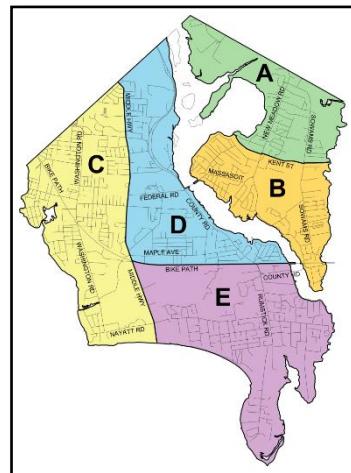
Thank you for your input!

1. What is your connection to the Town of Barrington? Please check all that apply.

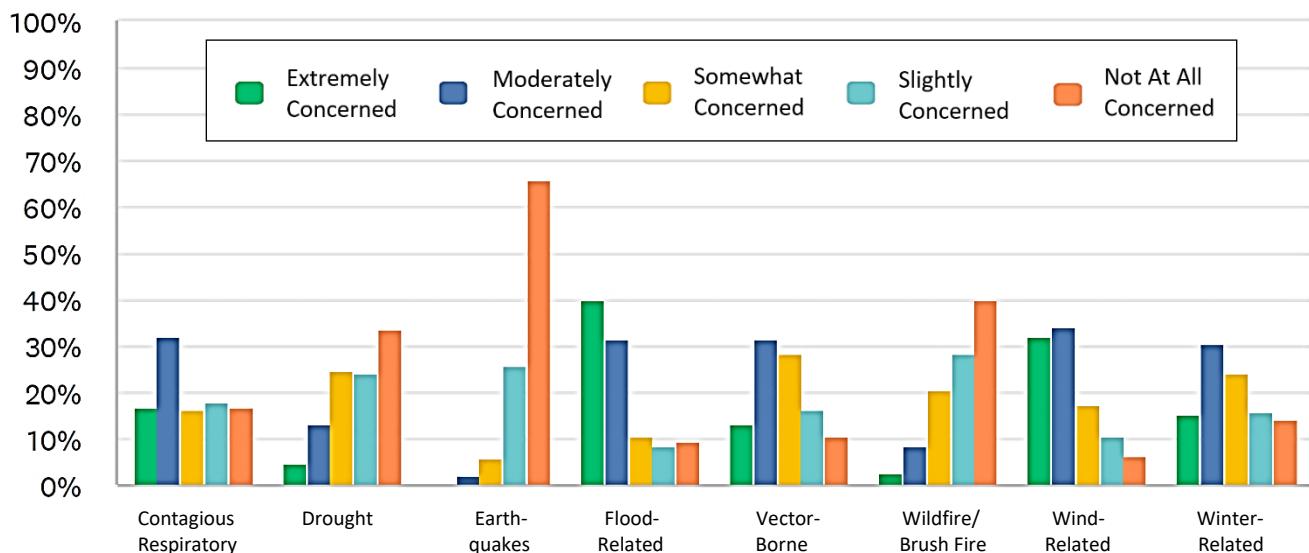


2. With reference to the map below, please check the section where your (primary) home or business is located.

A – 10.0%
B – 19.6%
C – 24.8%
D – 16.9%
E – 27.8%
I do not live/work in Barrington – 0.9%



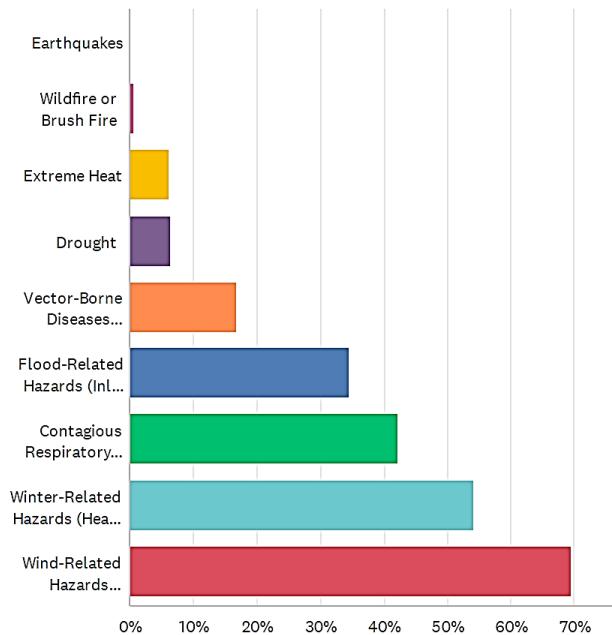
3. Please rank how concerned you are about the following natural hazards.



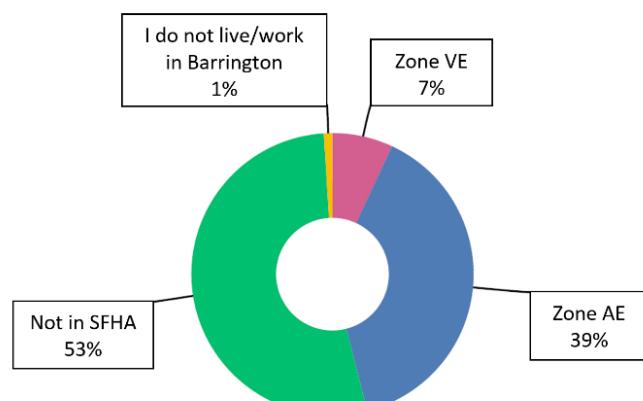
	EXTREMELY CONCERNED	MODERATELY CONCERNED	SOMEWHAT CONCERNED	SLIGHTLY CONCERNED	NOT AT ALL CONCERNED	TOTAL
Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses	16.86% 74	31.89% 140	16.40% 72	17.77% 78	17.08% 75	439
Drought	4.57% 20	13.01% 57	24.89% 109	23.97% 105	33.56% 147	438
Earthquakes	0.23% 1	2.08% 9	6.02% 26	25.93% 112	65.74% 284	432
Flood-Related Hazards (Inland Flooding, Coastal Flooding, Coastal Erosion)	40.09% 176	31.44% 138	10.71% 47	8.43% 37	9.34% 41	439
Vector-Borne Diseases Transmitted by Ticks or Mosquitoes	13.41% 59	31.36% 138	28.64% 126	16.14% 71	10.45% 46	440
Wildfire or Brush Fire	2.75% 12	8.26% 36	20.41% 89	28.44% 124	40.14% 175	436
Wind-Related Hazards (Tropical Storms and Hurricanes, High Winds, Tornadoes)	32.05% 141	34.09% 150	17.27% 76	10.45% 46	6.14% 27	440
Winter-Related Hazards (Heavy Snow, Ice, Extreme Cold)	15.33% 67	30.66% 134	24.03% 105	15.79% 69	14.19% 62	437

4. Have any of the following types of natural hazard events negatively impacted you or someone in your household while living/doing business in the Town of Barrington? Please check all that apply.

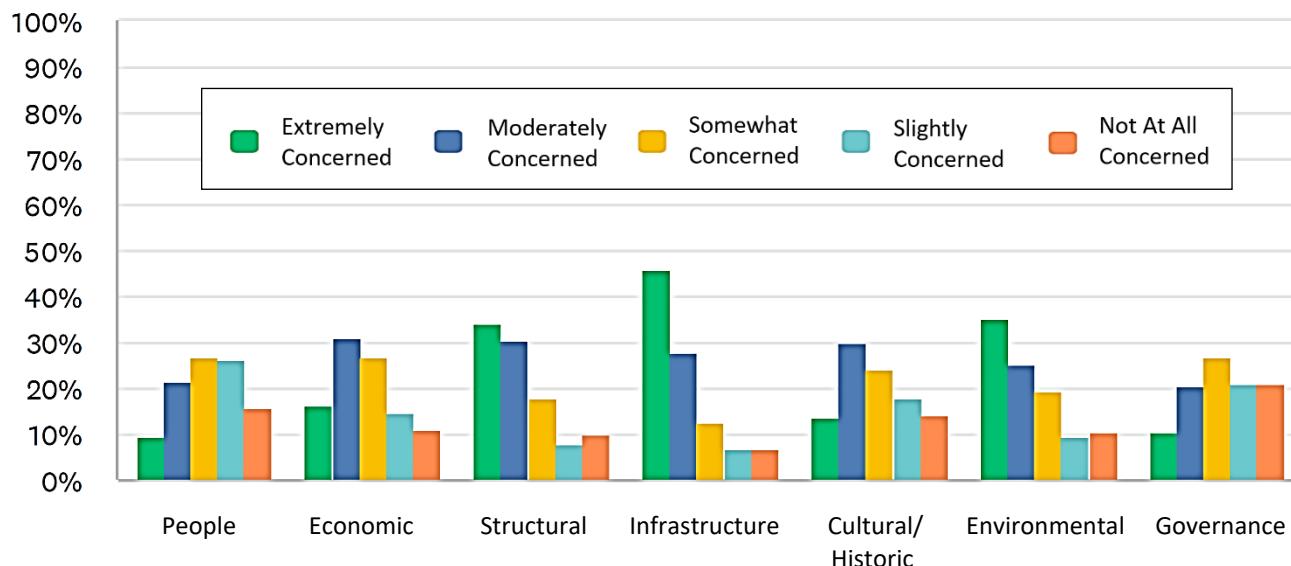
Answered: 344 Skipped: 98



5. Following the steps provided, please determine if your (primary) home or business is located in the Special Flood Hazard Area (which consists of both the VE and AE Zones).



6. Which of the following Town resources do you think may be harmed by natural hazards in the next two decades? Please rank each category based on how vulnerable/susceptible you think it is to potential impacts from natural hazards.

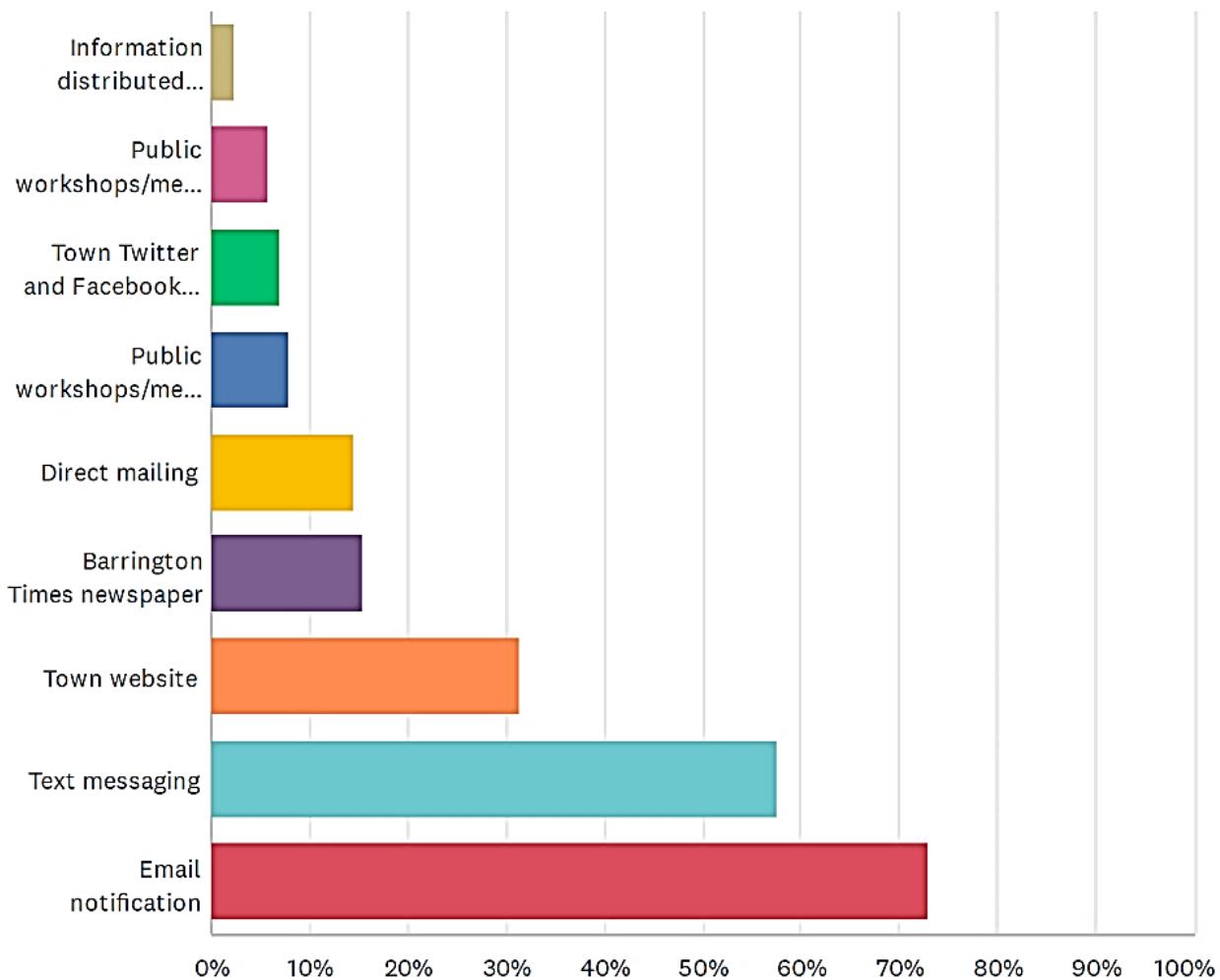


	EXTREMELY VULNERABLE	MODERATELY VULNERABLE	SOMEWHAT VULNERABLE	SLIGHTLY VULNERABLE	NOT VULNERABLE	TOTAL
People: Loss of life, injuries, compromised health	9.66% 42	21.61% 94	26.90% 117	26.21% 114	15.63% 68	435
Economic: Business interruptions/closures, job losses, etc.	16.06% 70	31.19% 136	26.83% 117	14.91% 65	11.01% 48	436
Structural: Damage to public and private buildings	34.09% 150	30.68% 135	17.73% 78	7.73% 34	9.77% 43	440
Infrastructure: Damage to roads, bridges, utilities, etc.	45.56% 200	27.79% 122	12.53% 55	7.06% 31	7.06% 31	439
Cultural/Historic: Damage to historic sites	13.59% 59	30.18% 131	24.42% 106	17.74% 77	14.06% 61	434
Environmental: Damage, contamination, or loss of forests, wetlands, floodplains, etc.	35.39% 155	25.11% 110	19.41% 85	9.36% 41	10.73% 47	438
Governance: Ability to maintain order and/or provide public amenities and services	10.60% 46	20.51% 89	26.73% 116	20.97% 91	21.20% 92	434

7. What should the Town of Barrington do to mitigate natural hazards in the future?

Please note: Because of the tremendous response, the 247 comments received for question 7 have been included in their entirety at the end of the survey results (after question 9).

8. To assist the Town in better communicating about what to do before, during, and after a disaster, please select the TOP TWO (2) methods you would prefer to receive information.



9. Which of the following steps has your household/business taken to prepare for a natural hazard event?
 Please check all that apply. ****Table shows the number of people who checked each item**

# of people	My household/business has:	# of people	My household/business has:
392	Installed smoke/carbon monoxide detectors	170	Recognized that in a major disaster, "the first 72 are on you" and prepared a disaster supply kit (for the first 72-hours of a disaster) with some or all of the following: basic medical supplies, food and water for people and pets; plates/cups/utensils/manual can opener; cash; change of clothes/shoes; list of prescriptions; list of key contact numbers; flashlight with extra batteries; whistle; face masks; hand sanitizer; toilet paper and other toiletries; plastic sheeting and duct tape; garbage bags and plastic ties; wrench/pliers; blankets; solar-powered cell phone charger
371	Purchased a homeowners/renter's insurance policy		
358	Kept gutters clean and pointed downspouts away from my house/business		
326	Regularly removed dead/dying trees or vegetation from the yard		
247	Purchased and know how to use ABC class fire extinguishers	155	In my basement, elevated some or all of the following above flood level: electrical outlets/switches, generator, water heater, washing and drying machines
240	Not allowed mulch to sit up against the siding (mulch attracts termites and other pests)	146	Purchased flood insurance
231	Installed a backup generator	87	Discussed with my family/employees an emergency plan and have a designated meeting place or a check-in procedure should our home/business need to be evacuated
220	Signed up for CodeRED emergency alerts through the Town of Barrington Fire Department's webpage or this link: CodeRED (<i>if you do it right now – it counts!</i>) CodeRED is an emergency notification service by which Public Safety can notify residents and businesses by telephone or cellular phone about emergency situations. The system is capable of sending messages to specific neighborhoods or the entire community.	54	Installed high impact windows or doors to withstand high winds
		47	Installed a check valve on my sewer lateral pipe
		34	Applied flood-proofing coatings or sealants
217	Graded my lawn away from my house/business (to minimize pooling of water adjacent to the structure)	11	Elevated my home/business on pilings or piers
204	Installed a sump pump or foundation vents	4	(for home/office renters) Discussed the benefit of some of the above items with landlord

Thank you for participating in the Town of Barrington 2022 Hazard Mitigation & Flood Management Plan Public Opinion Survey. Your responses are very important! Survey results will be used by the Project Steering Committee to guide and focus mitigation planning efforts. A summary of the survey results will be included as an Appendix to the Plan.

** 7. What should the Town of Barrington do to mitigate natural hazards in the future?

Total Comments - 247

- 1) There are always steps that the Town and residents can take to better prepare ourselves and to lessen the impacts of natural hazards. The Town should make sure that information on what can be done is communicated to residents.
- 2) I am glad our Town Manager and Town Council recognize the importance of making plans and implementing the plans that will make our community safer.
- 3) I am glad our Town Council and administration are focused on hazard mitigation. It is important for the long-term resilience of our community. Thank you.
- 4) Build appx. 3' seawall to keep water from roads. Consider seawall at all edges of town, working with property owners to determine best specific locations, and eg.on northside of town beach parking lot.
- 5) YIKES. I only skimmed the UPenn report. Restore marshland areas, create basins to hold water, ensure that Police, Fire, schools are in protected areas. Plan emergency exits, raise roads where needed. Plant windbreaks to lessen areas that are subject to high winds. Learn from other cultures like the Dutch who have had to deal with flooding?
- 6) Improve drainage on roads and clear trees from power lines.
- 7) Reduce parking lots, no more new asphalt driveways, preserve and enlarge marshes + wetlands, improve drainage, clean out old storm drains, dig out old stream beds so they flow better
- 8) continuous monitoring and planning; repair of bridges over Barrington and Warren rivers
- 9) It's a world-wide problem. Barrington acting alone can not do much...
- 10) Because our community is overall well-educated, I think most people read from enough reputable sources to understand that humans have impacted the climate and that our collective impact may cause communities to experience more severe weather. I am happy the Town is doing the HM&FMP as it is important for the community to understand what the potential hazard impacts are and some of the things we can do to lessen the impacts.
- 11) I don't think there is anything we can do that will impactful and have a net benefit
- 12) Nothing
- 13) Nothing should be done. Waste of Taxpayer funds!
- 14) First priority is to protect public utilities (water/sewer/gas/electric) and roads/bridges.
- 15) Help People protect property against sea Level rise
- 16) Notify residents about what is currently being done (when/where), and what are the plans with respect to the increase of danger due to climate change factors
- 17) 1) Eliminate the trash in/trash out policy and instead make more trash cans available. This will lessen pollution. 2) Think about every future development and its environmental impact (for instance, do not cut down 40 trees in Haines Park to install ballfields, 3) Stop the development of housing on undeveloped land, 4) Fix what is currently broken (e.g., bike path bridge), 5) Eliminate the use of all chemical fertilizers and adopt an organic approach instead, 6) Continue to nurture the town tree nursery , 7) Prohibit the use of gas-powered leaf blowers.
- 18) Update electrical infrastructure to minimize wind and snow outages. Asses shorelines and build barriers to minimize flooding as needed. Verify that sewers can handle greater demand for storm drainage. In short, anything to keep half the town from being swallowed by the river/bay.
- 19) Get ahead of concerns TODAY. Make smart investments TODAY along the shoreline to mitigate flood risk especially investing in public roads, bridges and utilities. Have a PLAN for evacuation.
- 20) Shore line mitigation, support residents to implement ways to preserve shore line and reduce flood. Traffic safety at major intersections. Road condition maintenance to decrease dips/holes on roads that would impact vehicles and households residing next to the main road.
- 21) Stop development within flood zones; move town resources out of flood zones
- 22) Preserve as much undeveloped land as possible. Return some developed land back into undeveloped land, if possible, specifically in flood-prone areas. Increase vigilance around power lines.
- 23) have a plan to shore up the shoreline and to mitigate flood possibilities on the coast and all vulnerable rivers, ponds (Brickyard)
- 24) I don't know enough about barriers and levees to comment on this, but I'm interested in learning more.
- 25) Prevent construction in flood prone areas. Assure that evacuation routes such as RT 114, County Road are maintained above the predicted flood levels.
- 26) Plant more trees, have more natural open spaces
- 27) Make a list of biggest priorities that could have the biggest impact on the town and start using engineers to build or reinforce structures, roads, etc to handle floods and storms.
- 28) Create potential scenario simulations and invest in mitigation / preventative measures in advance.

- 29) Obtain existing plans from similarly situated towns/cities in Mass, RI, MD, Delaware, etc. that are ahead of Barrington's planning stages. Identify if any are recognized as "best practices". In some cases, relevant plans may already exist.
- 30) Wetland management
- 31) Perform regular maintenance and/or repair of trees (especially near power lines), roads (including pavement and potholes) and wetlands and woods (e.g., removing dead and damaged trees and invasive species such as Chinese Bittersweet).
- 32) stop residential single home building
- 33) Create a plan ahead of time so we are out in front of a natural hazard and not chasing it.
- 34) Do without the massive fossil fuel inputs (and petrochemical inputs) provide for its basic agricultural needs and reconstruct the economy based on organic agriculture and the development of equitable ecological science, creating a better society for humans and more than human beings.
- 35) Restrict new building and population growth. Preserve open spaces, woods, beaches, wetlands. Enforce littering and speed laws.
- 36) this plan is a great start. We need to stop developers from developing property in flood zones and crowding properties.
- 37) Move power lines underground to decrease problems caused by high winds/power outages. Do not allow new construction in flood zones.
- 38) work on establishing water runoff areas to absorb flooding, like where the boat dock is on County Road
- 39) Revise zoning-put a stop to waterfront development or improvements - harden infrastructure
- 40) There needs to be a plan to address possible flooding of rt 114. I do not technically live in the floods zones, but the property behind me is in one - in a neighborhood off 114. The town needs a long range plan of what to do if 114 cannot be used as a safe evacuation route. Also, the go to place for me to find info about things going on is the Barrington Community facebook group. I don't think this is the best, because many people might not know about it and it relies on people reposting the town's news. I follow the town on facebook but the algorithm doesn't ever show me updates. You can see how information doesn't get disseminated effectively by noting how many people put their trash out incorrectly when there has been a change to the collection schedule.
- 41) Advanced planning and education of residents.
- 42) Build up sea walls and protections from a rise in sea level. Better street tree trimming and removal.
- 43) Ensure electrical supply is interrupted to operate sump pumps, etc.
- 44) Plan
- 45) nothing
- 46) make a better plan for evacuation
- 47) Ban =Gas Leaf Blowers to start with.
- 48) Latham Park needs a protective jetty like it's neighbor across the cove in Riverside. 18 years ago I asked if the Army corps of engineers could be involved. I was told by the town Council it would take at least 10 years to begin something of that magnitude. Well here we are , it could've been completed by now and we would not be worrying about erosion. Enough money has been spent in beautification. Stick with sea grass, every other planting has succumbed to salt air winds and salt water. That's a lot of tax dollars! Who the heck is doing the research??
- 49) Build proper seawall at Latham park
- 50) Clean the culvert in the woods off of Bittersweet. It is severely clogged and is cause for basement flooding
- 51) Not sure but I do know the 5 P's. Proper planning prevents poor performance.
- 52) Have clear, concise emergency action plans for each region of town.
- 53) Look to low lying European countries like the Netherlands for ideas
- 54) Nada
- 55) Consider building sea walls.
- 56) Public information Stop issuing new building permits in flood zones Understand that flood insurance will not be affordable if more than half of the structures in town will be inundated with the next 100 year storm event.
- 57) capital planning and project management with lots of planning
- 58) Study the science and be proactive not reactive to changing conditions.
- 59) Stop putting public assets like the Police Station in a lowland
- 60) You should not have built the Middle School and Police/Fire Station in a Flood Plain
- 61) Please cut back the trees in the Hampden Meadows area. Trees are constantly falling down in the area.
- 62) Come on, y'all know there is nothing that we can do locally.
- 63) Aggressively work to remediate invasive plant species (potential fire hazards, also dramatically impacts property values & town tax base)...
- 64) 1) EXPECT that they will occur, sometime. Better to be wrong about this with a plan than vice-versa
- 65) uncertain.
- 66) Install and maintain natural barriers to floods

- 67) It seems it would be reasonably straightforward to use Washington Road as a flood barrier. When you look at the flood map it is apparent that the AE12 flooding risk of much of the town arises from water entering from the Bay at Washington road, and then spreading from there. If the culvert underneath Washington road had a flood gate that could be closed when a hurricane is approaching then I believe much of the risk could be eliminated. This would also save a huge amount on everyone's flood insurance bill.
- 68) Increase DPW staff members
- 69) Organize groups of volunteers to assist emergency responders and social services with identifying and helping vulnerable neighbors (elderly, disabled, families with very young children).
- 70) 1.) Develop a clear plan. 1a.) spend more time developing our critical infrastructure. Get power lines underground, build our storm walls, fix our bike path bridges. Invest in our community. 2.) Execute -41 Hawthorne
- 71) Not a damn thing because you are just pushing the leftist climate change hysteria-for-profit and control. Go away.
- 72) Increase heights of sea walls around the Barrington River. Provide assistance to residence to make flood prone homes more resilient. Ease waterfront permit restrictions for homeowners looking to fortify properties against sea level rise.
- 73) More trash cans/recycling/compost, beach clean ups, incentives to keep the community clean, repair infrastructure, encourage more walking/biking, flood prevention methods
- 74) Work to establish a comprehensive plan and develop an integrated warning/communication system.
- 75) Town should be connected with FEMA and its RI counterpart so as to coordinate policies/strategies/solutions
- 76) Plan ahead for how to cope with catastrophes
- 77) Consider small production wind and solar power for need based services in the event of outages. Collaborate with inland city or town for evacuation and shelter needs. Plan for wind---as opportunity and threat. Incentivize energy conservation. Identify and protect vulnerable residents. Educate residents and builders about best practices in building and maintaining sustainable residences.
- 78) Don't dump money into something we can't control.
- 79) The town is built in a low-lying area, with areas that were swampland before the town was built out. Climate change is a global issue, the impacts local. Not much can be done to reverse climate change, though hopefully we can slow it. Prohibiting new building in flood prone areas and slowing growth throughout town, while restoring natural areas and reducing human impact on the land are likely the best mitigation tools we have.
- 80) Work with the state and fed resources to have a town emergency plan in place. Beyond that it is up to each home owner to mitigate exposures when possible.
- 81) Hire the appropriate engineers who are experts to help us be proactive to identify and mitigate these potential issues.
- 82) Start by not allowing new structures to be built in high risk flood zones
- 83) my lot was in AF 12 flood zone which was not a choice don't reinvent wheel. follow established published best practices. be a fiduciary for the town, not individuals
- 84) Lobby for federal / state money. Do not ask the tax payers so you can go on some high and mighty left wing climate change spending spree. The council isn't qualified and should not be wasting tax payer money period.
- 85) At the very least, allow no building in designated flood zones.
- 86) The town should consider proactively planning for managed retreat in Hampden Meadows and in other area that are especially vulnerable to SLR. Hampden Meadows in particular is locked in by transportation infrastructure that will be inundated by SLR. However other sub areas are also vulnerable. RT 114 endangers the entire town with its bridges among the most endangered in the state (DOT analysis) and Wampanoag Trail likely to last until the 30s or 40s at the latest. The Town needs to be creative in identifying the high ground and ensuring that all critical infrastructure is resilient and can operate in a high (12 ft by 2100) SLR scenario. Any new Town infrastructure needs to be built so that it has resilient power designed (including geothermal, battery, solar) and that it can withstand SLR.
- 87) Work with various environmental agencies to prepare for hazardous weather and flooding by using scientific based approaches that will protect the environment, people and homes in Barrington. Study other coastal areas of the country to see what they have done to mitigate natural hazards and determine if they have worked.
- 88) Having a climate plan would be helpful to identify projects and educational campaign to inform citizens of what changes they can consider making would be helpful as well.
- 89) Create a committee to work with CRM and other entities to help property owners make sensible improvements to the coastline.
- 90) improve our roads and egress points from the town, as well as likely points of traffic congestion that arises from the need for neighboring communities to travel through our town. Mitigate sea-level rise how we can by fixing eroded marshlands (dredge silt back onto the marshlands) and shorelines. Speed up removal of damaged, overgrown and neglected trees on town property edges along all streets so as to reduce utility down-time during storms and reduce likelihood that these trees will impact power and communications. Push back on the outrageous cost of water from Bristol County Water Authority (we residents pay 3x more than what some communities pay annually).

- 91) prepare now
- 92) Strong Zoning Laws. Keep wild areas in lower levels of the flood plain. Harden electrical and cable grid. Push state to mandate this. Cell towers, food stores etc are useless when the cables & poles go down. What's the point of going to a website for information if the internet is down. In an emergency WE NEED RADIOS!!! TV stations need to be on the radio as well like it used to be. Once again coordination with other entities. If cell towers go your phone is useless. Review Evacuation Centers and Evac routes to high ground. Will New Meadow into Seekonk get flooded leaving The Meadows and Sowams an Island. NOTE: 4 items in #8 rely on the internet working. OK before hand but how about during and after. Radio??? Low power FM from Police Station???
- 93) Plant trees. Do not encourage building in risk area.
- 94) nothing - the flood maps already reflect the risk and homeowner and property owners are responsible for their own properties. This sure sounds like the beginning of more overreach by this crazy town council and management.
- 95) Build up storm walls in key areas of coastal flooding.
- 96) Well, this is a loaded question that cannot be answered via a survey.
- 97) Higher sea wall, especially on river facing streets
- 98) I live in the home I grew up in. We had way more flooding at the end of my street than I have seen in the 25 years I have moved back here.
- 99) Ban subsidized private building and major reconstruction in flood prone areas
- 100) Ban all new construction if not net zero Plant more trees Protect undeveloped areas
- 101) Stop spending our tax money to fix a problem that cannot be fixed locally
- 102) REMOVE ALL TREES NEAR POWER LINES!! UPDATE THE TOWN'S HAZARD MITIGATION PLAN.
- 103) There is nothing we can do here that will have ANY impact. Get over yourselves
- 104) Burying electrical lines would mitigate Loss of electricity several times a year. Protect existing property from flood with walls etc.
- 105) The biggest threat within the next 20 years is climate change, which I assume this survey is mostly about given your identification of flooding hazards. An obvious response by the town is to advocate environmental conservation through more detailed education about factors such as air pollution (switch to electric mowers/trimmers), car fuel efficiency (electric vehicles), reassurances or implementation of recycling (is our curb recycling actually recycled or just landfill deposited?), and also perhaps incentives for residence to become more electric, fuel, and recycling conscious and choices to have less negative impact. Are there ways to also mitigate flooding affects- dams, water channeling with new viaducts or pumping stations? The best defense against disasters is to prevent them, obviously.
- 106) Flood prevention techniques
- 107) Support climate change initiatives
- 108) Modernize power and utility lines. Inspect drain systems on roads.
- 109) Inspect underground fuel tanks. There has been a recent fuel oil spill in our neighborhood which put aquifer and property at risk.
- 110) Listen to experts in the field and start to take action now.
- 111) Hire people with the appropriate credentials to start taking immediate action. It seems like we are running out of time!
- 112) Get rid of the entire school committee ! And stop the BS on Town Council. They were elected to care for their constituents - they've turned into I've got mine - screw you on getting yours. Small Town thinking.
- 113) There are trees in the creek of the bike path (our area 260 Washington RD) that have lost their stability due to erosion. Roots are very visible and the trees are leaning toward homes. My house was hit with a tree from the creek during a storm. There is a tree that scares me...as it is leaning now toward my bedroom . If it loosened due to rain or wind..and I was asleep, it could kill me. I think careful attention is needed to cut some of the huge trees down.
- 114) We will need new bridges to get out of town and to airport
- 115) Maintain a robust reactionary capability for rescuing people from flooded areas. Maintain a strong ability to repair infrastructure of roads and bridges. Identify ahead of time which roads might be have low enough use that they should not be repaved if damaged in order to save on reconstruction costs (ie, turn lightly used roads into dirt roads). Talk with other towns and the state of RI about building a Venice-style barrier between Newport, Jamestown and Narragansett to keep out floodwaters.
- 116) review & plan for flooding; protect remaining wetlands
- 117) Game plan likely scenarios and communicate plans for different scenarios to residents (both for readiness purposes and to educate residents about risks)
- 118) Consult professionals who have expertise in this area. Start budgeting for these services and things they might recommend
- 119) Make changes according to Fed/State guidelines.
- 120) Alternate routes out of town besides 114. Flood escape routes. Do NOT communicate to the community via Facebook and Twitter only. It forces people to be on platforms they otherwise would not want to be on.

- 121) do our best as a community to combat climate change which will significantly affect us all in the coming years. Encourage climate friendly transportation options, green buildings, locally sourced and grown food, environmentally friendly packaging (i.e. no single use plastics). Also I'd just say it's important to anticipate disasters/dedicate funding in advance and not wait for them to occur and be reactive. Does it really matter what residents think are the most important disasters to mitigate, since this may not reflect actual needs of our community and is very subjective? Have you performed a Hazard Vulnerability Analysis? That seems like a better tool to use to prioritize our needs.
- 122) This plan. More improvements to infrastructure as a share of overall budget.
- 123) Reduce paved surfaces, build bioswales, provide grants and loans to support weatherization upgrades. Relocate critical infrastructure, limit development in affected areas, and start buying up land in most flood prone areas.
- 124) tax proportions to flood and wind prevention. Especially to aid tree management companies in trimming branches around or near wires and removing old/dead trees
- 125) constructing natural barriers to flooding
- 126) Underground utilities Don't allow more building in flood zones
- 127) I have no idea.
- 128) Stop building in or near SFHA zones.
- 129) Reopen Covid testing center, create emergency notification system for residents
- 130) Do not issue building permits for flood zone areas. Raise County Road. Plan for flooding at High School and Downtown shopping area.
- 131) We'll need some type of wall next to 100 acre cove or some way to elevate County Road.
- 132) Have a written response plan in place for each area of concern. Secure resources at the firehouse, police station and DPW like Emergency response vehicles and boats to help in times of crisis.
- 133) Nothing we can do.
- 134) Construct a single 40 story skyscraper and move into it, allowing all the other land in town to turn fallow and go back to 1630.
- 135) It is difficult to say related to homes so close to the water? I honestly do not have an answer other than homeowners raising their properties. Businesses also? Potentially get federal government support to subsidize homeowners to help them get out of potential flood areas.
- 136) Build up the wetlands surrounding the coastal areas
- 137) Nothing we can do. Plant more grass at the beach.
- 138) Build Tree Houses!
- 139) Employ experts
- 140) I believe that the DPW does a good job.
- 141) Move the power lines to underground. We lose power so often when it's windy, snowy, rainy, or even sunny. It's a shame!
- 142) Become vegans!
- 143) 1. Invest in renewable energy. 2. Provide more substantive tax break for renewable energy alternatives e.g. solar. 3. Support hybrid or better fully electric vehicles. 4. Continue to invest/teach science based education/technology.
- 144) Ensure that roads and evacuation routes can remain functional if an evacuation were needed for flooding, hurricane, etc
- 145) Limit building of new homes. So much natural habitat on Adams Point Rd. (my street) was just cleared for yet another home. Not only does this impact animal habitats, but it also impacts plants and ecological features that protect us from flooding.
- 146) Be prepared!
- 147) Hire professionals who are specialists in this field. I have no experience in this field, therefore I do not know what needs to be done to mitigate natural hazards.
- 148) Restore wetlands, less impermeable surfaces
- 149) Under road wires?
- 150) There is a blocked/plugged culvert on Bittersweet that helps drain the water - if this was unblocked it could help with drainage in that area.
- 151) A comprehensive plan to mitigate flood risks should include consideration of reinforcing existing shorelines and/or creation of barriers. Future buildings should be elevated and/or more leeway given to residents to allow elevation of buildings. Consideration of new building and zoning rules to prevent additional development of impacted areas. Consider tax incentives and other grants to encourage sustainable building.
- 152) Elect Republican Town Council
- 153) Pray!
- 154) Stop building homes on every plot of land that becomes available and instead preserve it as open space.
- 155) going to alternative energy - subsidize solar panels for homes and electrical charging stations - convert town electricity to solar. Mitigations for the coastal houses
- 156) Update the sewer system

- 157) Protect and create more areas (wetlands/conservation) that mitigate coastal and river flooding. Educate and assist residents on ways to protect their homes. Eg. Elevate homes in most vulnerable areas.
- 158) Update the flooding zones to reflect climate change. Do not allow construction in areas expected to flood in less than 100 years. Require employees of the town of Barrington to be vaccinated against Covid.
- 159) Start construction of a wall to block rising water.
- 160) Stop building in flood plains. The police station should never have been built where it is!
- 161) We are but a drop in a vast ocean...
- 162) Nothing we can do
- 163) Make power, water, sewer more resilient; improve early warning systems, and clear evacuation routes; begin process of retracting or relocating residences and businesses from locations vulnerable to flooding; implement building standards to withstand wind, rain, floods. Also consider building seawall barriers and raising land levels with fill.
- 164) I think you are doing it!!
- 165) Encourage solar and wind usage by it resident, business, and public entities. Discourage development on coastal areas and around/on wetland. Encourage and create more protected, undeveloped areas.
- 166) ?
- 167) Focus on coastal mitigation/conservation as flooding would seem to be the highest likely effect of climate change and severe storms
- 168) Address flood hazards
- 169) Build Break Walls
- 170) Don't panic.
- 171) It's nature, you cannot change it. It's where we are
- 172) Start building flood walls along sides of main tributaries
- 173) Set up a disaster fund and contribute annually to help save for the inevitable. The town can use these resources to help when needs arise. Have future discussions to help raise awareness of this possibility, and publish the 2020 flood plain chart so the word gets out that this could happen.
- 174) Address the "wall" on Mathewson Lane. Build higher to mitigate/prevent flood water from washing over. Plan for erosion on rt 114 coming into town from E.P. (raise level of the road, think about a bridge in the future?)
- 175) maintenance of drainage systems. Tree pruning to limit power outages.
- 176) Repair the roads and bury the power lines.
- 177) begin planning for changes/moves for roads and homes that are at or close to current sea level
- 178) Get over it folks, there is nothing we can do that is affordable.
- 179) You cannot control nature. Stop spending my money to fool yourself
- 180) Nothing
- 181) There is nothing the Town can do. Get over it!
- 182) not sure
- 183) Please stop finding ways to spend tax dollars.
- 184) The biggest would be minimizing risks from coastal flooding as more likely to get continued hurricane/tropical storms and more rain in general. It's New England and not sure how you minimize winter storms other than putting the power lines underground.
- 185) Compulsory tree pruning, shelters with back up power.
- 186) Professionals should decide
- 187) consider walls along Hundred Acre Cove
- 188) start planning now for a carefully planned retreat from the coastline; clearly this is going to be really difficult (and costly), but better to start planning now then wait until we're in a crisis
- 189) I don't know.
- 190) Stop building new houses, this taxes the water supply and this has severe environmental impact
- 191) Prepare to assist residents in case of natural disasters. Due to much of Barrington being built in low lying areas in the past, not much can be done that is economically feasible. Any Future building if any type should take into consideration the possibility of flooding.
- 192) You are headed in the right direction by forming a committee. That's a start.
- 193) Continue doing the great work they are doing. Let us know how we can help.
- 194) Stop the reduction of wetlands however small on private property especially. Restore wetlands as much as possible. No building in flood prone areas, municipal, business or private residences.
- 195) Deny construction permitting for vulnerable areas.
- 196) Is a sea wall a possibility?
- 197) Raising and regrading the Mathewson Rd.- Ferry Lane corner area which floods on many Spring tides. Paving the road would also be a good idea. The paving of roads in RI no longer seems a priority for Towns and the State. Rt. 114 from Providence to Newport is an embarrassment.

- 198) Prepare! Keep up with current mitigation strategies! Plant more trees and do not let people cut them down without a fine.
- 199) Barrington should start building flood prevention structures (e.g., sea walls) and MUCH better drainage right away. Homes, businesses, and public services are at extreme risk of climate change-induced flooding. My family's home is at risk -- I can't afford for catastrophe to strike our lives and financial security because I moved to Barrington.
- 200) I'm not an engineer I don't know.
- 201) If possible, implement reasonable preventative measures
- 202) apply the law = mask mandate- No leaf burning- and add extreme environmental laws.
- 203) Find a plan to mitigate flooding
- 204) provide subsidies or tax rebates for homeowners who want to buy generators, elevate home on stilts, or do other things to mitigate natural hazards
- 205) Apply for federal grants for prevention
- 206) Focus on the rising sea level.
- 207) Build a sea barrier against floods together with the State of RI
- 208) Increase height of sea walls.
- 209) Provide property owners with information about grants and subsidies to help disaster-proof their homes, especially against flooding, which has the potential to impact so much of Barrington.
- 210) Don't know.
- 211) grants for home elevation; a concrete sea wall all around Latham park all the way to the end of Shore Dr. (like the one along the beach in Lynn, MA)
- 212) Continue restoration of natural wetlands to "absorb" the risk from rising sea levels.
- 213) Everything we can, up to and including managed retreat for threatened properties. Flooding in hampden meadows is a serious serious issue.
- 214) Build and maintain ways to prevent the rivers from flooding into the town
- 215) Raise County Road.
- 216) Do Nothing. The Town cannot control it, and we cannot afford it! STOP the madness
- 217) Trim trees along power lines Bolster bridges, embankments on rivers Improve upon sewer systems nearest rivers.
- 218) Consider appropriate hazardous mitigation - evac plans, shoring up vital infrastructure such as roads, focus on coastal preservation, change zoning to prioritize coastal preservation over development
- 219) I wish I knew!
- 220) They should do everything possible to reduce the town's carbon foot-print... NOW! And encourage the citizens to do the same with creative tax-breaks and other incentives ... NOW! The town should not harden the shoreline against rising sea levels. That is a fruitless endeavor and a gross misdirection of funds that should be used to reduce the towns carbon foot-print... NOW!

- 221) Protect shoreline habitat that buffers storm impacts (e.g. salt marshes) Relocate homes and business in the floodplain Consider climate change scenarios in town planning Assess vulnerability of critical facilities, transportation, utilities
- 222) Urge state to ensure escape paths for hurricanes are viable and available. We shouldn't have to worry if 114 is going to be flooded.
- 223) everything possible.
- 224) Explore flood mitigation measures and renewable energy strategies
- 225) Look ahead and make necessary changes now. Perhaps we can take lessons from the Netherlands and their dyke systems that help preserve their lands from flooding. The Dutch are masters of land preservation. Dykes around towns create great bike paths and protect towns and villages from flooding. Participate in creating a Citizens Emergency response team and train town volunteers. FEMA may still offer grant \$\$for this. This is offered and ongoing in Massachusetts. Keep an undated list of all seniors in town as well as handicapped individuals and reach out to them following a major storm. I live on Appian Way and we have NO cell phone service in our area through any carrier. This needs to be addressed. In a major storm, we have NO means of calling for any help if needed People need to worry less about their water views and be more concerned about damage from future major storms
- 226) More to mitigate flooding on Hampden Meadows Road along the water during Lunar Tide. Additional work should be done to protect Rte. 114 along Hundred Acre Cove. Lastly, the area around the Yacht Club needs to be either rezoned for elevated structures, or shored up.
- 227) Reinforce sea wall between allins cove and Latham park. Focus on renewables and sustainability.
- 228) Army Corp Of Engineers should consider building a barrier wall and hurricane barrier like New Bedford across the Warren river from Rumstick Pt Barrington.
- 229) Seek federal funding to elevate private homes to reduce flood risks.
- 230) Trim trees away from wires, cut down old trees whose roots can cause trouble with sewer, gas and water lines. If we have a Hurricane we will be without power for 2+ weeks

- 231) Reduce polluted runoff to the bay/waterways, increase coastal natural protection and reduce coastal erosion (salt marsh, vegetation, trees), encourage native pollinator planting, encourage reduced lawn mowing and reduced lawn fertilizer use
- 232) require new driveways to be of porous material (e.g., gravel, pebbles, not tar or cement;). All government buildings should have solar panels. All rain grates in roads should be oriented so bicycle tire won't get snagged in them.
- 233) Identify any possible mitigation to prevent flooding.
- 234) Bury all power lines; take advantage of what the Dutch know about flood control:
https://en.wikipedia.org/wiki/Flood_control_in_the_Netherlands
- 235) Undertake a study to identify natural and man-made drainages & infrastructure; identify risks; assess whether drainages & infrastructure can withstand risk events; make improvements where necessary to eliminate inadequacies; stop ignoring the flood issues and inadequacies that already exist and have grown worse because of the Town's inattention.
- 236) Form a committee, research solutions and look at what other at risk areas are doing to mitigate dangers and finally, implement solutions. Last point is important and cannot be left undone. Barrington is one of the highest risk towns in the state and it doesn't appear that the town has taken any steps towards almost certain major and permanent flooding in the near future. Solutions may include helping homeowners to either elevate homes or move. Would likely also include changes to roadways to reduce flooding.
- 237) Its bigger than a Barrington issue. But certainly a review of infrastructure, and potential loss to utilities that could have longterm impact is in order.
- 238) Response for people who how to handle things after significant event such as tree damage, water damage etc. Concerned it will be each to his/her own and get taken advantage of by contractors, repair, tree services etc.
- 239) Communication.
- 240) Plan for salt marsh migration to protect coastal buffer zones, which will in turn protect road ways, homes, businesses, beaches, etc. Find ways to increase renewable energy use in Barrington and as an example for other communities to fight climate change. Support environmental education that teaches people how our wellbeing is inextricably linked to the health of the natural ecosystems (e.g., oxygen from plankton populations in healthy oceans), including the value of protected, undeveloped land. Focus on equity; not every resident of Barrington can afford to rebuild from the impacts of climate change and associated natural disasters. A community is only as resilient as its most vulnerable residents.
- 241) protect your natural infrastructure- e.g., salt marshes and adjacent migration pathways
- 242) Implement a plan, test the plan and revisit the plan every year following models from other coastal communities that have been impacted by hazards that shut down a community.
- 243) B alert
- 244) Invest in infrastructure that would lessen the damage from sea level rise/flooding.
- 245) Hold meetings once or twice annually and invite the media, send regular mailings to residents and businesses concerns the issues and threats town and state officials are monitoring and taking steps to address.
- 246) plan, communicate, and implement projects that reduce risk of losses
- 247) Educate the community on steps residents can take to better safeguard against the impacts from natural hazards.

Outreach Activity 4: Informational Posters

Informational Posters:

Several styles of posters were created with input from the Steering Committee, to publicize the project and the various ways that the public could become involved. Over 30 posters were put up around Town in high pedestrian traffic areas. The posters were also sent out to the Town departments; the school community via the School Superintendent; various other groups; and e-blasted to the Town's over 6000 i-Contact followers.

Town of Barrington
Hazard Mitigation & Flood Management Plan

*High School Students,
Parents, Teachers & Staff*

We need your help!

The Town of Barrington is working to become more resilient to flooding and other natural hazards. We are preparing a Hazard Mitigation & Flood Management Plan to minimize our community's risks. To help ensure the Plan reflects community priorities, we are asking residents, businesses, and others interested in the resilience of our community to share your opinions through an online survey.

ONLINE SURVEY

Take this quick online SURVEY to help us better understand your hazard concerns. Your input will guide and focus our mitigation activities to help lessen the impacts of future hazard events for you and your family. The survey will be available online until April 19, 2022 and should take under 10 minutes to complete.

You can access the survey by:

- scanning the QR code to the left
- by typing the survey link into your browser: <https://www.surveymonkey.com/r/LMKMFXT>
- through a link on the Project Webpage: <https://www.barrington.ri.gov/hazard-mitigation-flood-management>



*THANK
YOU!*

Example of
two of the
posters

Town of Barrington
Hazard Mitigation & Flood Management Plan

We need your help!

The Town of Barrington is working to become more resilient to flooding and other natural hazards. We are preparing a Hazard Mitigation & Flood Management Plan in Spring 2022 to minimize our community's risks. To help ensure the Plan reflects community priorities, we are asking residents, businesses, and others interested in the resilience of our community to share your opinions through an online survey.

ONLINE SURVEY

Take this quick online SURVEY to help us better understand your hazard concerns. Your input will guide and focus our mitigation activities to help lessen the impacts of future hazard events for you and your family. The survey will be available online until April 19, 2022 and should take under 10 minutes to complete. You can access the survey by scanning the QR code to the left, through a link on the Project webpage (below), or by typing into your browser: <https://www.surveymonkey.com/r/LMKMFXT>

TOWN WEBSITE – PROJECT WEBPAGE
Development of the Plan is overseen by a Steering Committee made up of Town staff, residents, and other stakeholders. The Steering Committee meetings, opportunities for public input and feedback, and other information about the Plan can be found on the Project Webpage: <https://www.barrington.ri.gov/hazard-mitigation-flood-management>

PUBLIC INFORMATION MEETING
A public meeting will be held on April 26, 2022 at 6:30pm hosted by the Resilience & Energy Committee. There will be a brief project presentation followed by an open discussion on the past occurrence of local natural hazards and potential future areas/issues of concern. The location and zoom link (if available) will be posted on the Town's website prior to the meeting.

*THANK
YOU!*



Outreach Activity 5: Newspaper Article

The following was published in the Barrington Times April 6, 2022 Edition.

Online Survey will help officials understand hazard concerns

Survey is part of hazard mitigation and flood management plan

The Town of Barrington needs your help.

Barrington is working to become more resilient to flooding and other natural hazards, and officials are currently preparing a hazard mitigation and flood management plan to minimize the community's risks.

To help ensure the plan reflects community priorities, officials are asking residents and businesses to share opinions and participate in the planning process. There are several ways people can become involved:

Project Webpage: A webpage (on the town's website) has been created to help inform the community about the plan and how residents, businesses, and others interested in Barrington's resilience to natural hazards can provide input and feedback. The webpage can be accessed at <https://www.barrington.ri.gov/hazard-mitigation-flood-management>

Steering committee meetings: Development of the plan is overseen by a steering committee made up of town staff, residents, local business, and other stakeholders. The committee meetings are posted on the project webpage and the town's upcoming meeting calendar. All meetings are open to the public with both a ZOOM and in-person attendance option.

Online survey: People can take a quick online survey to help officials better understand hazard concerns. Input will guide and focus mitigation activities to help lessen the impacts of future hazard events. The survey will be available online through April 19 and should take less than 10 minutes to complete. People can access the survey at <https://www.barrington.ri.gov/hazard-mitigation-flood-management>

Public Information Meeting: Two public informational meetings are scheduled – the first will be held on April 26 at 6:30pm, hosted by the Resilience & Energy Committee, and the second is on May 10 at 7pm hosted by the Conservation Commission. Additional information on these meetings will be posted on the project webpage.

Outreach Activity 6: Public Information Meeting

A public meeting hosted by the Resilience & Energy Committee was held on April 26, 2022 to promote discussion among R&E committee members and other attendees about creating a safer, more resilient community and to solicit input for consideration and integration into the development of the Plan; particularly past occurrence of local natural hazards and potential future areas/issues of concern. The Town's Project Consultant gave a PowerPoint presentation followed by an open discussion/Q&A period.

What is hazard mitigation and why do we need a Plan?

Hazard Mitigation is defined as any sustained action taken to reduce or eliminate the long-term risk to life and property from hazard events.



Why Create a Hazard Mitigation Plan?

- By planning ahead Barrington becomes pro-active rather than reactive
- Helps the community identify goals to prepare and adapt to changing hazards and vulnerabilities
- Provides an opportunity to prioritize preventative measures (projects, initiatives, policies) to reduce property damage and loss of life associated with natural hazards; and to expedite disaster recovery
- Provides an opportunity to engage/educate the community to risks associated with natural hazards
- Saves the community money by instituting mitigation measures to protect against natural hazards
- Eligible for FEMA Funding

**Example of
two of the
slides**

Why expand the Plan to include Flood Management?

- With extensive coastline (nearly 20 miles) and vast floodplain areas, Barrington is one of Rhode Island's most vulnerable communities to the impacts from flooding
- Flood risks will continue to grow in the coming decades due to sea level rise and other anticipated deleterious effects of climate change
- The Town intends to participate in the Community Rating System (CRS) Program
- Creating the Plan based on the CRS planning process for floodplain management allows the Town to maximize CRS credit for this process, which has the potential of reducing premiums for residents and businesses who purchase flood insurance through NFIP



Coastal Flooding
East Bank of
Barrington River, Day
Before Hurricane Irene
November 2011

Outreach Activity 7: Press Release

The following was published in the Barrington Times May 18, 2022 Edition.

Hazard mitigation plan goes up for review soon

Public hearing set for June 14

In accordance with the Federal Disaster Mitigation Act of 2000, the Town of Barrington is updating its hazard mitigation plan and seeking feedback from the public.

The Town will make a draft of the plan available to the public for input during a three-week public review period. There will also be a public hearing. The public review period begins May 24 and ends June 14. The hearing is scheduled for June 14 at 7pm in the town hall.

The draft plan is an update to the town's 2017 plan and provides a mitigation strategy roadmap for the next five years. It was completed under the guidance of a steering committee consisting of town staff, residents, and other stakeholders. The plan also integrates comments and input from the community. More than 440 people submitted responses to a public opinion survey distributed in April. More than half of the respondents included comments and recommendations that have been reviewed and considered. Many suggestions are recognized in the 2022 Action Plan.

The overall purpose of the plan is to strengthen the town's resilience to various natural hazards, including flooding and hurricanes. It identifies vulnerabilities that include updated climate change predictions and rising sea levels, as Barrington has 20 miles of coastline and seven square miles of water.

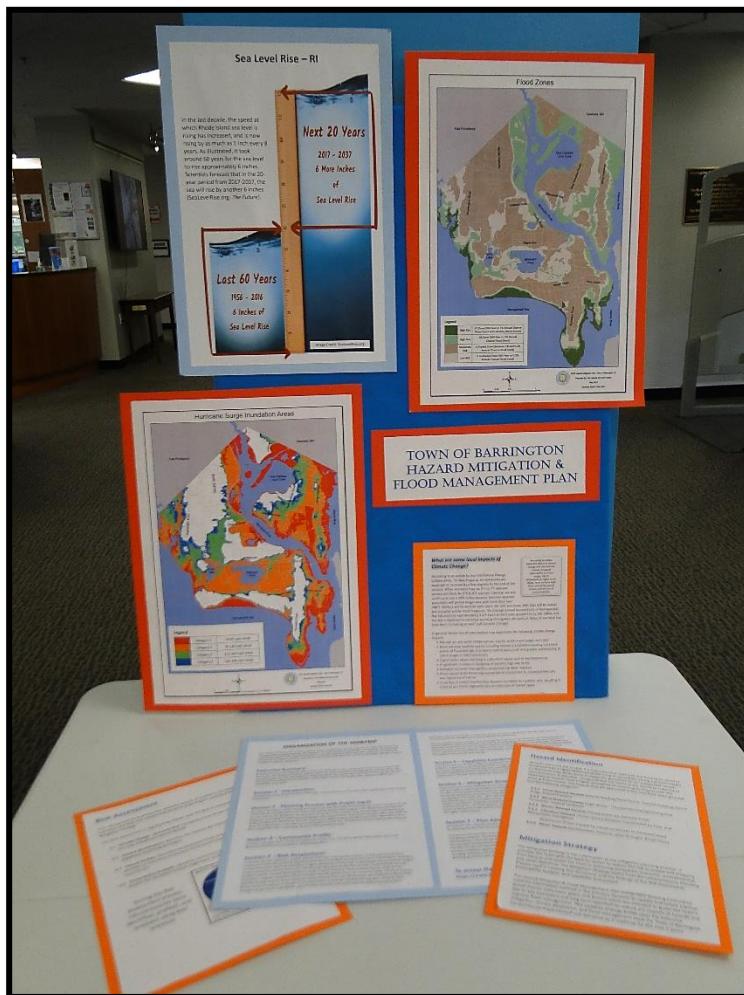
Between May 24 and June 14, an online version of the draft plan will be available on the town's website (<https://www.barrington.ri.gov/hazard-mitigation-flood-management>) with a hard copy available for review at the town clerk's office. For those individuals who cannot attend the public hearing and want to provide written comments, please submit them by June 10 to: Teresa Crean, Director of Planning, Building & Resiliency, Town Hall, 283 County Road, Barrington, RI or via email: tcrean@barrington.ri.gov.

Outreach Activity 8: Disseminate Public Review Draft (Public Review Period)

The *PR Draft* was posted on the Town's website (with a hard copy available for viewing at the Town Clerk's Office) on May 24, 2022, initiating a three-week public review period which allowed the community and stakeholders ample time to read, evaluate, and provide input or feedback on the *PR Draft* prior to or at the Public Hearing (June 14, 2022). Publicity for the *PR Draft* was included in Outreach Activities 7 & 9, and through an email blast to the community and an email sent to the groups, agencies, and organizations listed in **Appendix 2-3**.

Outreach Activity 9: Kiosk at the Public Library

A kiosk was set up at the Barrington Public Library to publicize that the *PR Draft* was available to the public-at-large and encourage the community to provide input and feedback either prior to or at the Public Hearing. As shown below, key maps and other material was provided. The kiosk remained from May 26-June 15, 2022.



Outreach Activity 10: Public Hearing

At the end of the 3-week *Public Review Period*, a Public Hearing was held hosted by the Conservation Commission. The Public Hearing was widely advertised (including a press release in the Barrington Times, information on the Town's website, a kiosk at the Barrington Library, an email to the groups, agencies, and organizations listed in **Appendix 2-3**, and a Public Hearing legal notice in the May 25 and June 8, 2022 editions of the Barrington Times), to provide an opportunity for the general public, neighboring jurisdictions, and other stakeholders to provide pre-adoption input and feedback of the *Draft HM&FMP*.

At the Public Hearing, the Town's Consultant directed a Power Point presentation providing an overview the benefits of a HM&FMP, how the *Plan* was prepared, the hazards included, what is at risk, the proposed *Action Plan* to mitigate risks, and *Plan* implementation. A public comment/question-and-answer session followed the presentation providing the public the opportunity to give input and feedback.

Kim Jacobs
Civil Engineer & Resilience
Planning Consultant

Town of Barrington

Hazard Mitigation & Flood
Management (HM&FM) Plan

Public Hearing Agenda

- What is hazard mitigation and why do we need a Plan?
- How was the Plan prepared?
- What hazards are included in the Plan?
 - What is at risk?
- How do we mitigate these hazards?
 - How is the Plan implemented?
- Public comment/Q&A Session

KMJ - CE/RF

Example of
two of the
slides

What hazards are included in the Plan?

Flood-Related Hazards (Inland Flooding, Coastal Flooding/Storm Surge, Coastal Erosion)
Wind-Related Hazards (High Winds, Tornadoes, Tropical Cyclones)
Winter-Related Hazards (Heavy Snow, Ice, Extreme Cold)
Infectious Disease-Related Hazards (Vector-borne Diseases Transmitted by Ticks and Mosquitoes, Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses)
Other Hazards (Earthquakes, Extreme Heat, Drought, Brush Fires)

Climate Change (including SLR)

- For the foreseeable future, climate change (including sea level rise) will have a significant impact locally, nationally, and globally
- In the Plan, climate change is recognized as a present threat and an ongoing amplifier to some of the natural hazards

For each hazard the assessment considered:

- Location (geographic areas affected)
- Extent (strength or magnitude of impact)
- Past events
- Climate change impacts
- Probability of future events

APPENDIX 2-3

Coordination with Agencies & Organizations

Appendix 2-3

Coordination with Agencies & Organizations

The Steering Committee recognized that the planning process would be greatly enhanced by inviting local, regional, state, and federal agencies and organizations to participate in the process. As indicated in the following Table, the Town coordinated with **16 local government & school district groups, as well as 33 agencies and organizations outside of Barrington's governmental structure**. Coordination with these key groups was initiated at the beginning of the planning process through an email informing them of the development of the *Plan* and welcoming them to provide information or opinions and participate in meetings or other outreach activities. A second email was sent during the *Public Review Period* to provide the opportunity for pre-adoption review of the *HM&FMP*.

Coordination with Agencies & Organizations

Local Government & School District (16)		
Organization (alphabetized)	Contact	Email Address
Barrington School Committee	Gina Bae, Chair	
Barrington School District	Mike Messore, Superintendent	
Bristol County Water Authority	Allan Klepper, Chair	
Building Board of Review	Thomas Billups, Chair	
Conservation Commission	Douglas Materne, Chair	
Diversity, Equity, & Inclusion Committee	Braxton Howard Medlin, Chair	
Economic Development Commission	Matthew Amaral, Chair	
Harbor Commission	Nelson Hawkins Jr., Chair	
Housing Board of Trustees	Carla DeStefano, Chair	
Open Space Committee	Kelly Chinners Reiss, Chair	
Park & Recreation Commission	Michael Seward, Chair	
Planning Board	Roni Phipps, Vice Chair	
Resilience & Energy Committee	Lynne Carter, Chair	
Senior Services Advisory Board	Erin Paquette, Chair	
Town Council	Michael Carroll, President	
Zoning Board of Review/Appeals	Thomas Kraig, Chair	
Agencies & Organizations Outside the Community's Governmental Structure (33)		
Organization (alphabetized)	Contact	Email Address
Barrington Land Conservation Trust	Ian Donahue, Co-President, Comm. Chair	iandonahue29@gmail.com
Bristol County Water Authority	Steve Coutu, Executive Director	scoutu@bcwari.com
Coastal Resources Management Council	Leah Feldman, Coastal Policy	lfeldman@crmc.ri.gov
East Bay Chamber of Commerce	Michelle Hughes, Chair	michelle@mhughescpa.com

East Bay Green Infrastructure Coalition	Sara Churgin, Leadership Committee	schurgin.ericd@gmail.com
East Bay Regional Task Force	Kristen Westmoreland, Co-Regional Director East Bay Regional Task Force	kwestmoreland@barrington.ri.gov
Eastern RI Conservation District	Sara Churgin, District Manager	schurgin.ericd@gmail.com
Narragansett Bay Estuary Program	Mike Gerel, Executive Director	mike.gerel@nbep.org
National Flood Insurance Program	Eugene Kohls, Region I ISO/CRS Specialist	EKohls@verisk.com
National Grid	Andrea Moshier, Lead Program Manager, Community Solutions	Andrea.Moshier@nationalgrid.com
National Oceanic and Atmospheric Association (NOAA)	Kim Texeira, Chief of the Policy, Planning, and Communications Division for NOAA's Office for Coastal Management	Kimberly.Texeira@noaa.gov
Rhode Island Department of Environmental Management (RIDEM)	Jason McNamee, Deputy Director for Natural Resources	jason.mcnamee@dem.ri.gov
Rhode Island Department of Environmental Management (RIDEM)	Terry Gray, Acting Director Rhode Island Department of Environmental Management	terry.gray@dem.ri.gov
Rhode Island Department of Transportation (RIDOT) Stormwater Management	Nicole Leporacci, Environmental Scientist	Nicole.Leporacci@dot.ri.gov
Rhode Island Department of Transportation (RIDOT)	Peter Healey, Chief Civil Engineer Road Design	peter.healey@dot.ri.gov
Rhode Island Department of Transportation (RIDOT)	Pamela Cotter, Acting Administrator of Planning at Rhode Island Department of Transportation	Pamela.Cotter@dot.ri.gov
Rhode Island Division of Statewide Planning	Roberta Groch, <i>Assistant Chief, AICP</i>	roberta.groch@doa.ri.gov
Rhode Island Emergency Management Agency (RIEMA)	Melinda Hopkins, State Hazard Mitigation Officer	melinda.hopkins@ema.ri.gov
Rhode Island Emergency Management Agency (RIEMA)	Patrick MacMeekin, Risk & Hazards Planner / Mapping	patrick.macmeekin@ema.ri.gov
Rhode Island Infrastructure Bank (RIIB)	Kimberly Korioth, <i>Stormwater and Resilience Analyst</i>	kkorioth@riib.org
Rhode Island State Conservation Committee	Sara Churgin, Project Coordinator	schurgin.ericd@gmail.com
Roger Williams University	Pamela Judge, Assistant Prof of Engr	pjudge@rwu.edu
Save The Bay	Wenley Ferguson, Director of Habitat Restoration	wferguson@savebay.org
State Senator	Cynthia Coyne - District 32 (Barrington, Bristol, East Providence)	sen-coyne@rilegislature.gov
State Representative	Jason Knight - District 67 (Warren, Barrington)	rep-Knight@rilegislature.gov
State Representative	Liana Cassar – District 66 (Barrington, East Providence)	rep-cassar@rilegislature.gov
The Nature Conservancy	Sheila Dormody, Director, Climate and Cities Programs	sheila.dormody@tnc.org
Town of Bristol	Fire Chief Michael DeMello, EMA Director	mdemello@bristolri.gov
Town of East Providence	Fire Chief Glenn Quick	gquick@eastprovidenceri.gov
Town of Seekonk, MA	Fire Chief Sandra Lowery, EMA Director	slowery@seekonkfd.com
Town of Swansea, MA	Fire Chief Eric Hajder, EMA Director	ehajder@swanseama.gov
Town of Warren	Fire Chief James Sousa, EMA Director	jsousa@townofwarren-ri.gov
US Army Corps of Engineers	Michael Riccio, Project/Study Manager	Michael.S.Riccio@usace.army.mil

Please Note: all emails sent encouraged the recipient to share the email with other committee or office members who may be interested; over the project duration some of the contacts changed; for privacy purposes local email addresses have not been provided

APPENDIX 4-1

Hazard Ranking - Vulnerability Summary

Appendix 4-1

Hazard Ranking - Vulnerability Summary

To assist the Steering Committee in comparing and prioritizing the hazards in terms of the Town's overall vulnerability, a standard methodology was used based on three semi-quantitative factors (probability of occurrence, likely range of impact, and likely magnitude of impact). From personal experience, review of hazard profiles, and input from the community via the Public Opinion Survey, the Steering Committee members ranked the hazards. The scoring rubric is provided below and the Committee's composite results have been provided in terms of the full analysis and an overall ranking.

Vulnerability Summary: Scoring Rubric

<p>Likelihood of Occurrence (Probability/Expected Frequency) <i>In other word, how likely is it that this hazard will occur in Barrington</i></p> <p>0= Unlikely: Hazard anticipated to occur at least once within the upcoming 50-years</p> <p>1= Occasional: Hazard anticipated to occur at least once within the upcoming 30-years</p> <p>2= Likely: Hazard anticipated to occur at least once within the upcoming 10-years</p> <p>3= Highly Likely: Hazard anticipated to occur at least once within the upcoming 5-years</p> <p>Likely Range of Impact <i>In other word, if hazard occurs in Barrington, how much of the Town do you think might be damaged/impacted</i></p> <p>0= Small = less than 10% of Town</p> <p>1= Medium = 10-40% of Town</p> <p>2= Large = 41-70% of Town</p> <p>3= Extensive = greater than 70% of Town</p>	<p>Likely Magnitude of Impact (Vulnerability) – <i>In other word, if hazard occurs in Barrington, to what degree might the following be damaged</i></p> <p>Built Environment Impact: Physical loses and damages to structures & infrastructure</p> <p>0= Negligible: No damage</p> <p>1= Low: Isolated, minimal damage</p> <p>2= Moderate: Sporadic damage to buildings or infrastructure or utilities</p> <p>3= High: Widespread, critical damage to buildings or infrastructure or utilities</p> <p>Natural Environment Impact: Physical loses and damages to the environment</p> <p>0= Negligible: No damage</p> <p>1= Low: Isolated, minimal damage</p> <p>2= Moderate: Sporadic damage to environment</p> <p>3= High: Widespread, critical damage to environment</p> <p>Economic Impact: The interruption to business or services; cost of clean-up</p> <p>0= Negligible: No interruption to daily business or services; no cost of clean-up</p> <p>1= Low: Minimal interruption to a few businesses or services and/or minimal cost of clean-up</p> <p>2= Moderate: Employees/owners/customers unable to reach facility/place of business; short shutdown of services; and/or moderate cost of clean-up</p> <p>3= High: Significant damage to facilities requiring temporary/permanent shutdown of facility/place of business; medium shutdown of services; and/or high cost of clean-up</p> <p>Human Impact: Possibility of injury, illness, emotional stress, or death</p> <p>0= Negligible: No Injuries</p> <p>1= Low: Injuries are treatable with first aid</p> <p>2= Moderate: Injuries/illnesses treatable with medical care, injuries do not result in permanent disability, or disfigurement; some emotional stress</p> <p>3= High: Injuries lead to permanent disability, disfigurement and/or death; high emotional stress</p>
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Vulnerability Summary: Hazard Ranking

This Table represents an average of the Steering Committee members rankings for each factor; the numeric totals were rounded to the nearest whole number and related to the qualitative descriptor.

Hazard Event	Likelihood of Occurrence	Likely Range of Impact	Likely Magnitude of Impact (Vulnerability)			
			Built Environment Impact	Natural Environment Impact	Economic Impact	Human Impact
	Likelihood this will occur	How much of Town will be impacted	Physical losses and damages to structures & infrastructure	Physical losses and damages	Cost of cleanup, Interruption of business	Possibility of injury, illness, emotional stress, or death
Score	0= Unlikely 1= Occasional 2= Likely 3= Highly Likely	0= Small 1= Medium 2= Large 3= Extensive	0= Negligible 1= Low 2= Moderate 3= High	0= Negligible 1= Low 2= Moderate 3= High	0= Negligible 1= Low 2= Moderate 3= High	0= Negligible 1= Low 2= Moderate 3= High
FLOOD-RELATED HAZARDS						
Inland Flooding	Highly Likely	Medium	Moderate	Low	Moderate	Low
Dam Failure	Unlikely	Small	Low	Low	Low	Low
Coastal Flooding	Highly Likely	Large	Moderate	Moderate	Moderate	Moderate
Coastal Erosion	Highly Likely	Medium	Moderate	Moderate	Moderate	Low
WIND-RELATED HAZARDS						
Tropical Cyclones: Tropical Storms & Hurricanes (Storm Surge)	Likely	Large	High	Moderate	High	Moderate
High Winds	Highly Likely	Large	Moderate	Moderate	Moderate	Low
Thunderstorms, Hail, or Lightening	Likely	Large	Low	Low	Low	Low
Tornadoes	Unlikely	Small	Low	Low	Low	Low
WINTER STORM-RELATED HAZARDS						
Heavy Snow (Nor'easter)	Highly Likely	Large	Low	Low	Moderate	Low
Ice or Extreme Cold	Likely	Large	Low	Low	Low	Low
INFECTIOUS DISEASE						
Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses	Likely	Large	Negligible	Negligible	Low	Moderate
Vector-borne Diseases Transmitted by Ticks and Mosquitoes	Likely	Medium	Negligible	Negligible	Negligible	Low
OTHER HAZARDS						
Earthquake	Unlikely	Medium	Negligible	Negligible	Negligible	Negligible
Drought	Occasionally	Medium	Negligible	Low	Low	Low
Brushfires	Unlikely	Small	Low	Low	Low	Negligible
Extreme Heat	Likely	Large	Negligible	Low	Low	Low

Vulnerability Summary: Committee Overall Hazard Ranking (Probability/Range/Magnitude)

This Table represents an average of the Steering Committee members rankings. Each of the three semi-quantitative factors (probability of occurrence, likely range of impact, and likely magnitude of impact) were given equal weight in the overall ranking. As such the numeric totals for the 4 components associated with Likely Magnitude of Impact (Built Environment Impact, Natural Environment Impact, Economic Impact, and Human Impact) were first summed and divided by four to produce an average Likely Magnitude of Impact (Vulnerability) subtotal.

Hazard	Overall Ranking	Risk Category
Tropical Cyclones: Tropical Storms and Hurricanes	2.47	High
Coastal Flooding/Storm Surge	2.42	
High Winds	2.42	
Heavy Snow	2.37	
Ice or Extreme Cold	2.14	
Coastal Erosion	2.00	
Inland Flooding	2.00	
Thunderstorms, Hail, or Lightening	1.93	Medium
Extreme Heat	1.61	
Contagious Respiratory Illness Caused by Influenza Viruses or Coronaviruses	1.56	
Vector-borne Diseases Transmitted by Ticks and Mosquitoes	1.26	
Tornadoes	1.03	
Drought	0.91	Low
Brushfires	0.67	
Dam Failure	0.33	
Earthquake	0.22	

APPENDIX 4-2

Maps

For Map Reference:

Critical Facilities List with Map Numbering Identification

Maps:

Critical Facilities

Flood Zones

Flood Zones with Critical Facilities Overlay

Hurricane Surge Inundation Areas

Hurricane Surge Inundation Areas with Critical Facilities Overlay

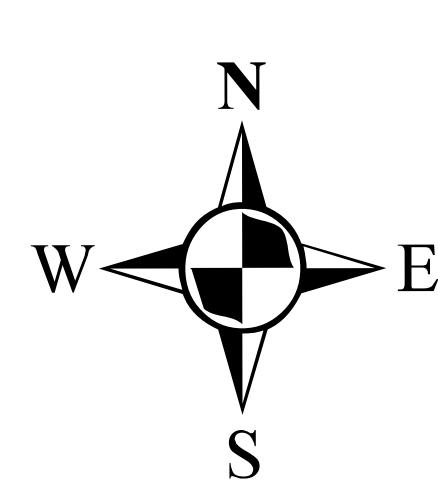
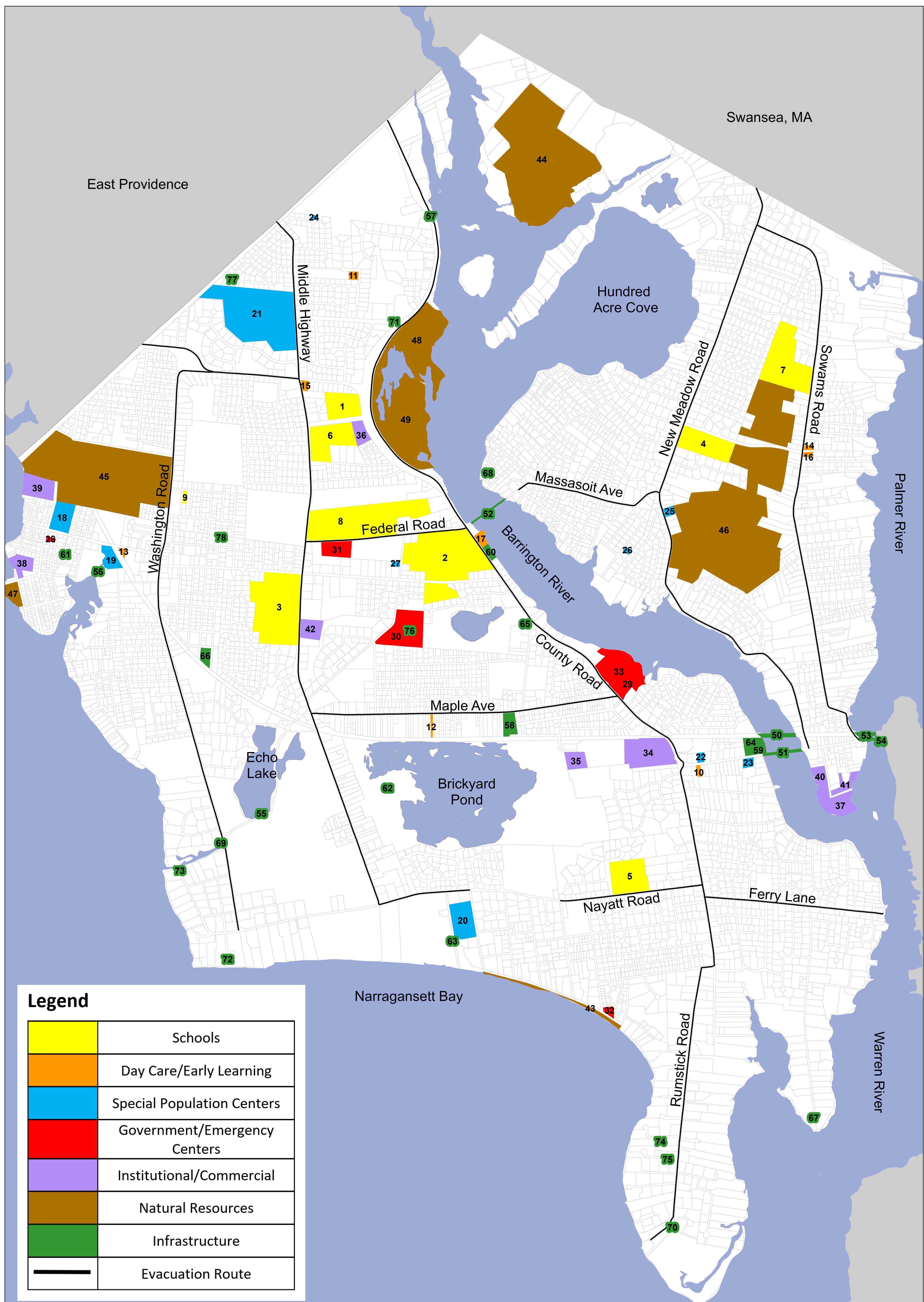
Sea Level Rise Inundation Areas

Sea Level Rise Inundation Areas with Critical Facilities Overlay

Critical Facilities List with Map Numbering Identification

Schools	Day Care/ Early Learning	Special Population Centers	Government/ Emergency Centers
1 Barrington Christian Academy (Private)	10 Apple Blossom Preschool & Early Learning Center (Private)	18 Atria Bay Spring Assisted Living Facility (Private)	28 Barrington Bay Spring Community Center (Public)
2 Barrington High School (Public)	11 Barrington Early Childhood Center (Private)	19 Barrington Cove Apartments (Private)	29 Barrington Public Library (Public)
3 Barrington Middle School (Public)	12 Kids Junction (Private)	20 Former Carmelite Monastery (Public)	30 Department of Public Works/Recycling Center (Public)
4 Hampden Meadows School (Public)	13 Kids Quarters (Private)	21 Former Zion Bible Institute (Private)	31 Public Safety Building (Public)
5 Nayatt School (Public)	14 Montessori Center of Barrington (Private)	22 LIFE Incorporated (Private)	32 Town Beach Bathhouse (Public)
6 Primrose Hill School (Public)	15 Red Brick Nursery School (Private)	Maher (Private)	33 Town Hall/School Administration
7 Sowams School (Public)	16 The Early Learning Centers of RI (Private)	23 County Road	
8 St. Andrews School (Private)	17 Tot's Cooperative Nursery School (Private)	24 Grassy Plain Road	
9 St. Luke's School (Private)		25 New Meadow Road	
		26 Puritan Avenue	
		27 Upland Way	
Institutional/ Commercial	Natural Resources	Infrastructure	
34 Barrington Shopping Center (Private)	43 Barrington Town Beach (Public)	Bridges (Public)	
35 Bayside YMCA (Private)	44 Douglas Rayner Wildlife Refuge/Nockum Hill (BLCT)	50 Barrington River Bike Path Bridge	
36 East Bay Health Center (Private)	45 Haines Memorial State Park (State)	51 Barrington River Bridge	
Marinas	46 Hampden Meadows Greenbelt (Public)	52 Central (Massasoit Avenue) Bridge	
37 Barrington Yacht Club (Private)	47 Latham Park (Public)	53 Warren River Bike Path Bridge	
38 Lighthouse Marina (Private)	48 Osamequin Nature Preserve (Public)	54 Warren River Bridge	
39 Safe Harbor Cove Haven (Private)		Dams	
40 Stanley's Boat Yard (Private)		55 Echo Lake Dam (Public)	
41 Striper Marina (Private)		56 Unnamed Dam behind Barrington Cove Apartments (Private)	
42 US Post Office (Federal)	49 Walker Farm (Public)	57 Evacuation Route (Public) - <i>a low point on Route 114</i>	
		58 National Grid Substation (Private)	
		Park & Ride	
		59 Police Cove (Public)	
		60 White Church (Public)	
		Sanitary Sewerage Pump Stations (Public)	
		Primary	
		61 Bay Spring Ave Pump Station	
		62 Brickyard Pond Pump Station	
		63 Freemont Pump Station	
		64 Police Cove Pump Station	
		65 Prince's Pond Pump Station	
		66 Walnut Road Pump Station	
		Ejector	
		67 Adam's Point Ejector Station	
		68 Juniper Street Ejector Station	
		69 Nayatt Point Ejector Station	
		70 Rumstick Ejector Station	
		71 Wampanoag Ejector Station	
		Grinder	
		72 Elm Lane Grinder Station	
		73 Nayatt Rod Grinder Station	
		74 Pheasant Lane Grinder Station	
		75 Strawberry Drive Grinder Station	
		Storm Drainage Pump Stations (Public)	
		76 DPW Upland Way	
		77 Hazelton Road	
		78 Prospect Street	

Critical Facilities



0 0.5 1
Miles

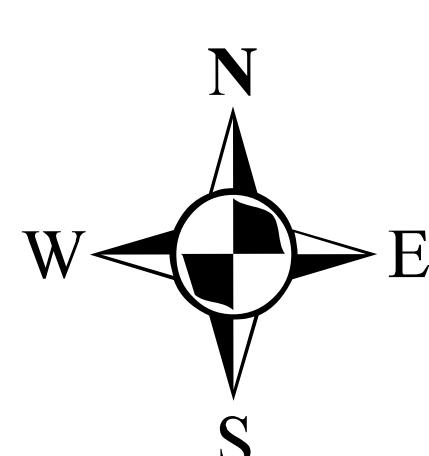
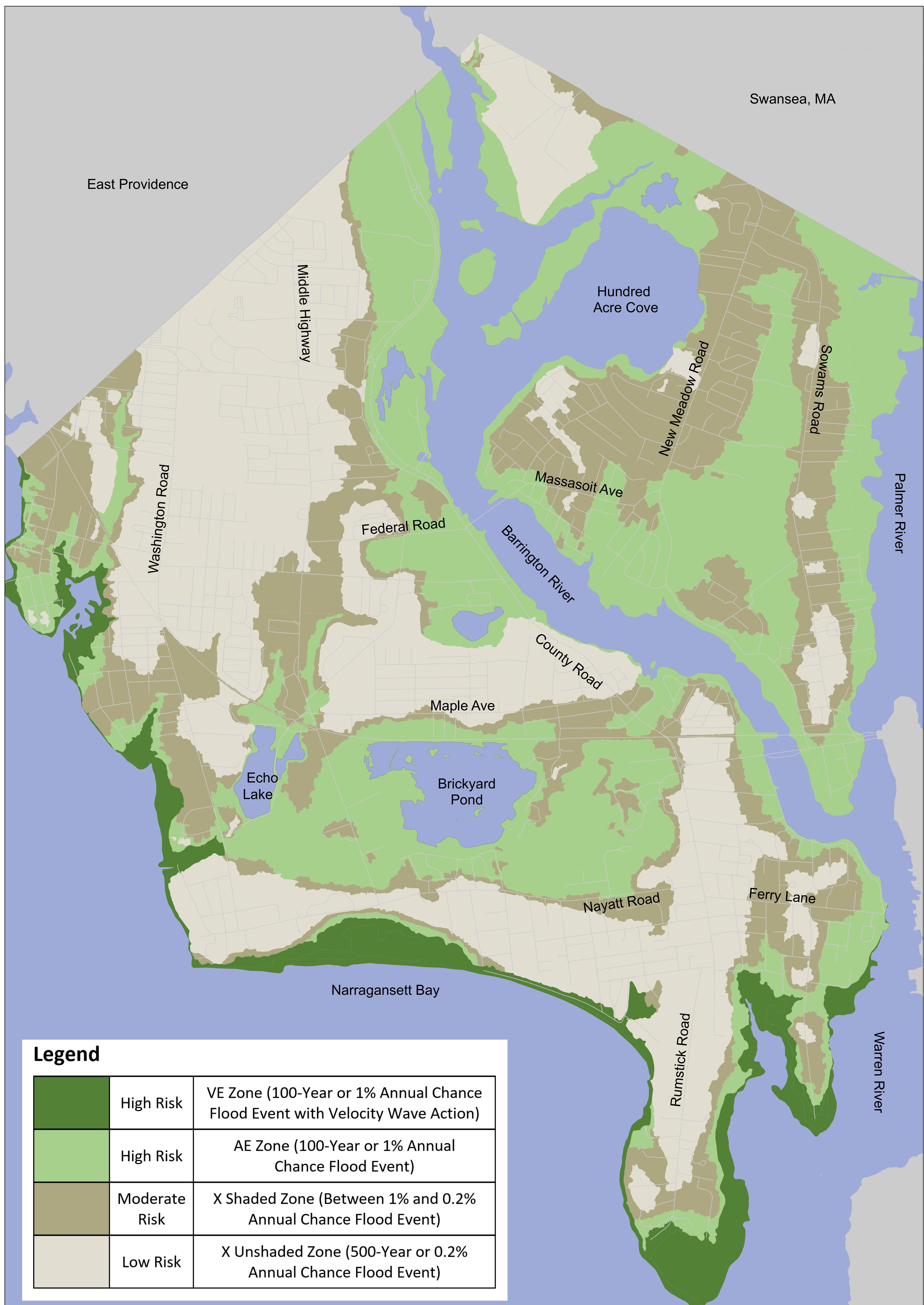


2022 Hazard Mitigation & Flood Management Plan

Prepared By: Kim Jacobs and Cam Evans

Town of Barrington - June 2022 - Sources: RIGIS, Town GIS

Flood Zones



0 0.5 1
Miles

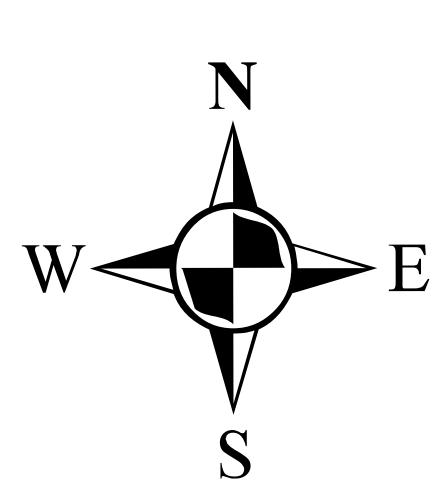
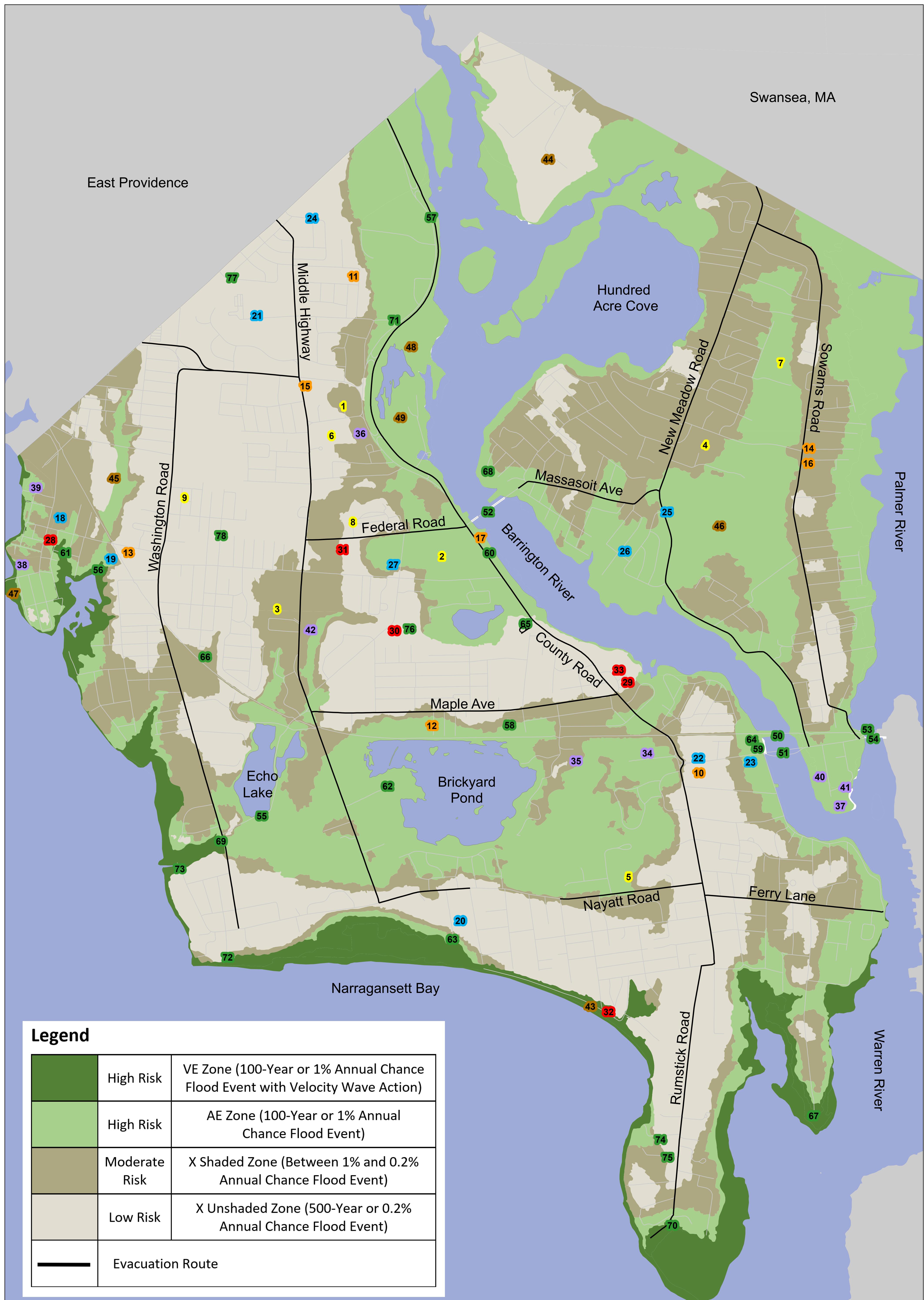


2022 Hazard Mitigation & Flood Management Plan

Prepared By: Kim Jacobs and Cam Evans

Town of Barrington - June 2022 - Sources: RIGIS, Town GIS

Flood Zones with Critical Facilities Overlay



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Miles

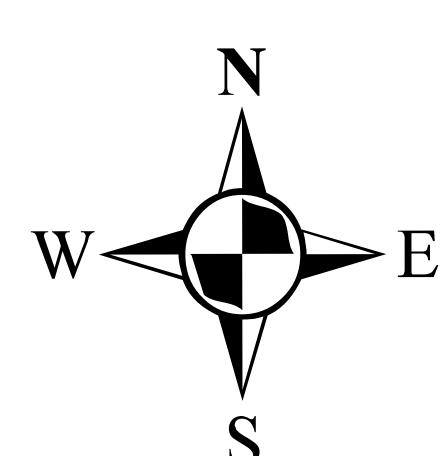
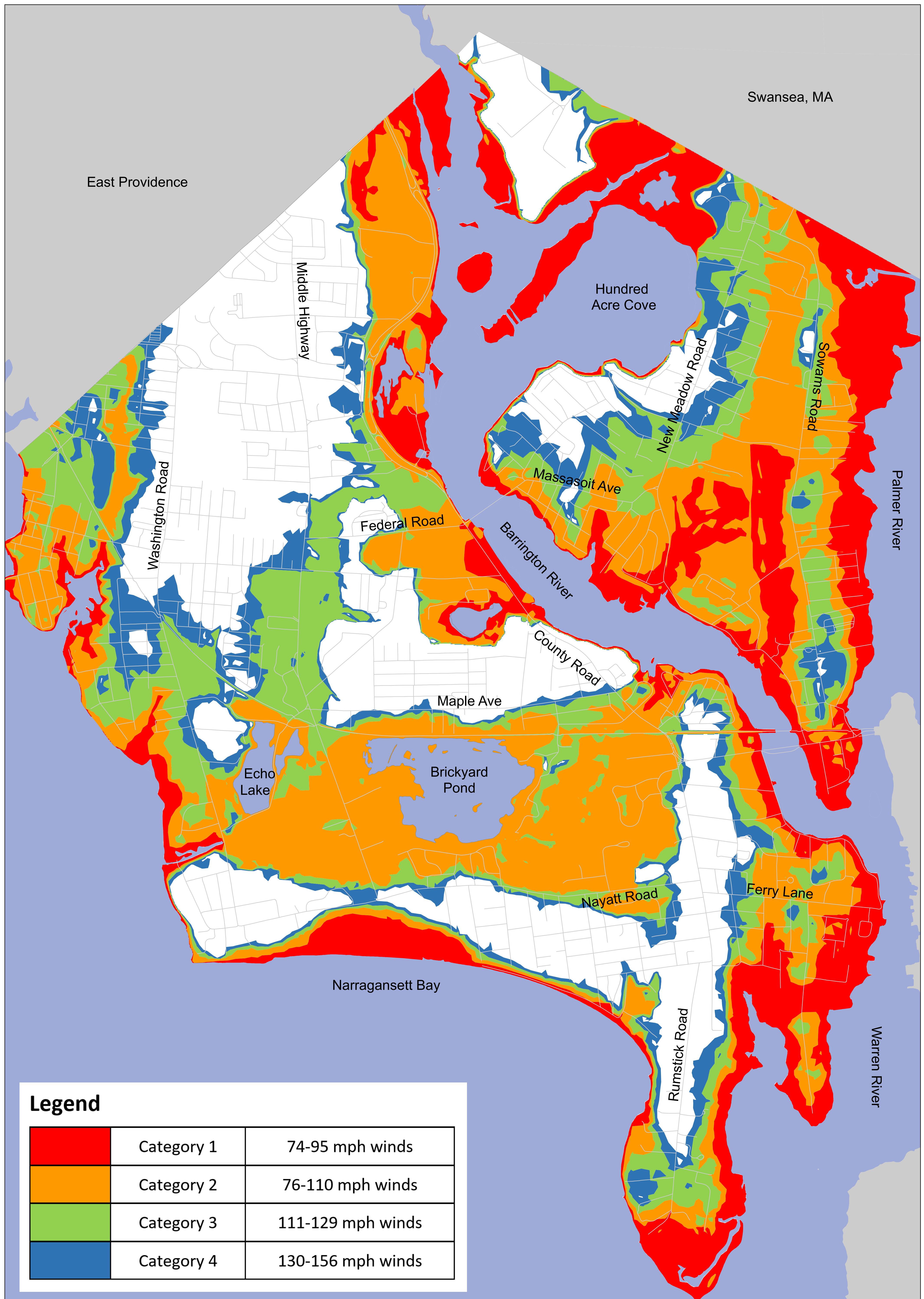


2022 Hazard Mitigation & Flood Management Plan

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Town of Barrington - June 2022 - Sources: RIGIS, Town GIS

Hurricane Surge Inundation Areas



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Miles

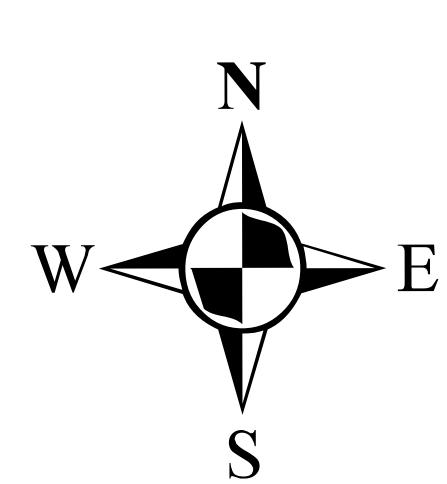
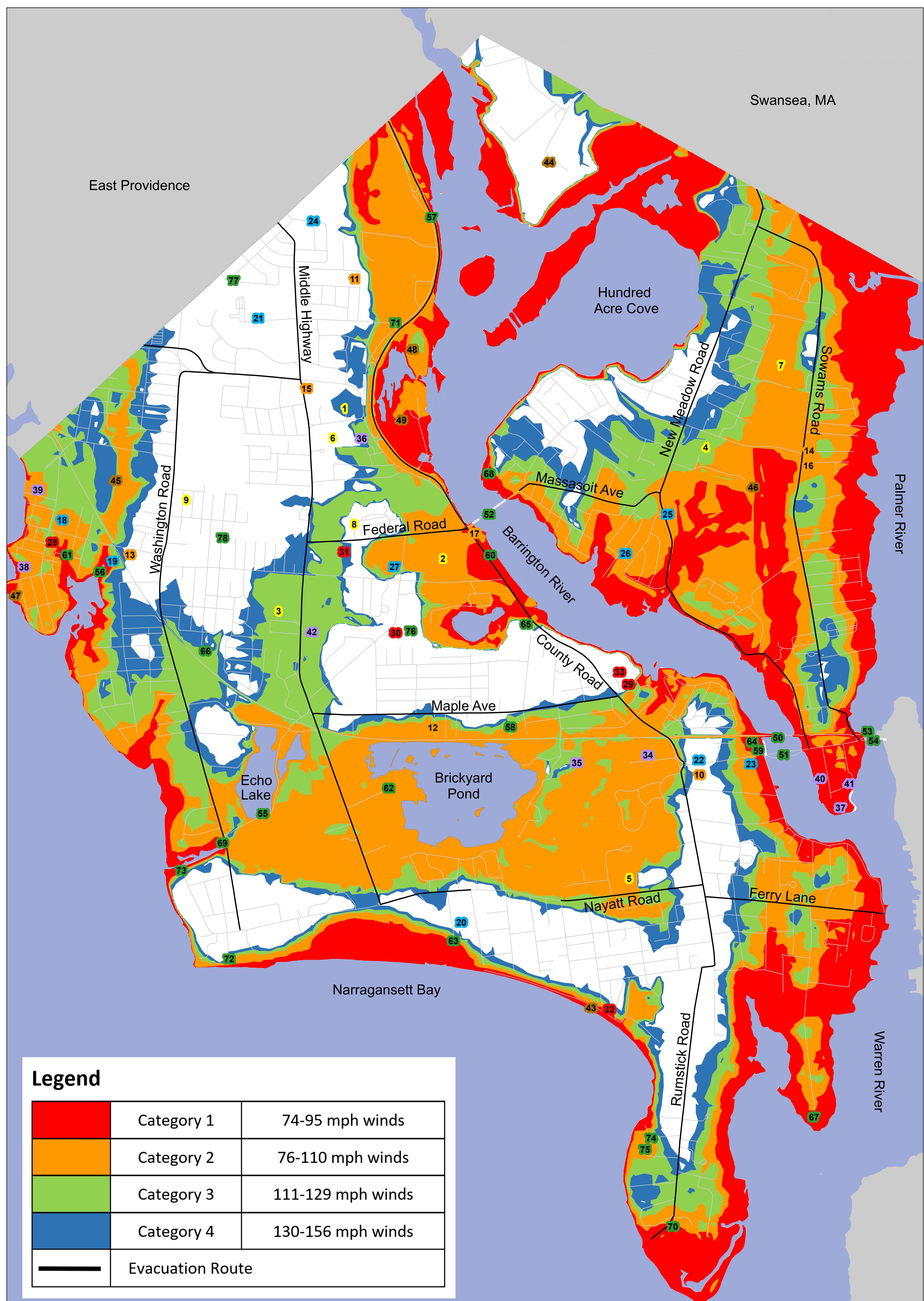


2022 Hazard Mitigation & Flood Management Plan

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Town of Barrington - June 2022 - Sources: RIGIS, Town GIS

Hurricane Surge Inundation Areas with Critical Facilities Overlay



0 0.5 1
Miles

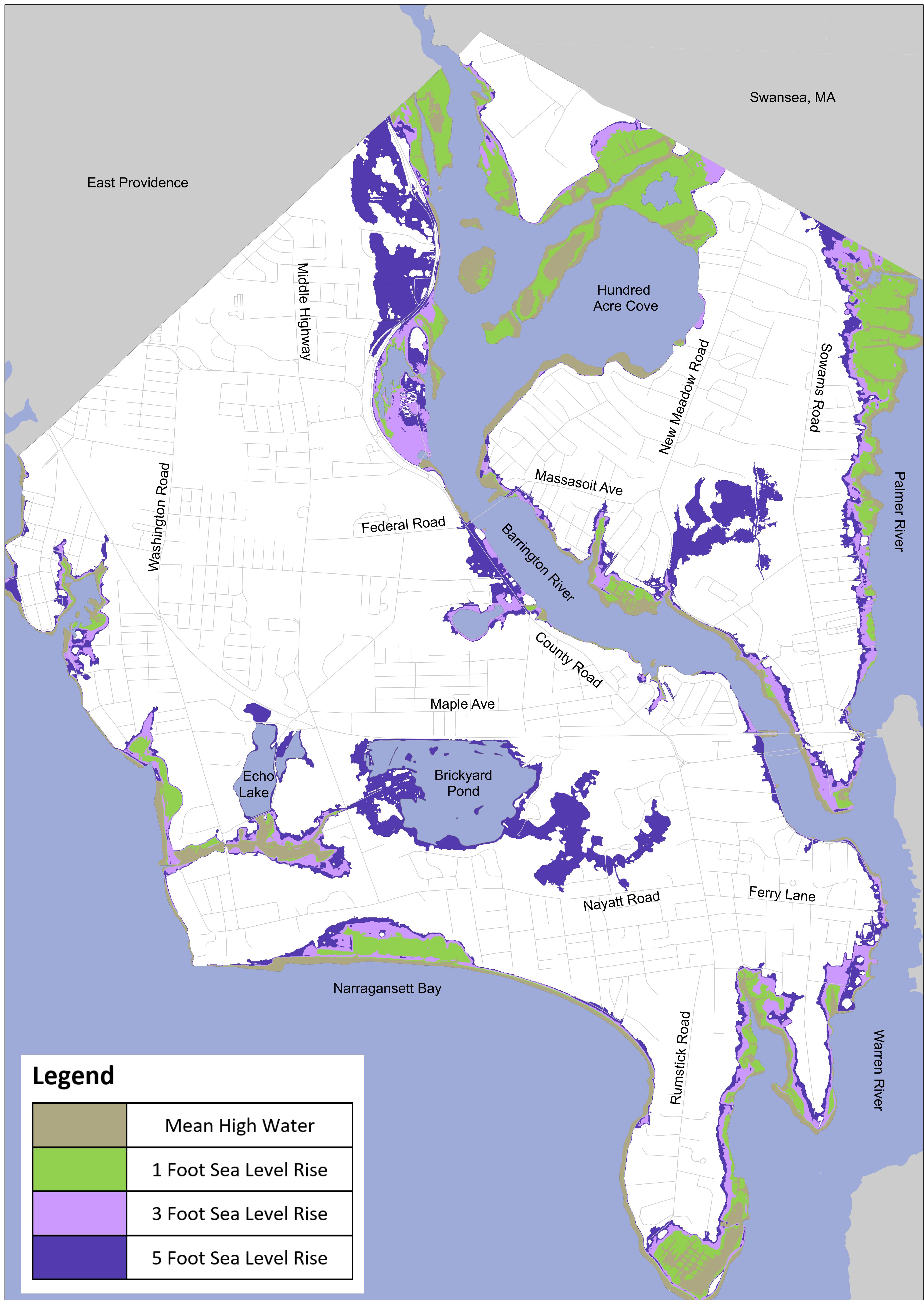


2022 Hazard Mitigation & Flood Management Plan

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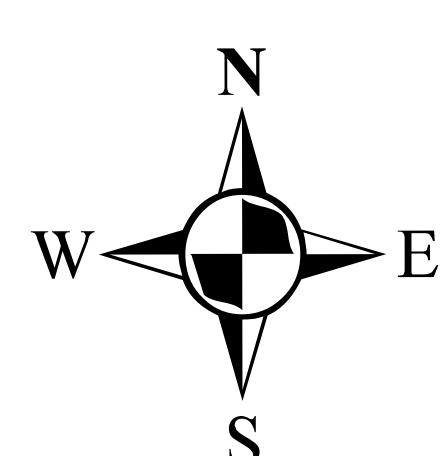
Town of Barrington - June 2022 - Sources: RIGIS, Town GIS

Sea Level Rise Inundation Areas

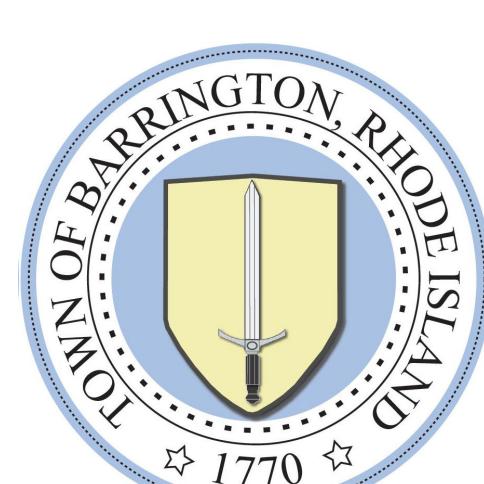


Legend

	Mean High Water
	1 Foot Sea Level Rise
	3 Foot Sea Level Rise
	5 Foot Sea Level Rise



0 0.5 1
Miles

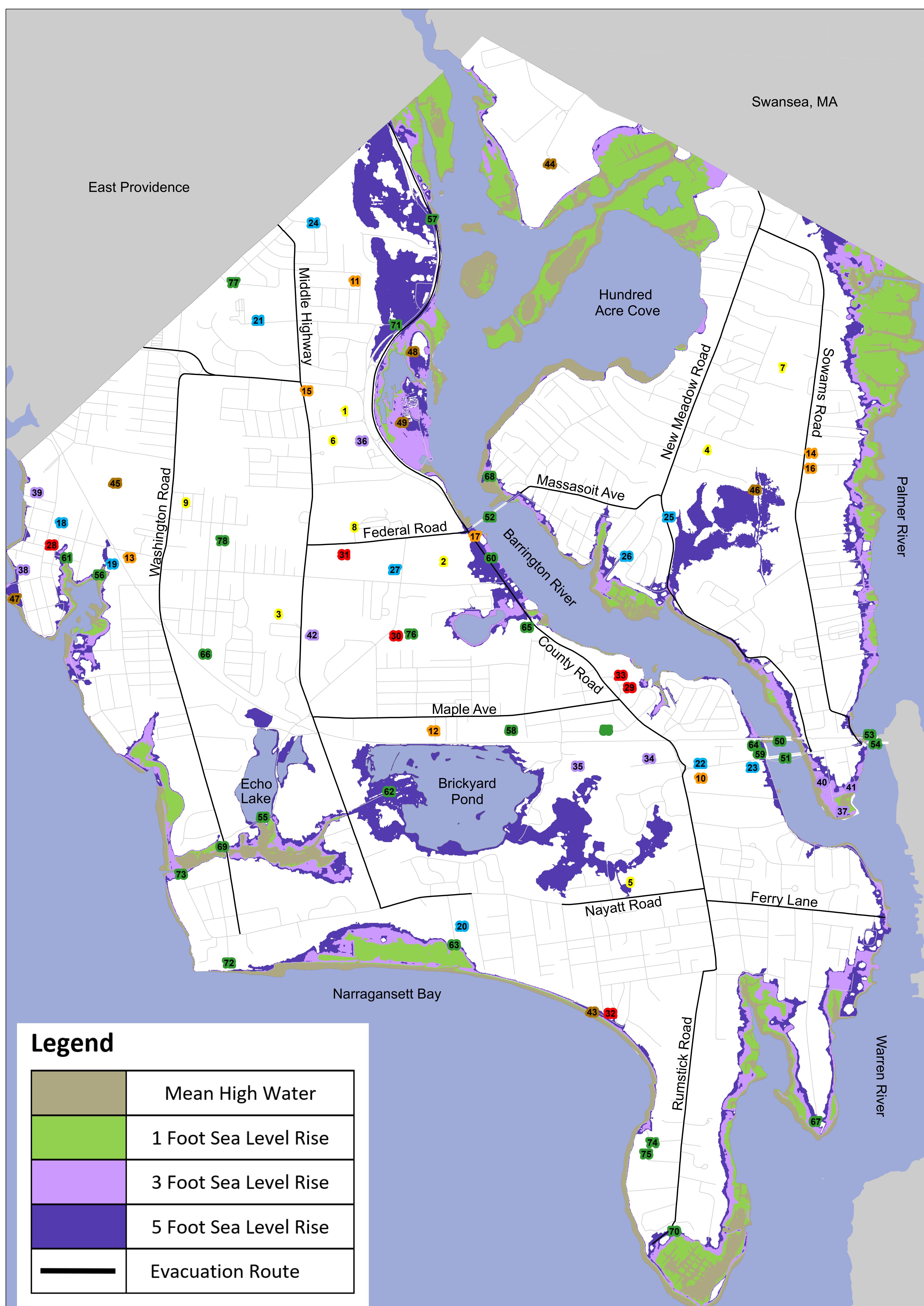


2022 Hazard Mitigation & Flood Management Plan

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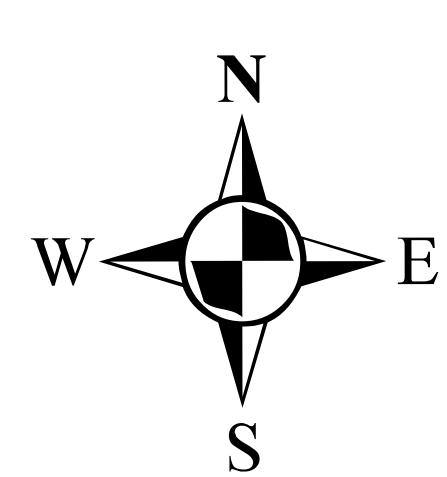
Town of Barrington - June 2022 - Sources: RIGIS, Town GIS

Sea Level Rise Inundation Areas with Critical Facilities Overlay



Legend

Brown	Mean High Water
Green	1 Foot Sea Level Rise
Light Purple	3 Foot Sea Level Rise
Dark Purple	5 Foot Sea Level Rise
Black Line	Evacuation Route



2022 Hazard Mitigation & Flood Management Plan

Prepared By: Kim Jacobs and Cam Evans

Town of Barrington - June 2022 - Sources: RIGIS, Town GIS

APPENDIX 4-3

Critical Facilities Vulnerability Analysis

Critical Facilities with Map Numbering System

Schools	Day Care/ Early Learning	Special Population Centers	Government/ Emergency Centers	Institution/Commercial	Natural Resources	Infrastructure
1 Barrington Christian Academy (Private)	10 Apple Blossom Preschool & Early Learning Center (Private)	18 Atria Bay Spring Assisted Living Facility (Private)	28 Barrington Bay Spring Community Center (Public)	34 Barrington Shopping Center (Private)	43 Barrington Town Beach (Public)	Bridges (Public) 50 Barrington River Bike Path Bridge 51 Barrington River Bridge 52 Central (Massasoit Avenue) Bridge 53 Warren River Bike Path Bridge 54 Warren River Bridge
2 Barrington High School (Public)	11 Barrington Early Childhood Center (Private)	19 Barrington Cove Apartments (Private)	29 Barrington Public Library (Public)	35 Bayside YMCA (Private)	44 Douglas Rayner Wildlife Refuge/Nockum Hill (BLCT)	Dams 55 Echo Lake Dam (Public) 56 Unnamed Dam behind Barrington Cove Apts (Private)
3 Barrington Middle School (Public)	12 Kids Junction (Private)	20 Former Carmelite Monastery (Public)	30 Department of Public Works/Recycling Center (Public)	36 East Bay Health Center (Private)	45 Haines Memorial State Park (State)	Evacuation Route (Public) - a low point on Route 114
4 Hampden Meadows School (Public)	13 Kids Quarters (Private)	21 Former Zion Bible Institute (Private)	22 LIFE Incorporated (Private)	31 Public Safety Building (Public)	46 Hampden Meadows Greenbelt (Public)	National Grid Substation (Private)
5 Nayatt School (Public)	14 Montessori Center of Barrington (Private)	15 Red Brick Nursery School (Private)	32 Town Beach Bathhouse (Public)	Marinas 37 Barrington Yacht Club (Private) 38 Lighthouse Marina (Private) 39 Safe Harbor Cove Haven (Private) 40 Stanley's Boat Yard (Private) 41 Striper Marina (Private)	47 Latham Park (Public)	Park & Ride 59 Police Cove (Public) 60 White Church (Public)
6 Primrose Hill School (Public)	16 The Early Learning Centers of RI (Private)	23 County Road 24 Grassy Plain Road 25 New Meadow Rd 26 Puritan Avenue 27 Upland Way	33 Town Hall/School Administration	42 US Post Office (Federal)	48 Osamequin Nature Preserve (Public)	Sanitary Sewerage Pump Stations (Public) Primary 61 Bay Spring Ave Pump Station 62 Brickyard Pond Pump Station 63 Freemont Pump Station 64 Police Cove Pump Station 65 Prince's Pond Pump Station 66 Walnut Road Pump Station Ejector 67 Adam's Point Ejector Station 68 Juniper Street Ejector Station 69 Nayatt Point Ejector Station 70 Rumstick Ejector Station 71 Wampanoag Ejector Station Grinder 72 Elm Lane Grinder Station 73 Nayatt Rod Grinder Station 74 Pheasant Lane Grinder Station 75 Strawberry Drive Grinder Station Storm Drainage Pump Stations (Public) 76 DPW Upland Way 77 Hazelton Road 78 Prospect Street
7 Sowams School (Public)	17 Tot's Cooperative Nursery School (Private)				49 Walker Farm (Public)	
8 St. Andrews School (Private)						
9 St. Luke's School (Private)						

Vulnerability Analysis Summary of Critical Facilities

Quantitative Analysis Criteria:

FEMA Flood Zone: highest risk zone that any portion of the building footprint is touching; if no structure then highest risk zone that any portion of the parcel is touching

Flood Depth 100-year Storm: Based on STORMTOOLS - highest depth identified for any portion of the building footprint; if no structure then highest depth identified for any portion of the parcel

Inundation by SLR: Based on STORMTOOLS – lowest SLR scenario that any portion of the building footprint is included within; if no structure then lowest SLR scenario that any portion of the parcel is included within

Hurricane Category: lowest hurricane category that any portion of the building footprint is touching; if no structure then lowest hurricane category that any portion of the parcel is touching

Vulnerable Facilities Category	Vulnerable Facility Location & Ownership	Services a Vulnerable Population	FEMA Flood Zone	Flood Depth 100yr Storm	Inundated by SLR	Hurricane Category	Winter Storm-Related	Earthquakes	Extreme Heat	Drought	Brush Fires	Contagious Respiratory Illness (Flu/Coronavirus)	Vector Borne Diseases (Ticks/Mosquitos)	Primary Effects or Problems
Schools	Barrington Christian Academy (Private) 9 Old County Road	Students (K – 8 th grade)	X	----	----	Cat 4	yes	yes	----	----	----	yes	----	public safety, property damage, disruption of services
	Barrington High School (Public) 220 Lincoln Avenue	Students (9 th - 12 th grade)	AE	4.6 Feet	7 Foot SLR	Cat 2	----	yes	----	----	----	yes	----	public safety, property damage, disruption of services
	Barrington Middle School (Public) 261 Middle Hwy	Students (6 th - 8 th grade)	X	0.8 Feet	12 Foot SLR	Cat 3	----	yes	----	----	----	yes	----	public safety, property damage, disruption of services
	Hampden Meadows School (Public) 297 New Meadow Road	Students (4 th - 5 th grade)	X	----	----	Cat 3	yes (older flat roof)	yes	----	----	----	yes	----	public safety, property damage, disruption of services
	Nayatt School (Public) 400 Nayatt Road	Students (K – 3 rd grade)	X	2.3 Feet	12 Foot SLR	Cat 2	yes (older flat roof)	yes	----	----	----	yes	----	public safety, property damage, disruption of services
	Primrose Hill School (Public) 60 Middle Hwy	Students (pre-K – 3 rd grade)	X	----	----	----	----	yes	----	----	----	yes	----	public safety, property damage, disruption of services
	Sowams School (Public) 364 Sowams Road	Students (K – 3 rd grade)	X	1.8 Feet	12 Foot SLR	Cat 2	yes (older flat roof)	yes	----	----	----	yes	----	public safety, property damage, disruption of services
	St. Andrews School (Private) 63 Federal Road	Students (6 th - 12 th grade)	X	1.9 Feet	12 Foot SLR	Cat 3	yes	yes	----	----	----	yes	----	public safety, property damage, disruption of services
	St. Luke's School (Private) 10 Waldron Avenue	Students (pre-K - 8 th grade)	X	----	----	----	yes	yes	----	----	----	yes	----	public safety, property damage, disruption of services
Day Care/Early Learning	Apple Blossom Preschool & Early Learning Center (Private) 136 County Road	Children (toddler – preschool)	X	----	----	----	----	yes	----	----	----	yes	----	public safety; property damage; disruption of services
	Barrington Early Childhood Center (Private) 27 College Lane	Children (preschool – preK)	X	----	----	----	----	yes	----	----	----	yes	----	public safety; property damage; disruption of services
	Kids Junction (Private) 406 Maple Avenue	Children (preschool and after school grades K – 6 th)	AE	7.1 Feet	7 Foot SLR	Cat 2	yes	yes	----	----	----	yes	----	public safety; property damage; disruption of services
	Kids Quarters (Private) 64 Bay Spring Avenue	Children (infants – preK)	X	----	----	Cat 4	yes	yes	----	----	----	yes	----	public safety; property damage; disruption of services
	Montessori Center of Barrington (Private) 303 Sowams Road	Children (toddler – K)	X	----	----	Cat 2	yes (older flat roof)	yes	----	----	----	yes	----	public safety; property damage; disruption of services
	Red Brick Nursery School (Private) 50 Middle Hwy	Children (preschool – K)	X	----	----	----	----	yes	----	----	----	yes	----	public safety; property damage; disruption of services
	The Early Learning Centers of RI (Private) 301 Sowams Road	Children (infants – K and afterschool for ages 6-12 years)	X	1.0 Feet	12 Foot SLR	Cat 2	----	yes	----	----	----	yes	----	public safety; property damage; disruption of services
	Tot's Cooperative Nursery School (Private) 461 County Road	Children (preK)	AE	10.6 Feet	3 Foot SLR	Cat 1	----	yes	----	----	----	yes	----	public safety; property damage; disruption of services

Vulnerable Facilities Category	Vulnerable Facility Location & Ownership	Services a Vulnerable Population	FEMA Flood Zone	Flood Depth 100yr Storm	Inundated by SLR	Hurricane Category	Winter Storm-Related	Earthquakes	Extreme Heat	Drought	Brush Fires	Contagious Respiratory Illness (Flu/Coronavirus)	Vector Borne Diseases (Ticks/Mosquitos)	Primary Effects or Problems
Special Population Centers	Atria Bay Spring Assisted Living Facility (Private) 147 Bay Spring Avenue	Seniors	X	1.6 Feet	----	Cat 2	----	yes	yes	----	----	yes	----	senior populations are more susceptible to extreme heat and will benefit from access to AC; public safety; property damage; disruption of services; economic loss
	Barrington Cove Apartments (Private) 90 Bay Spring Avenue	Seniors	X	5.2 Feet	12 Foot SLR	Cat 2	yes (older flat roof)	yes	yes	----	----	yes	----	senior populations are more susceptible to extreme heat and will benefit from access to AC; parking area is in flood zone AE; public safety; property damage; disruption of services; economic loss
	Former Carmelite Monastery (Public) 25 Watson Avenue	Potentially Seniors	X	----	----	----	yes	yes	Yes (when occupied)	----	----	Yes (when occupied)	----	senior populations are more susceptible to extreme heat and will benefit from access to AC; public safety; property damage; disruption of services; economic loss
	Former Zion Bible Institute (Private) 27 Middle Highway	Potentially Seniors	X	----	----	----	yes	yes	Yes (when occupied)	----	----	Yes (when occupied)	----	senior populations are more susceptible to extreme heat and will benefit from access to AC; public safety; property damage; disruption of services; economic loss
	LIFE Incorporated (Private) 137 County Road	Group Home	X	----	----	----	----	yes	----	----	----	yes	----	public safety; property damage; disruption of services; economic loss
	Maher (Private) • 94 County Road • 3 Grassy Plain Road • 225 New Meadow Road • 14 Puritan Avenue • 29 Upland Way	Group Home	X	4.0 Feet	10 Foot SLR	Cat 2	----	yes	----	----	----	yes	----	public safety; property damage; disruption of services; economic loss
			X	----	----	----	----	yes	----	----	----	yes	----	
			AE	4.8 Feet	10 Foot SLR	Cat 2	----	yes	----	----	----	yes	----	
			AE	6.7 Feet	7 Foot SLR	Cat 2	----	yes	----	----	----	yes	----	
			AE	2.3 Feet	12 Foot SLR	Cat 2	----	yes	----	----	----	yes	----	
Government/Emergency Centers	Barrington Bay Spring Community Center (Public) 170 Narragansett Avenue		X	3.9 Feet	12 Foot SLR	Cat 3	----	yes	----	----	----	yes	----	property damage; disruption of services
	Barrington Public Library/Senior Center/ Preservation Society Museum/Tap-In (Public) 281 County Road		X	----	----	----	----	yes	----	----	----	yes	----	public safety; disruption of services * Emergency Warming/Cooling Center
	Department of Public Works/Recycling Center (Public) 84 Upland Way		X	----	----	----	----	yes	----	----	----	yes	----	public safety; disruption of services
	Public Safety Building (Police/Fire/EMS) (Public) 100 Federal Road		X	----	----	Cat 3	----	yes	----	----	----	yes	----	public safety; property damage; disruption of services * Lobby Emergency Warming/Cooling Center
	Town Beach Bathhouse (Public) 99 Bay Road		VE	9.2 Feet	7 Foot SLR	Cat 1	yes (flat roof)	yes	----	----	----	yes	----	property damage; disruption of services
	Town Hall/School Administration (Public) 283 County Road		X	----	----	----	----	yes	----	----	----	yes	----	property damage; disruption of services

Vulnerable Facilities Category	Vulnerable Facility Location & Ownership	Services a Vulnerable Population	FEMA Flood Zone	Flood Depth 100yr Storm	Inundated by SLR	Hurricane Category	Winter Storm-Related	Earthquakes	Extreme Heat	Drought	Brush Fires	Contagious Respiratory Illness (Flu/Coronavirus)	Vector Borne Diseases (Ticks/Mosquitos)	Primary Effects or Problems
Institutional/Commercial	Barrington Shopping Center (Private) 184 County Road		AE	5.7 Feet	10 Foot SLR	Cat 2	yes	yes	----	----	----	yes	----	public safety; property damage; disruption of services; economic loss
	Bayside YMCA (Private) 70 West Street		X	1.0 Feet	12 Foot SLR	Cat 3	----	yes	----	----	----	yes	----	public safety; property damage; disruption of services; economic loss
	East Bay Health Center (Private) 2 Old County Road		X	----	----	Cat 3	----	yes	----	----	----	yes	----	public safety; property damage; disruption of services; economic loss
	Marinas		AE	10.9 Feet	2 Foot SLR	Cat 1	yes	yes	----	----	----	----	----	property damage; disruption of services; economic loss
	• Barrington Yacht Club (Private) 25 Barton Avenue		X	6.2 Feet	12 Foot SLR	Cat 3	----	yes	----	----	----	----	----	
	• Lighthouse Marina (Private) 110 Shore Drive		AE	6.6 Feet	10 Foot SLR	Cat 2	yes	yes	----	----	----	----	----	
	• Safe Harbor Cove Haven (Private) 101 Narragansett Avenue		AE	10.4 Feet	3 Foot SLR	Cat 1	----	yes	----	----	----	----	----	
	• Stanley's Boat Yard (Private) 17 Barton Avenue		AE	11.0 Feet	5 Foot SLR	Cat 1	yes	yes	----	----	----	----	----	
	• Striper Marina (Private) 26 Tyler Point Rd													
	US Post Office (Federal) 200 Middle Hwy		X	1.1 Feet	12 Foot SLR	Cat 3	yes	yes	----	----	----	yes	----	property damage; disruption of services; economic loss
Natural Resources	Barrington Town Beach (Public)	----	VE	19.1 Feet	1 Foot SLR	Cat 1	----	----	yes	----	----	----	----	property damage; disruption of access; coastal erosion; wetland & habitat damage; no shade structures
	Douglas Rayner Wildlife Refuge/Nockum Hill (BLCT)	Northern Diamondback Terrapin Turtles	AE	2.3 Feet	7 Foot SLR	Cat 1	----	----	----	yes	yes	----	yes	property damage; disruption of access; coastal erosion; wetland & habitat damage; mosquito & tick borne diseases
	Haines Memorial State Park (State)	----	AE	9.7 Feet	5 Foot SLR	Cat 1	----	----	----	----	----	----	yes	property damage; disruption of access; coastal erosion; wetland & habitat damage; mosquito & tick borne diseases
	Hampden Meadows Greenbelt (Public)	----	AE	9.7 Feet	5 Foot SLR	Cat 1	----	----	----	yes	yes	----	yes	property damage; disruption of access; wetland & habitat damage; mosquito & tick borne disease
	Latham Park (Public)	----	VE	20.4 Feet	2 Foot SLR	Cat 1	----	----	yes	----	----	----	----	property damage; disruption of access; coastal erosion; no shade structures
	Osamequin Nature Preserve (Public)	----	AE	12.8 Feet	1 Foot SLR	Cat 1	----	----	----	yes	yes	----	yes	property damage; disruption of access; coastal erosion; wetland & habitat damage; mosquito & tick borne diseases
	Walker Farm (Public)	----	AE	13.8 Feet	1 Foot SLR	Cat 1	----	----	yes	----	----	----	----	property damage; disruption of access; coastal erosion; wetland & habitat damage; no shade structures

Vulnerable Facilities Category	Vulnerable Facility Location & Ownership	Services a Vulnerable Population	FEMA Flood Zone	Flood Depth 100yr Storm	Inundated by SLR	Hurricane Category	Winter Storm-Related	Earthquakes	Extreme Heat	Drought	Brush-fires	Contagious Respiratory Illness (Flu/Coronavirus)	Vector Borne Diseases (Ticks/Mosquitos)	Primary Effects or Problems
Infrastructure	Bridges: (Public) <ul style="list-style-type: none"> • Barrington River Bike Path Bridge • Barrington River Bridge • Central (Massasoit Avenue) Bridge • Warren River Bike Path Bridge • Warren River Bridge 		AE	14.2 Feet	3 Foot SLR	Cat 1	yes	yes	----	----	----	----	----	public safety; disruption of services; infrastructure damage; economic loss
	AE		12.3 Feet	3 Foot SLR	Cat 1	yes	yes	----	----	----	----	----		
	AE		11.2 Feet	5 Foot SLR	Cat 1	yes	yes	----	----	----	----	----		
	AE		11.8 Feet	3 Foot SLR	Cat 1	yes	yes	----	----	----	----	----		
	AE		13.8 Feet	3 Foot SLR	Cat 1	yes	yes	----	----	----	----	----		
	Dams: <ul style="list-style-type: none"> • Echo Lake Dam (Public) South Lake Drive • Unnamed Dam behind Barrington Cove Apartments (Private) Bay Spring Avenue 		AE	12.2 Feet	5 Foot SLR	Cat 2	----	yes	----	----	----	----	----	property damage, infrastructure damage
	AE		12.2 Feet	5 Foot SLR	Cat 1	----	yes	----	----	----	----	----		
	Evacuation Route (Public) <i>data for a low point on Route 114</i>		AE	12.2 Feet	3 Foot SLR	Cat 1	yes	yes	----	----	----	----	----	public safety; disruption of services; infrastructure damage; economic loss
	National Grid Substation (Private) 236 Maple Avenue		AE	2.9 Feet	12Foot SLR	Cat 3	----	yes	----	----	----	----	----	public safety; disruption of services; infrastructure damage; economic loss
	Park & Ride: <ul style="list-style-type: none"> • Police Cove (Public) • White Church (Public) 		AE	8.8 Feet	5 Foot SLR	Cat 1	yes	----	----	----	----	----	----	disruption of services; property damage; infrastructure damage
	AE		11.4 Feet	2 Foot SLR	Cat 1	yes	----	----	----	----	----	----		
	Sanitary Sewerage Pump Stations (Public) Primary: <ul style="list-style-type: none"> • Bay Spring Ave Pump Station • Brickyard Pond Pump Station • Freemont Pump Station • Police Cove Pump Station • Prince's Pond Pump Station • Walnut Road Pump Station 		VE	5.4 Feet	----	Cat 2	----	----	----	----	----	----	----	disruption of services; infrastructure damage; public health risks
	AE		4.9 Feet	12 Foot SLR	Cat 3	----	----	----	----	----	----	----		
	AE		4.6 Feet	----	Cat 2	----	----	----	----	----	----	----		
	AE		0.7 Feet	----	Cat 2	----	----	----	----	----	----	----		
	X		5.7 Feet	7 Foot SLR	Cat 3	----	----	----	----	----	----	----		
	X		----	----	Cat 4	----	----	----	----	----	----	----		
	Ejector: <ul style="list-style-type: none"> • Adam's Point Ejector Station • Juniper Street Ejector Station • Nayatt Point Ejector Station • Rumstick Ejector Station • Wampanoag Ejector Station 		VE	----	----	Cat 1	----	----	----	----	----	----	----	disruption of services; public health risks
	AE		----	----	Cat 1	----	----	----	----	----	----	----		
	AE		----	----	Cat 1	----	----	----	----	----	----	----		
	VE		----	----	Cat 1	----	----	----	----	----	----	----		
	AE		----	----	Cat 2	----	----	----	----	----	----	----		
	Grinder: <ul style="list-style-type: none"> • Elm Lane Grinder Station • Nayatt Road Grinder Station • Pheasant Lane Grinder Station • Strawberry Drive Grinder Station 		X	----	----	Cat 3	----	----	----	----	----	----	----	disruption of services; public health risks
	VE		----	----	Cat 1	----	----	----	----	----	----	----		
	X		----	----	Cat 2	----	----	----	----	----	----	----		
	X		----	----	Cat 2	----	----	----	----	----	----	----		
	Storm Drainage Pump Stations (Public) <ul style="list-style-type: none"> • DPW Upland Way • Hazelton Road • Prospect Street 		X	----	----	----	----	----	----	----	----	----	----	disruption of services; infrastructure damage; public health risks
	X		----	----	----	----	----	----	----	----	----	----		
	X		----	----	----	----	----	----	----	----	----	----		

APPENDIX 4-4

Building & Roads Vulnerability Analysis

For Map Reference:

Geospatial Analysis of Sea Level Rise in Barrington

Maps:

Structural Density Analysis OSLR-100yr Storm Return

Structural Density Analysis 2SLR-100yr Storm Return

Structural Density Analysis 5SLR-100yr Storm Return

Building Analysis OSLR-100yr Storm Return

Building Analysis 2SLR-100yr Storm Return

Building Analysis 5SLR-100yr Storm Return

Road Analysis Plat 1 2SLR-10YR

Road Analysis Plat 2 2SLR-10YR

Road Analysis Plat 3 2SLR-10YR

Road Analysis Plat 4 2SLR-10YR

Road Analysis Plat 13 2SLR-10YR

Road Analysis Plat 25 2SLR-10YR

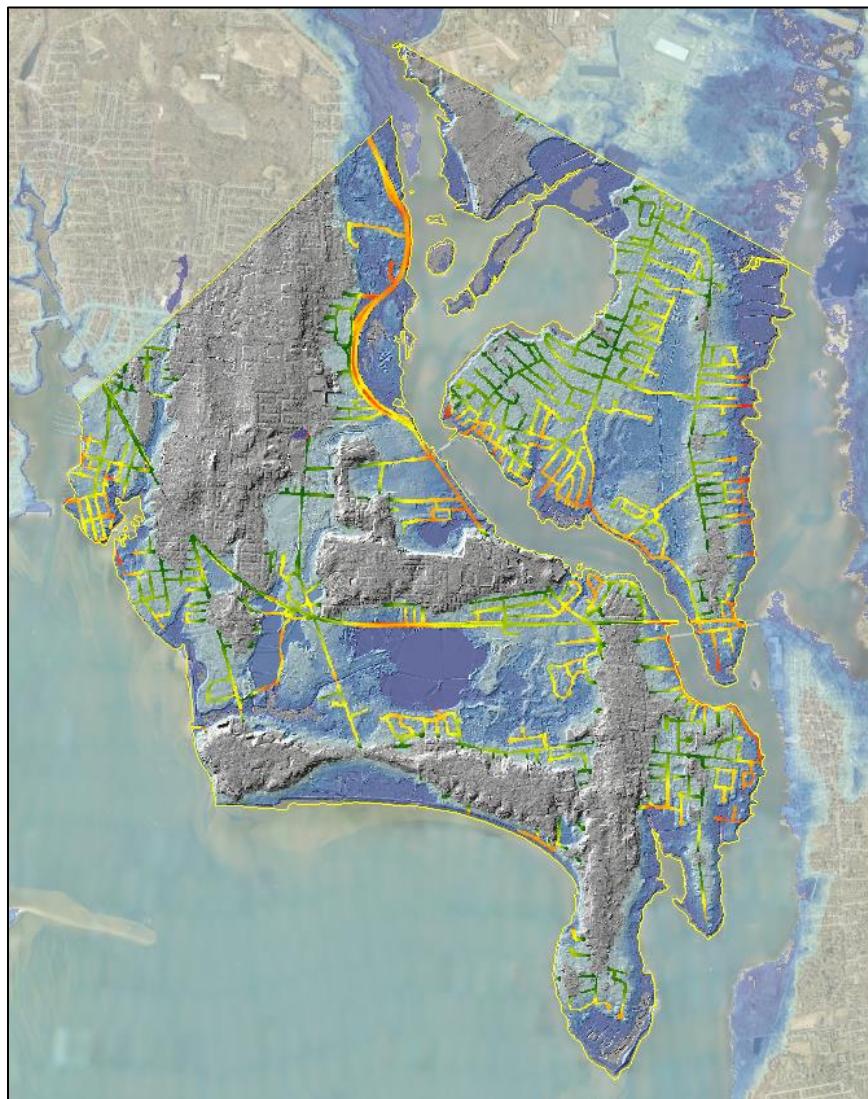
Road Analysis Plat 26 2SLR-10YR

Road Analysis Plat 27 2SLR-10YR

Road Analysis Plat 32 2SLR-10YR

Road Analysis Plat 33 2SLR-10YR

Geospatial Analysis of Sea Level Rise in Barrington, Rhode Island



COASTAL
INSTITUTE

Patrick MacMeekin, GIS Specialist
University of Rhode Island, Coastal Institute
Climate Response Demonstration Site Initiative

April, 2021

Project Participants:

Authorship:

This plan was written by Patrick MacMeekin, as a continuation of previous analysis for the adjacent town of Warren, Rhode Island. This project is part of the University of Rhode Island, Coastal Institute's Climate Response Demonstration Site Initiative.

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Executive Summary:

This geospatial analysis of sea level rise for Barrington, Rhode Island is a continuation of ongoing storm inundation mitigation planning for the municipality. Barrington is a coastal town located in northeastern Rhode Island, abutting Narragansett Bay. Due to Barrington's low-lying extent, the municipality is vulnerable to the impacts of sea level rise and flooding from storm events.

The URI Coastal Institute (CI), through its Climate Response Demonstration Site initiative, has been working with the town of Barrington for several years, collaborating with town officials and others to identify and study adaptation strategies to promote resilience of the community and enhance ecosystem sustainability in the face of climate change. Barrington, and neighboring Warren, make up the "mixed use" demonstration site — one of three sites in the state where the CI is working with community officials and land managers to explore adaptation strategies that address sea level rise and coastal flooding at different locations across the state that were selected to represent shoreline types common in RI (natural areas, urban waterfronts, and mixed-use communities). An important reason leading to the selection of Barrington and Warren as a demonstration site is inundation modeling that reveals extensive low elevation areas of high-density development in this area are especially vulnerable to flooding associated with sea level rise and storm surge.

The goal of this project was to develop a suite of data products to assist town officials in medium and long-term decision making. Products include maps of flooding extent, maps showing density of structural damage, and tabulated data that summarize impacts of flooding (e.g., linear feet of roadway flooded under various scenarios). In addition, this project has resulted in a robust suite of ready-to-use geospatial data layers (both raster and vector data layers) that can be tailored to fit specific future analysis needs. All analyses presented in this report were conducted using ArcGIS Desktop Version 10.6. Selected examples of map products are included as appendices to this report.

The methodology for this study is broken into three distinct geospatial analyses, to examine the effects of sea level rise and storm flooding on:

- 1) Roadways in Barrington, (for all management authorities)
- 2) Structures in Barrington (regardless of ownership), and
- 3) The density of affected structures in Barrington.

Each step in the analysis process built upon the findings of the previous steps and will support future research topics.

The process began with the analysis of roadways, finding that even at current sea levels, potential flooding from extreme storms (e.g., 100-yr return period events) can inundate large segments of the road network, causing portions of the town to be inaccessible by roadway. Further, the 30-year projected sea level rise in the region is expected to be 3 feet above current levels (Rhode Island Coastal Resources Management Council, BeachSAMP 2018). Under these conditions entire neighborhood blocks will become inaccessible under normal tide ranges, and with the addition of a storm surge, neighborhood blocks will be inundated by several feet of flood water.

Floodwater depth on road surface (feet) - Intersection of Primrose Hill Rd and Wampanoag Trail				
Sea Level Rise Scenario	Mean higher-high water	1-year storm return period	25-year storm return period	100-year storm return period
0 ft	--	--	6.9	12.6
1 ft	--	--	7.9	--
2 ft	--	0.7	8.9	13.7
3 ft	--	1.7	9.9	14.9
5 ft	0.5	3.7	11.9	15.9
7 ft	2.5	5.7	13.9	17.9
10 ft	5.5	8.7	16.9	24.5

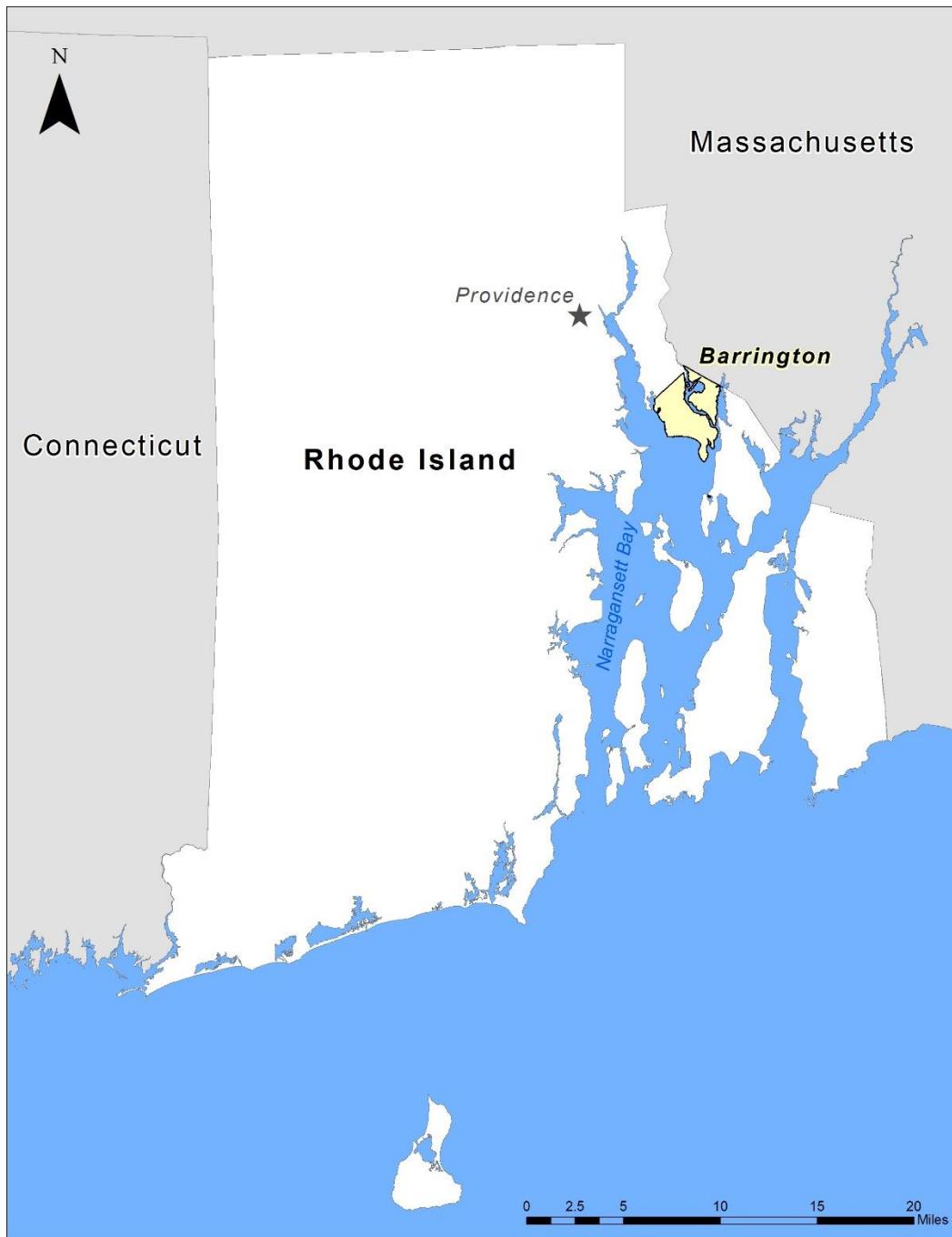
The next stage in the analysis was to examine the extent of structural damage for a 100-year storm under three different sea level rise scenarios: current sea level, 2-ft sea level rise, and 5-ft sea level rise. This analysis considered the structure category and damage functions developed by the US Army Corp of Engineers (USACE) as part of the North Atlantic Comprehensive Coastal Study (NACCS). (For example, the NACCS damage functions estimate that a ground level structure with a basement will sustain more damage than an elevated structure without a basement during a coastal flood event.) The analysis finds under current conditions, upwards of 300 structures will be significantly damage (sustaining greater than 50% damage) during a 100-year storm event. With 2-foot and 5-foot sea level rise scenarios, the same 100-year event will cause significant damage (greater than 50% damage) to approximately 630 structures, and 1,400 structures, respectively.

Count of Damaged Structures by Sea Level Reis Scenario, with 100 Year Storm Return Period			
Sea Level Rise Scenario	<50% structural damage	> 50% structural damage	Total
SLR0	1,586	308	1,894
SLR2	1,957	631	2,588
SLR5	2,028	1,412	3,440

The final stage of the analysis was to prepare maps showing the density of damaged structures to help identify specific neighborhoods where flood risk is greatest and where the town may want to consider targeted adaptation options such as property buyouts.

INTRODUCTION

Barrington, Rhode Island is a coastal community situated on the northeastern side of Narragansett Bay, located in Bristol County, approximately 5.5 miles southeast of Providence, and borders Massachusetts. While Barrington is a geographically small municipality of approximately 8.6 square miles, the town has over 30 miles of waterfront along Narragansett Bay and the Barrington River (a tidal extension of Narragansett Bay).



Barrington Location Map

This analysis of sea level rise and storm surge contributes to ongoing work at the University of Rhode Island's Coastal Institute (CI), as part of its Climate Response Demonstration Site initiative. This project leverages and builds on the extensive modeling and analysis of flooding in the state developed as part of the Shoreline Change Special Area Management Plan, called BeachSAMP for short (Rhode Island Coastal Resources Management Council, 2018). BeachSAMP is an extensive document detailing the effects of sea level rise and storm surge on Rhode Island's coastline for the purpose of informing state and local decision makers to guide medium- and long-term decision making. As a result of the 2018 BeachSAMP project, several geospatial data layers were produced from models of sea level rise and storm surge. These resulting data layers are collectively referred to as "STORMTOOLS," they are available free to the public in the form of GIS raster layers for download, or as online interactive map viewers from the STORMTOOLS website. STORMTOOLS geospatial data was the starting point for this more detailed examination of Warren Rhode Island. All analyses were conducted using in ArcGIS Desktop Version 10.6

Analysis Process

The process for analysis of sea level rise in Barrington built upon the previous analysis for the adjacent town of Warren, the two analyses have many similarities but also a few differences. (See companion document -*Geospatial Analysis of Sea Level Rise in Warren, Rhode Island- MacMeekin, January 2021*) The general analysis process for Barrington followed the same sequence of analysis as Warren, first a roadway analysis was conducted using the same models, and data layers as the Warren analysis. This resulted in approximately 70 raster layers depicting the floodwater depth on the road surface for a given sea level rise scenario and storm return period. This also resulted in Microsoft Excel sheets depicting the road name and linear feet of flooded roadway for every sea level rise scenario, and storm return period.

The flood risk analysis (or CERI analysis) was an examination of the effects of sea level rise in buildings and structures. Again, this analysis was identical to the process outlined in the Warren project report. Finally, this project concluded with an analysis of the density of effected structures for a given sea level rise scenario, mirroring the process for Warren.

Data Driven Pages

The analysis for Barrington differs from the Warren Analysis, in that Barrington was interested in collecting data for the entire town, while Warren was focused on the downtown core (Warren census block 305). Mapping the entire town of Barrington required many more maps, to automate this process the "Data Driven Pages" function in ArcMap was utilized. Data Driven Pages is a function in which the user selects a grid reference, and the tool creates one map for every attribute in the grid reference. For this project, the existing Plat Map grid was used as the Data Driven Pages reference grid. The result was a new map centered on every Plat Map for the town, 37 Plats in total. Data driven pages was used on the roadway analysis for the 0 ft, 2ft, 3ft, and 5ft sea level rise scenarios, and on the structure analysis for the 0 ft, 2ft, and 5ft sea level rise scenarios. In total approximately 600 maps were produced for this project.



MN
↑
GN
↓
Declination:
-13°

Floodwater Depth on Roadway

2 Foot Sea Level Rise,
10 Year Storm Return Period

Barrington, Rhode Island

Data Source: Rhode Island Geographic Information System
Dataset Name: IMGRU_201804_RGB_3in.pdf
URL: https://maps.edc.uri.edu/giservices/IMGRU_201804_RGB_3in_softwareimageServer
RIGIS, 2016. 2015 NACCS-Derived Inundation Surfaces for Rhode Island
Incorporating the Effects of Both Storm Surge and Tide. Rhode Island Geographic Information System (RIGIS)
Data Distribution System, URL: <http://www.rgis.org>, Environmental Data Center,
University of Rhode Island, Kingston, Rhode Island (last date accessed: 20 January 2016).

Map Created by Pat MacMeekin
03/12/2021

Legend

Flood Water Depth, 2 Foot Sea Level Rise
10 YR Storm Return Period

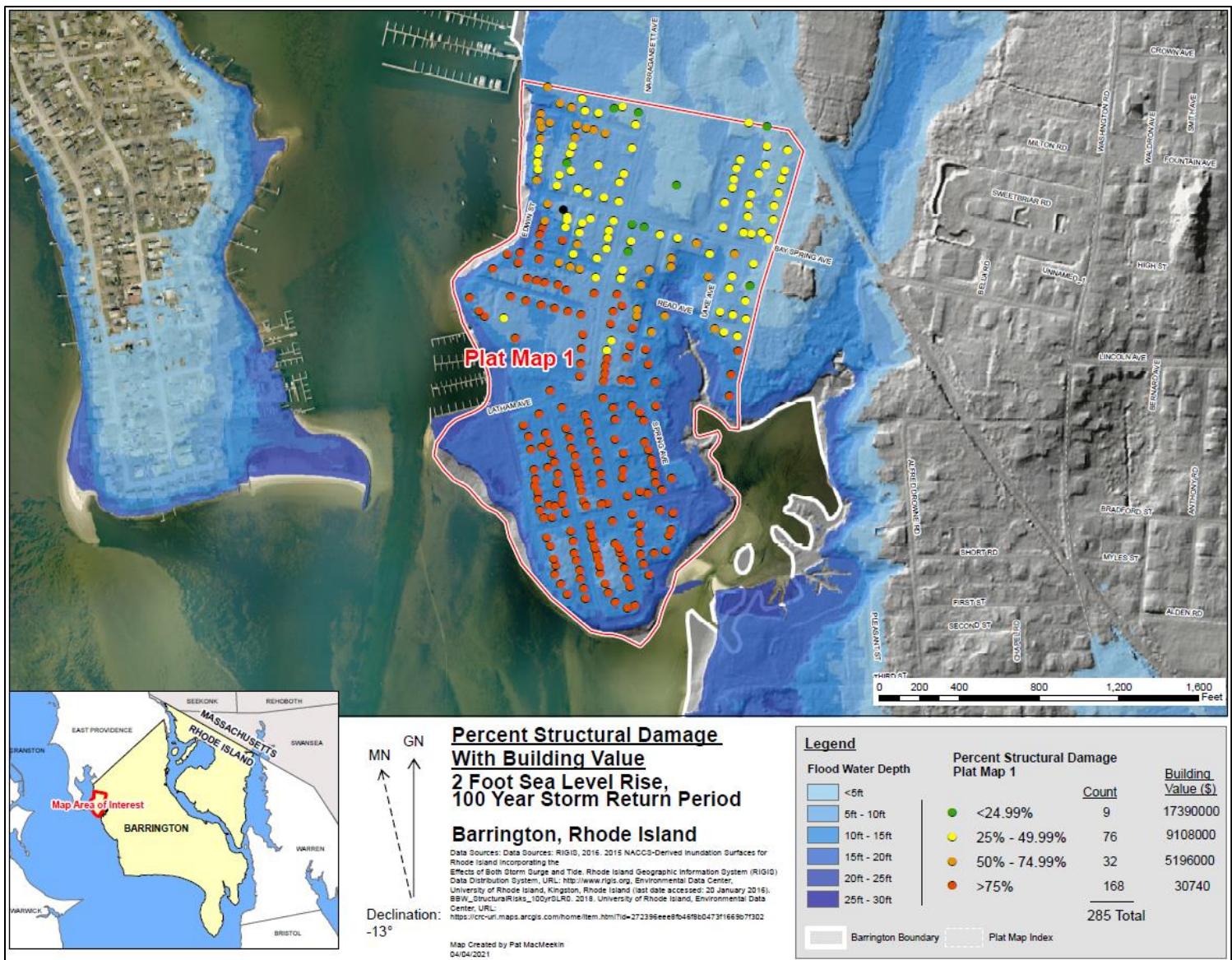
< 0.4ft	0.4ft - 0.8ft	0.8ft - 1.2ft	1.2ft - 1.6ft	1.6ft - 2ft	2.0ft - 2.4ft	2.4ft - 2.8ft
0.4ft - 0.8ft	0.8ft - 1.2ft	1.2ft - 1.6ft	1.6ft - 2ft	2.0ft - 2.4ft	2.4ft - 2.8ft	2.8ft - 3.2ft
0.8ft - 1.2ft	1.2ft - 1.6ft	1.6ft - 2ft	2.0ft - 2.4ft	2.4ft - 2.8ft	2.8ft - 3.2ft	3.2ft - 3.6ft

2ft SLR, 10 Yr Storm Return

Plat Map Index

Barrington Boundary

Example Map- Roadway analysis

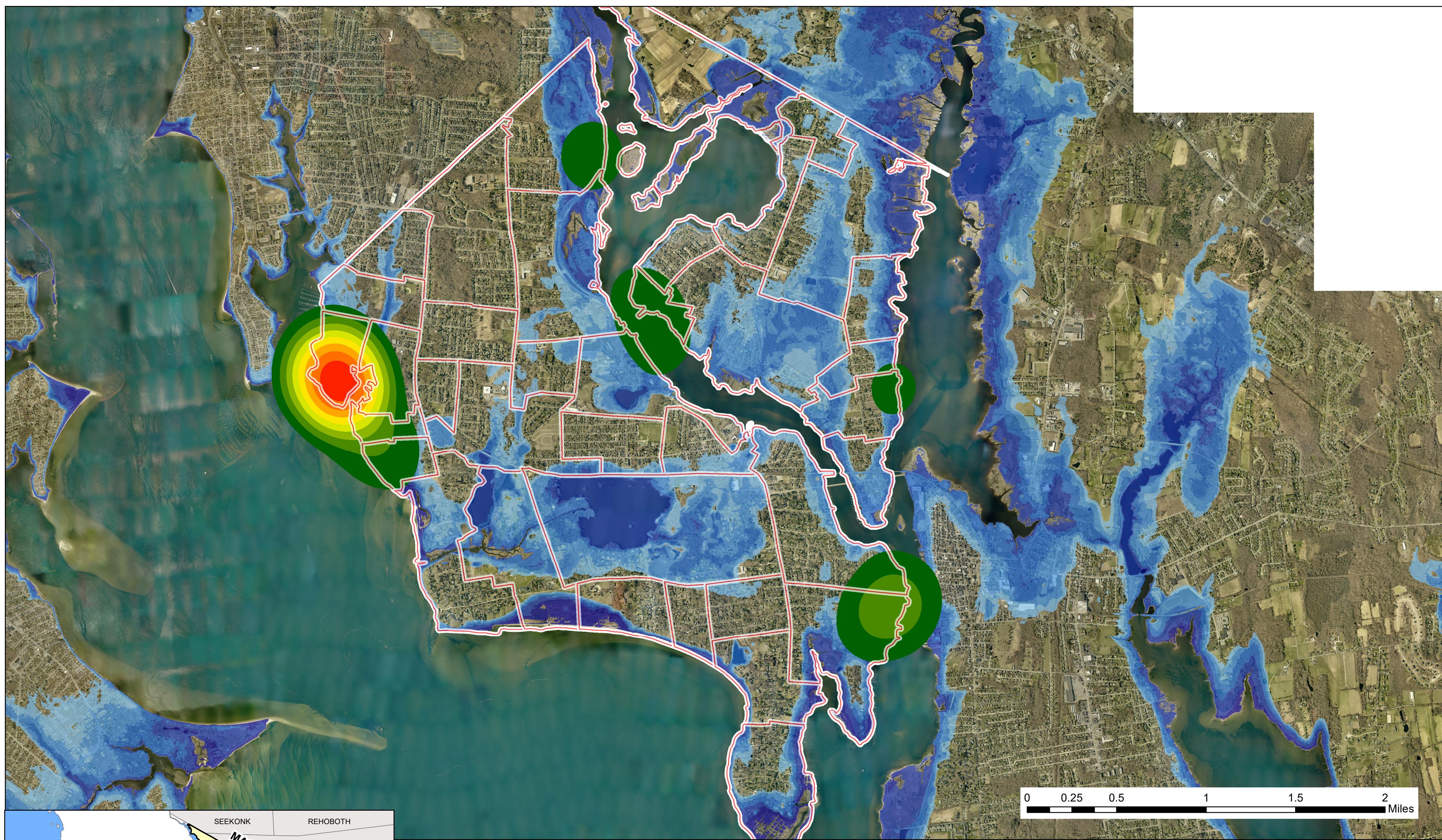


Example Map- Structure analysis

NAME	Length (Feet)
FRANCIS ST	242.5991817
FRANCIS ST	142.5688011
NEW MEADOW RD	344.4549456
HERITAGE RD	415.8940177
RUSTWOOD DR	144.7985471
NEW MEADOW RD	123.3768488
ROBBINS DR	1360.590666
MASSASOIT AVE	327.2452373
KING PHILIP AVE	491.9076311
NEW MEADOW RD	483.6641582
FEDERAL RD	71.12732533
FEDERAL RD	163.2465288
LAFAYETTE RD	529.844262
WAMPANOAG TRL	452.9112212
WAMPANOAG TRL	507.1556877
MALLARD COVE WAY	136.3460335
NEW MEADOW RD	23.74857836
NEW MEADOW RD	20.43806852
NEW MEADOW RD	437.2698236
MALLARD COVE WAY	133.9605895
NEW MEADOW RD	37.61044744
HERITAGE RD	1367.601562
PECK LN	334.7063254
PRIMROSE HILL RD	92.1280821
WAMPANOAG TRL	464.7106954
WEDGEWOOD LN	218.7722577
OLD RIVER RD	392.688001
BELTON DR	204.5053565
RUSTWOOD DR	245.0074721
WAMPANOAG TRL	380.8969702
TEAKWOOD DR	505.6363296
BRIARWOOD DR	310.5186108
WAMPANOAG TRL	49.84569351
BRIARWOOD DR	282.6397533
RUSTWOOD DR	365.6772899
OLD CHIMNEY RD	221.8397596
WESTWOOD LN	154.399207
PROMENADE ST	423.5253928
ROGERS AVE	64.31094236
OLD CHIMNEY RD	520.302955
PALISADE LN	326.665712
GREGORY CT	203.1010879
SOWAMS RD	456.7516107
BROOK ST	27.4759264
OLD CHIMNEY RD	281.1764109
FIRESIDE DR	768.4237911
LISTER DR	684.0415237
MARTIN AVE	184.5523401
MASSASOIT AVE	192.0664776
MASSASOIT AVE	131.4811798

Example of flooded roads list-

2Ft sea level rise, 25 year storm return period. This is a truncated list; the complete list is over 600 records long.



Structural Damage Density

**0 Foot Sea Level Rise,
100 Year Storm Return Period**

Barrington, Rhode Island

Data Sources: Data Sources: RIGIS, 2016. 2015 NACCS-Derived Inundation Surfaces for Rhode Island Incorporating the Effects of Both Storm Surge and Tide. Rhode Island Geographic Information System (RIGIS) Data Distribution System, URL: <http://www.rigis.org>, Environmental Data Center, University of Rhode Island, Kingston, Rhode Island (last date accessed: 20 January 2016). BBW_StructuralRisks_100yrSLR0. 2018. University of Rhode Island, Environmental Data Center, URL: <https://crc-uri.maps.arcgis.com/home/item.html?id=272396eee8fb46f8b0473f1669b7f302>

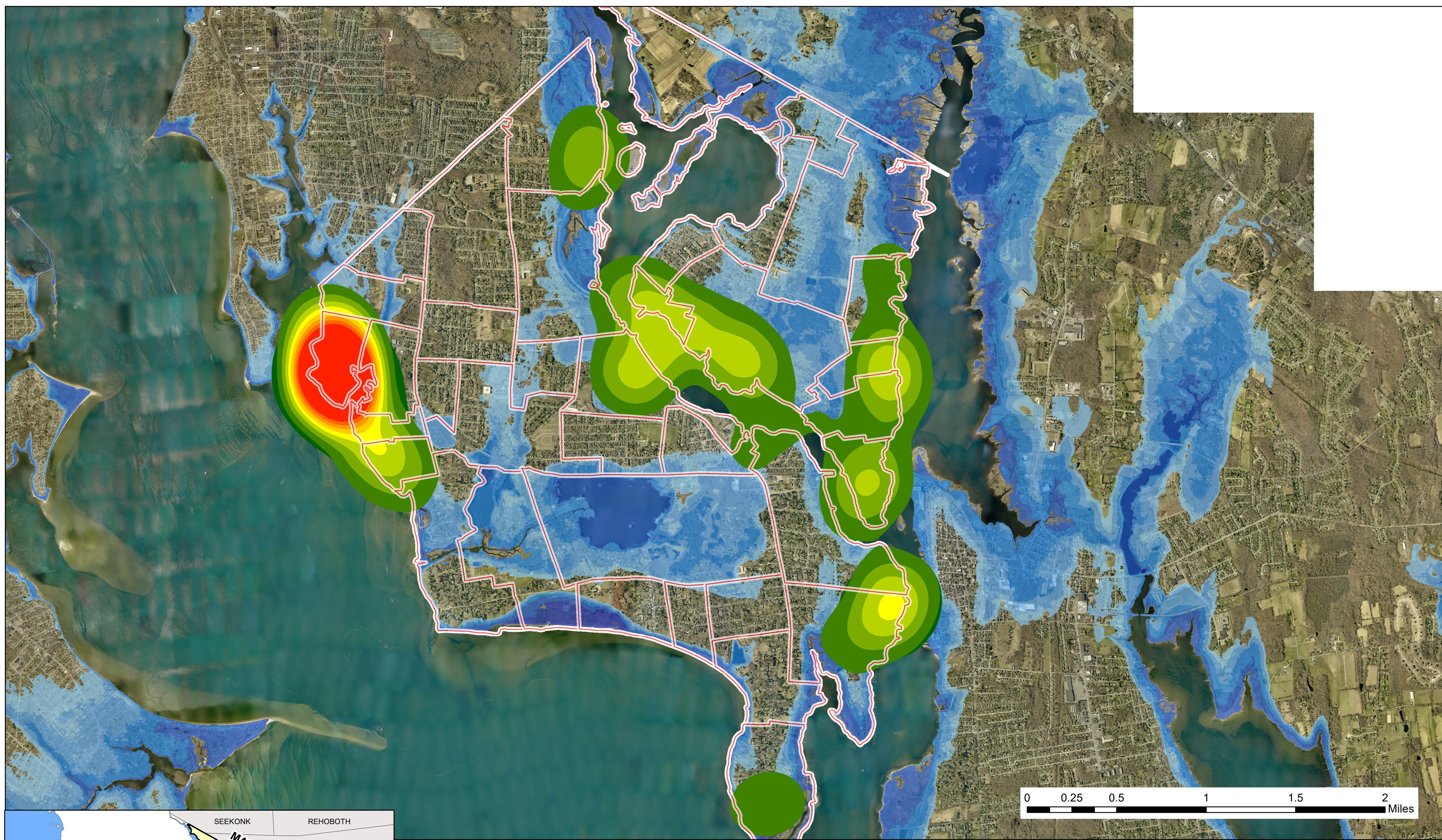
Map Created by Pat MacMeekin
04/08/2021

Legend

Flood Water Depth
< 4ft
4ft - 8ft
8ft - 12ft
12ft - 16ft
16ft - 20ft

Density of Structures Sustaining 50% Damage and Greater	
Very Low	Moderately High
Low	High
Moderately Low	Very High
Moderate	Highest

Plat Map Index Barrington Boundary



Structural Damage Density

**2 Foot Sea Level Rise,
100 Year Storm Return Period**

Barrington, Rhode Island

Data Sources: Data Sources: RIGIS, 2016. 2015 NACCS-Derived Inundation Surfaces for Rhode Island Incorporating the Effects of Both Storm Surge and Tide. Rhode Island Geographic Information System (RIGIS) Data Distribution System, URL: <http://www.rigis.org>, Environmental Data Center, University of Rhode Island, Kingston, Rhode Island (last date accessed: 20 January 2016). BBW_StructuralRisks_100yrSLR0. 2018. University of Rhode Island, Environmental Data Center, URL: <https://crc-uri.maps.arcgis.com/home/item.html?id=272396eee8fb46f8b0473f1669b7f302>

Map Created by Pat MacMeekin
04/08/2021

Legend

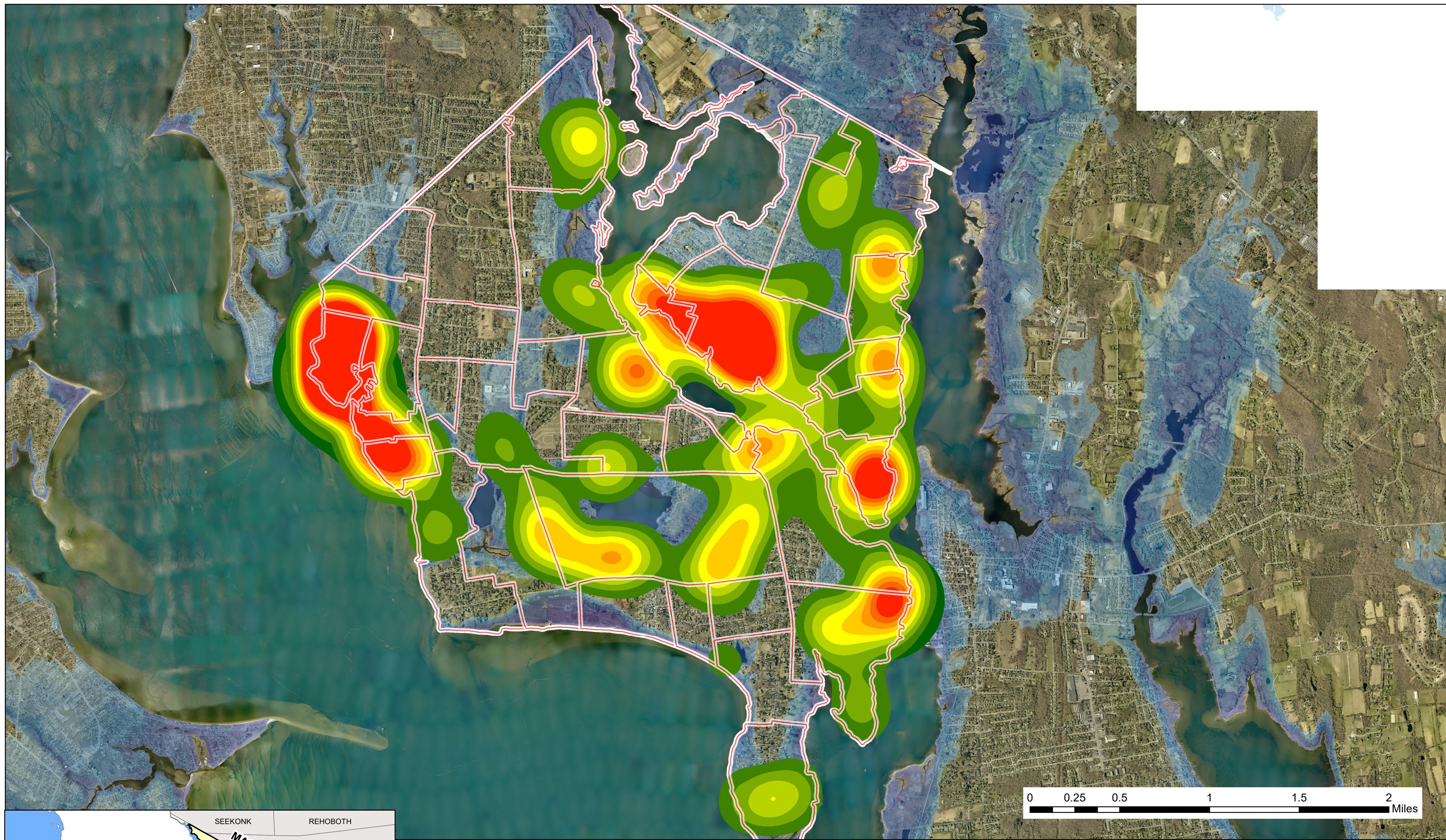
Flood Water Depth

- <5ft
- 5ft - 10ft
- 10ft - 15ft
- 15ft - 20ft
- 20ft - 25ft
- 25ft - 30ft

Density of Structures Sustaining 50% Damage and Greater

Very Low	Moderately High
Low	High
Moderately Low	Very High
Moderate	
Highest	

Plat Map Index Barrington Boundary



Structural Damage Density

**5 Foot Sea Level Rise,
100 Year Storm Return Period**

Barrington, Rhode Island

Data Sources: Data Sources: RIGIS, 2016. 2015 NACCS-Derived Inundation Surfaces for Rhode Island Incorporating the Effects of Both Storm Surge and Tide. Rhode Island Geographic Information System (RIGIS) Data Distribution System, URL: <http://www.rigis.org>, Environmental Data Center, University of Rhode Island, Kingston, Rhode Island (last date accessed: 20 January 2016). BBW_StructuralRisks_100yrSLR0. 2018. University of Rhode Island, Environmental Data Center, URL: <https://crc-uri.maps.arcgis.com/home/item.html?id=272396eee8fb46f8b0473f1669b7f302>

Map Created by Pat MacMeekin
04/08/2021

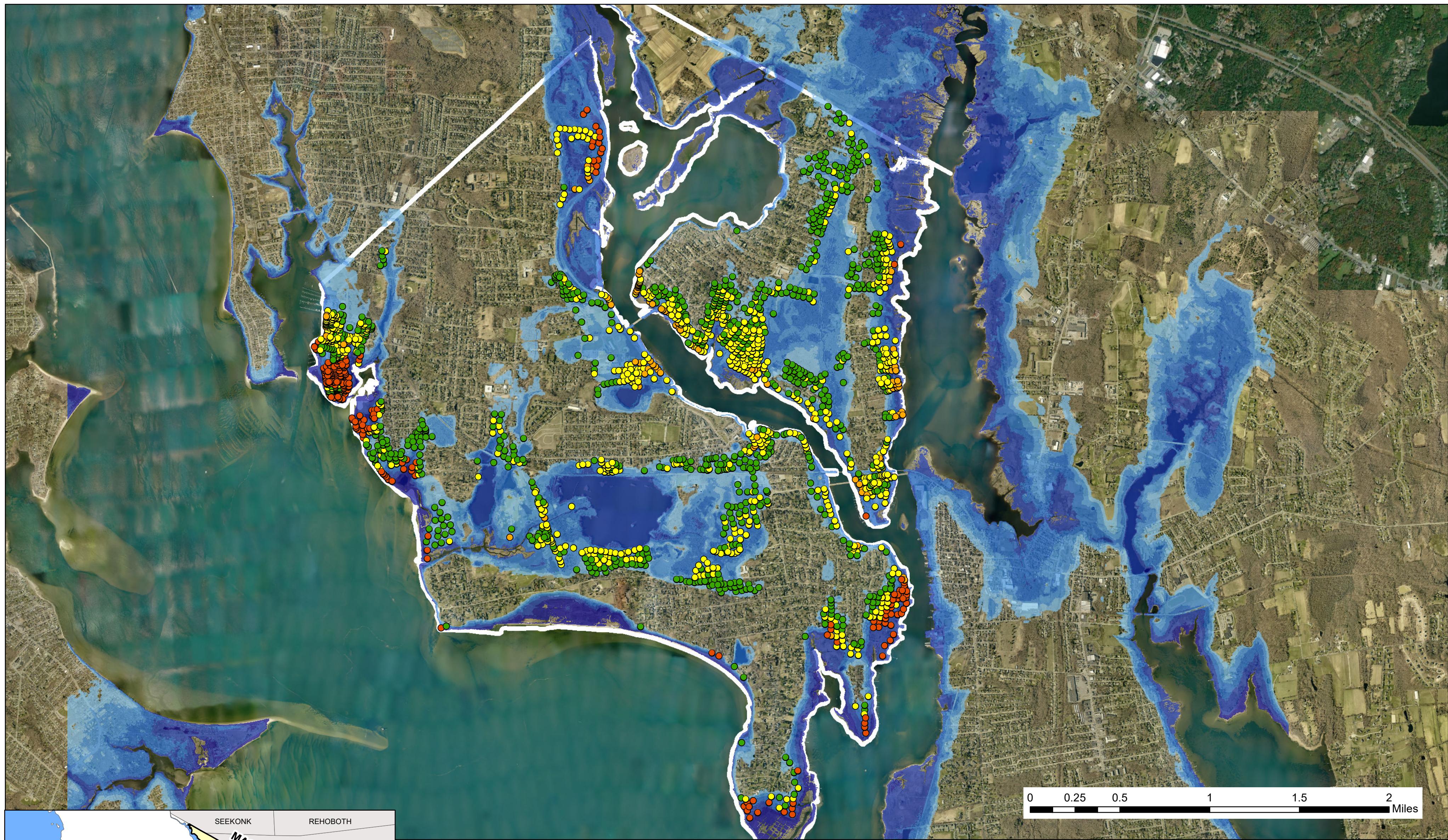
Legend

Flood Water Depth
<5ft
5ft - 10ft
10ft - 15ft
15ft - 20ft
20ft - 25ft
25ft - 30ft

Density of Structures Sustaining 50% Damage and Greater



Plat Map Index Barrington Boundary



Percent Structural Damage

0 Foot Sea Level Rise, 100 Year Storm Return Period Barrington, Rhode Island

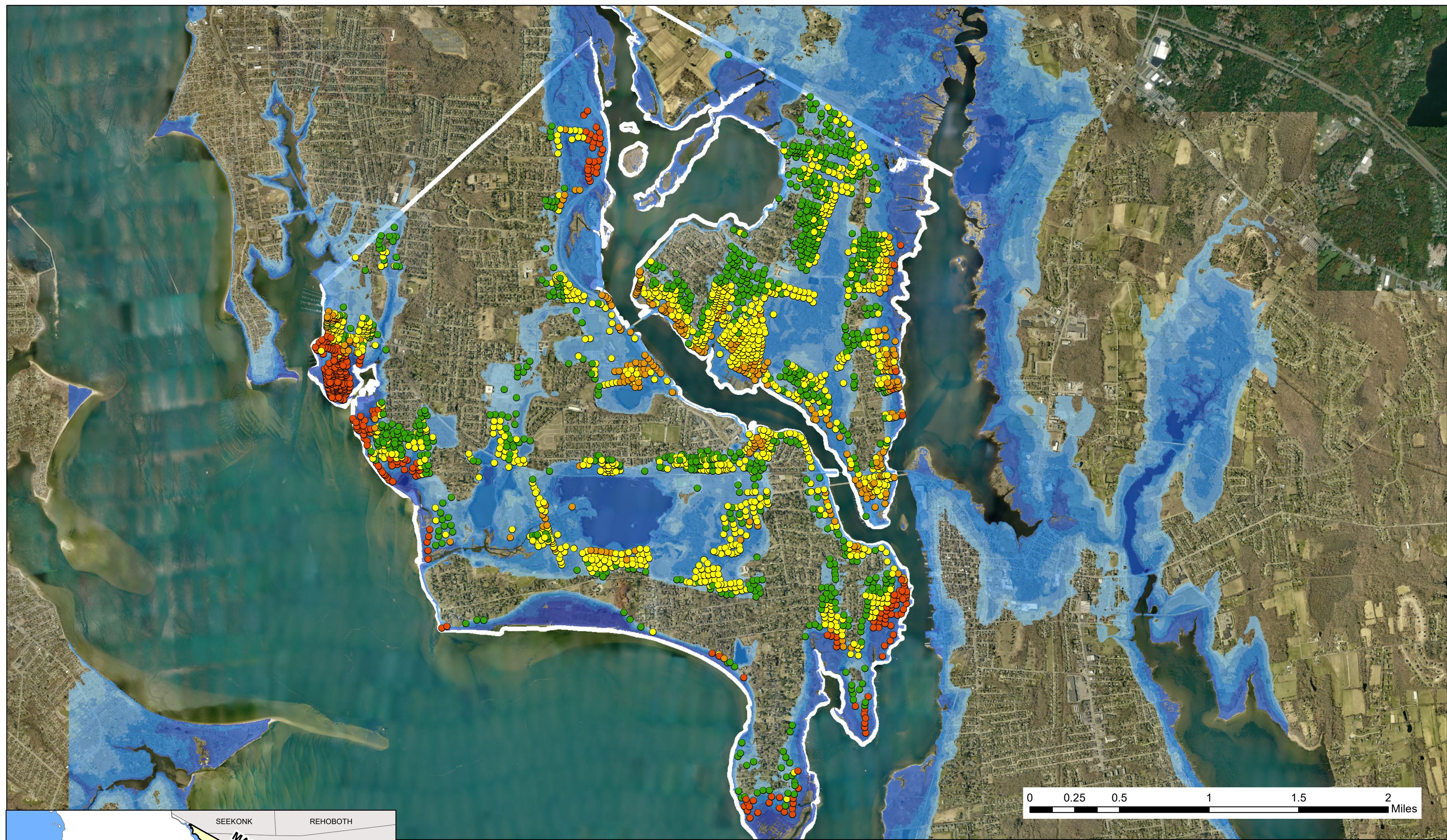
Data Sources: Data Sources: RIGIS, 2016. 2015 NACCS-Derived Inundation Surfaces for Rhode Island Incorporating the Effects of Both Storm Surge and Tide. Rhode Island Geographic Information System (RIGIS) Data Distribution System, URL: <http://www.rigis.org>, Environmental Data Center, University of Rhode Island, Kingston, Rhode Island (last date accessed: 20 January 2016). BBW_StructuralRisks_100yrSLR0. 2018. University of Rhode Island, Environmental Data Center, URL: <https://crc-uri.maps.arcgis.com/home/item.html?id=272396eee8fb46f8b0473f1669b7f302>

Map Created by Pat MacMeekin
05/24/2021

Legend

Percent Structural Damage		
Flood Water Depth	Building Count	Building Value (\$)
< 4ft	853	297,871,402
4ft - 8ft	733	190,439,618
8ft - 12ft	89	23,650,000
12ft - 16ft	219	63,999,000
16ft - 20ft		
	Total: 1,894	575,960,020

Barrington Boundary



Percent Structural Damage

2 Foot Sea Level Rise, 100 Year Storm Return Period Barrington, Rhode Island

Data Sources: Data Sources: RIGIS, 2016. 2015 NACCS-Derived Inundation Surfaces for Rhode Island Incorporating the Effects of Both Storm Surge and Tide. Rhode Island Geographic Information System (RIGIS) Data Distribution System, URL: <http://www.rigis.org>, Environmental Data Center, University of Rhode Island, Kingston, Rhode Island (last date accessed: 20 January 2016). BBW_StructuralRisks_100yrSLR0. 2018. University of Rhode Island, Environmental Data Center, URL: <https://crc-uri.maps.arcgis.com/home/item.html?id=272396eee8fb46f8b0473f1669b7f302>

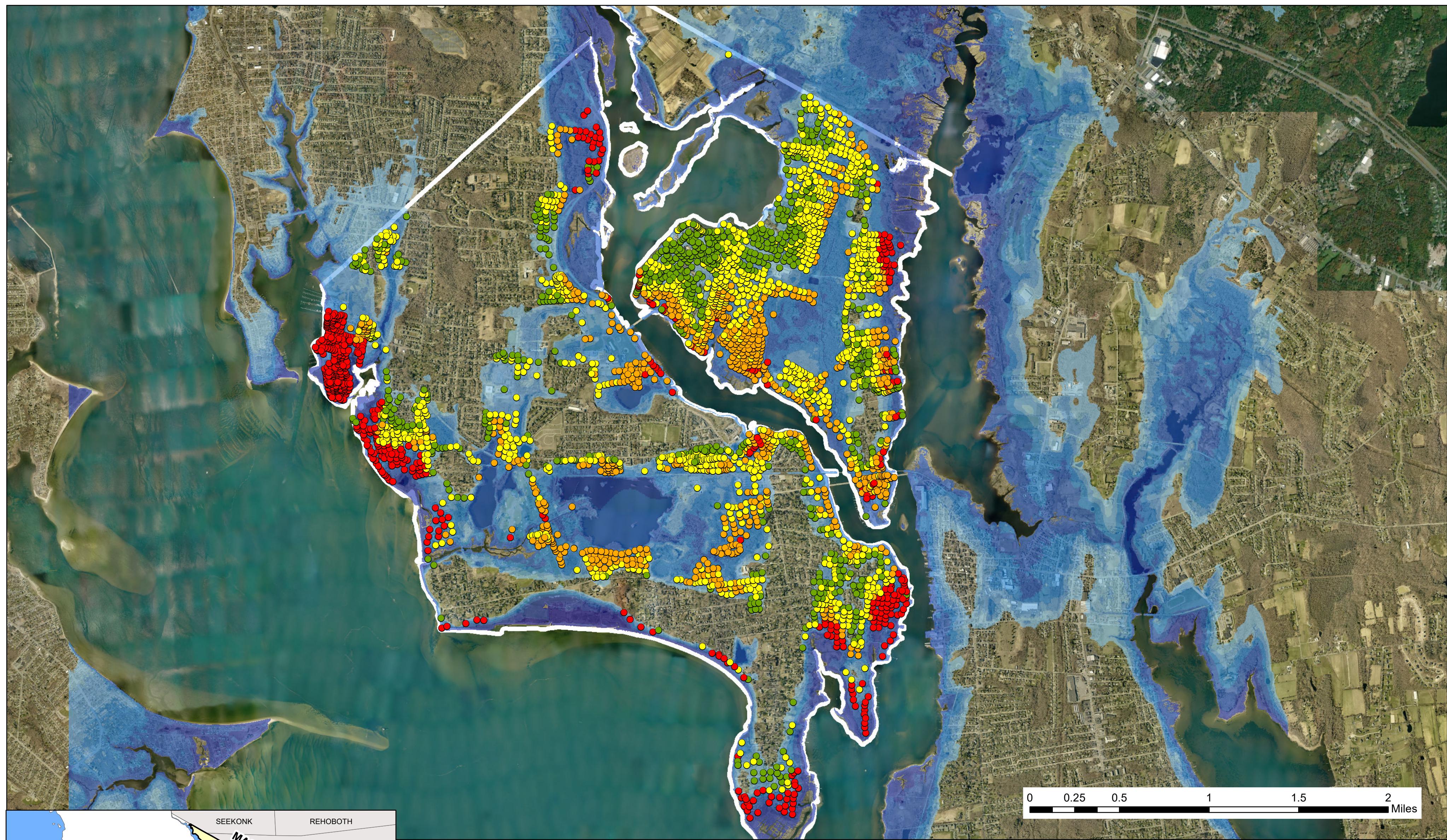
Map Created by Pat MacMeekin
05/24/2021

Legend

Flood Water Depth	Percent Structural Damage	Building Count	Building Value (\$)
<5ft	<24.99%	868	358,313,103
5ft - 10ft	25% - 49.99%	1,089	307,134,726
10ft - 15ft	50% - 74.99%	299	7,743,800
15ft - 20ft			
20ft - 25ft			
25ft - 30ft			

Total: 2,588 841,487,829

Barrington Boundary



Percent Structural Damage

5 Foot Sea Level Rise, 100 Year Storm Return Period Barrington, Rhode Island

Data Sources: Data Sources: RIGIS, 2016. 2015 NACCS-Derived Inundation Surfaces for Rhode Island Incorporating the Effects of Both Storm Surge and Tide. Rhode Island Geographic Information System (RIGIS) Data Distribution System, URL: <http://www.rigis.org>, Environmental Data Center, University of Rhode Island, Kingston, Rhode Island (last date accessed: 20 January 2016). BBW_StructuralRisks_100yrSLR0. 2018. University of Rhode Island, Environmental Data Center, URL: <https://crc-uri.maps.arcgis.com/home/item.html?id=272396eee8fb46f8b0473f1669b7f302>

Map Created by Pat MacMeekin
05/24/2021

Legend

Flood Water Depth	Percent Structural Damage	Building Count	Value (\$)
<5ft	<24.99%	760	279,626,014
5ft - 10ft	25% - 49.99%	1,268	392,168,402
10ft - 15ft	50% - 74.99%	799	234,168,427
15ft - 20ft			
20ft - 25ft			
25ft - 30ft			
	>75%	613	183,514,000
		Total: 3,440	1,089,476,843

Barrington Boundary



Floodwater Depth on Roadway

2 Foot Sea Level Rise,
10 Year Storm Return Period

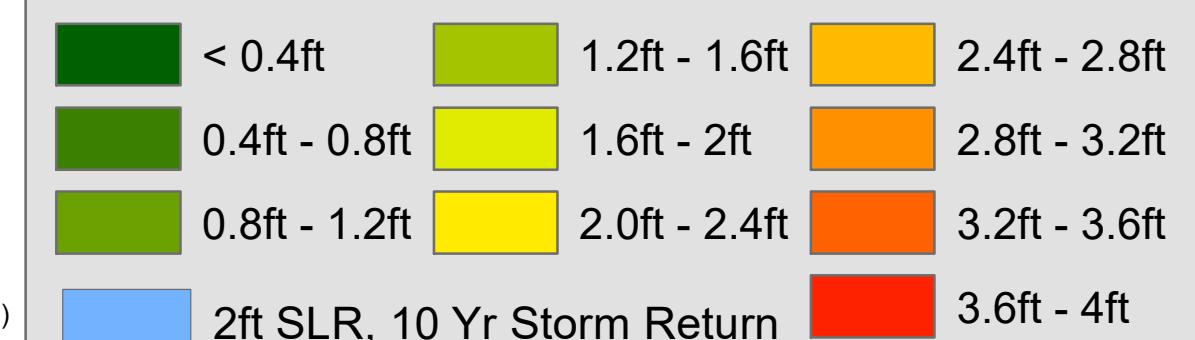
Barrington, Rhode Island

Data Sources: Imagery- ArcGIS Image Service
Service Name: IMG/RI_201804_RGB_3in_spf
URL: https://maps.edc.uri.edu/rigis/services/IMG/RI_201804_RGB_3in_spf/ImageServer
RIGIS, 2016. 2015 NACCS-Derived Inundation Surfaces for Rhode Island
Incorporating the Effects of Both Storm Surge and Tide. Rhode Island Geographic Information System (RIGIS)
Data Distribution System, URL: <http://www.rigis.org>, Environmental Data Center,
University of Rhode Island, Kingston, Rhode Island (last date accessed: 20 January 2016).

Map Created by Pat MacMeekin
03/12/2021

Legend

Flood Water Depth, 2 Foot Sea Level Rise
10 YR Storm Return Period



Plat Map Index

Barrington Boundary





Floodwater Depth on Roadway

2 Foot Sea Level Rise,
10 Year Storm Return Period

Barrington, Rhode Island

Data Sources: Imagery- ArcGIS Image Service
 Service Name: IMG/RI_201804_RGB_3in_spf
 URL: https://maps.edc.uri.edu/rigis/services/IMG/RI_201804_RGB_3in_spf/ImageServer
 RIGIS, 2016. 2015 NACCS-Derived Inundation Surfaces for Rhode Island
 Incorporating the Effects of Both Storm Surge and Tide. Rhode Island Geographic Information System (RIGIS)
 Data Distribution System, URL: <http://www.rigis.org>, Environmental Data Center,
 University of Rhode Island, Kingston, Rhode Island (last date accessed: 20 January 2016).

Map Created by Pat MacMeekin
 03/12/2021

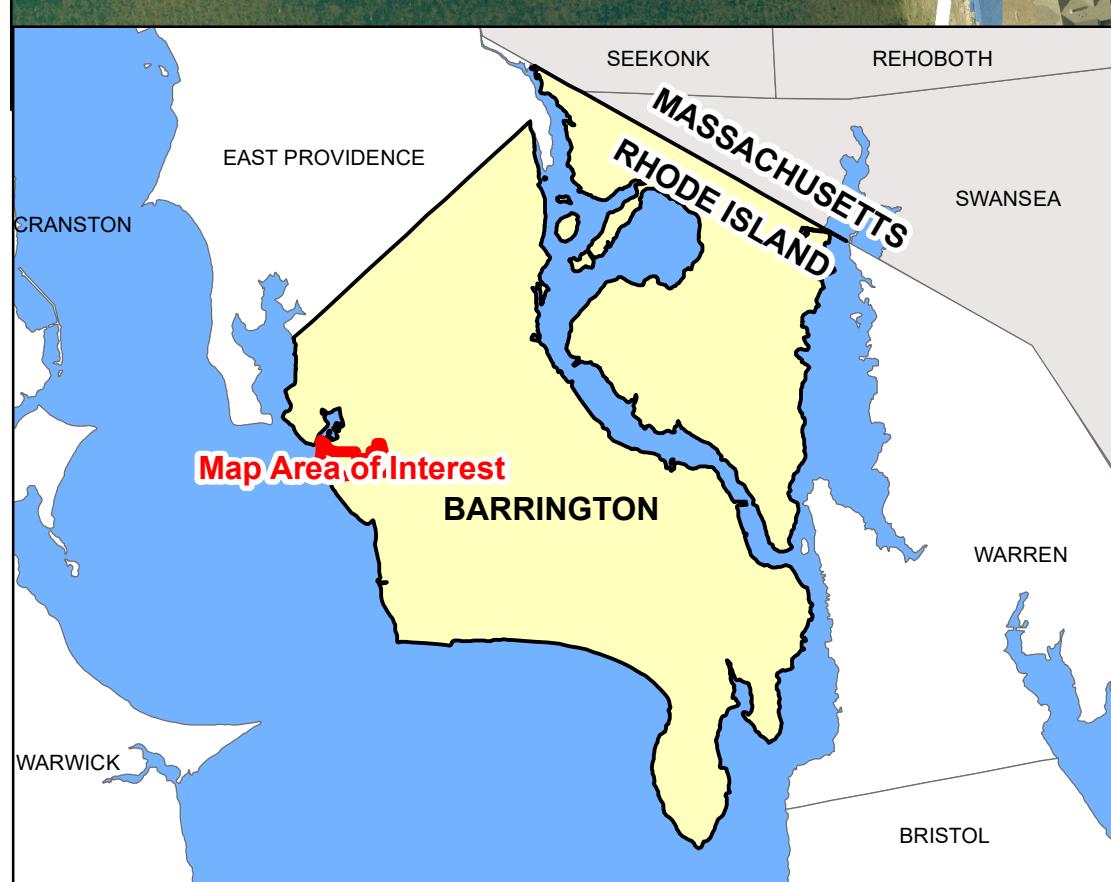
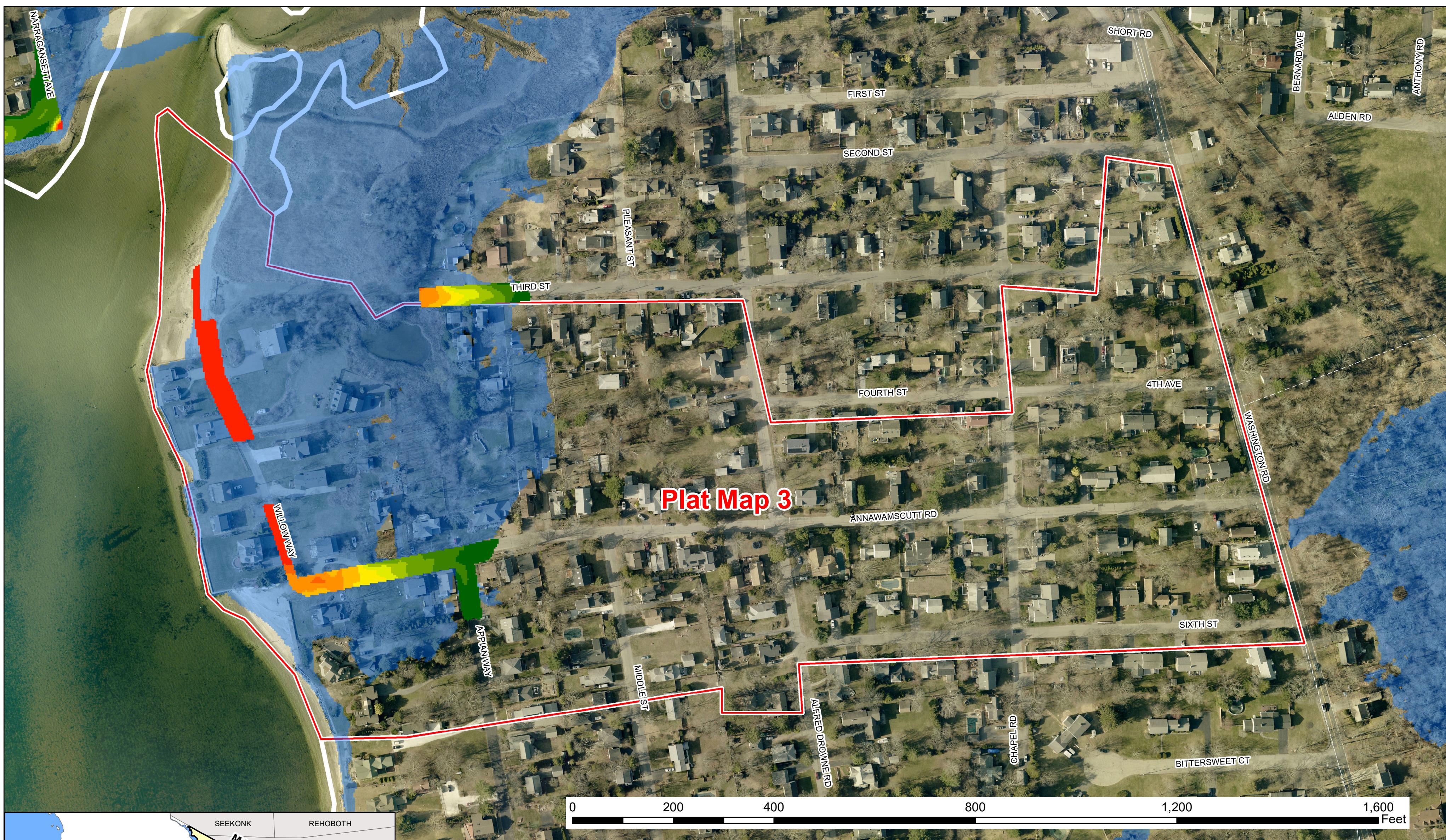
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Flood Water Depth, 2 Foot Sea Level Rise
10 YR Storm Return Period



Plat Map Index

Barrington Boundary



Floodwater Depth on Roadway

2 Foot Sea Level Rise, 10 Year Storm Return Period

Barrington, Rhode Island

Data Sources: Imagery- ArcGIS Image Service
Service Name: IMG/RI_201804_RGB_3in_spf
URL: https://maps.edc.uri.edu/rigis/services/IMG/RI_201804_RGB_3in_spf/ImageServer
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University of Rhode Island, Kingston, Rhode Island (last date accessed: 20 January 2016).

Map Created by Pat MacMeekin
03/12/2021

Legend

Flood Water Depth, 2 Foot Sea Level Rise 10 YR Storm Return Period



Plat Map Index

Barrington Boundary



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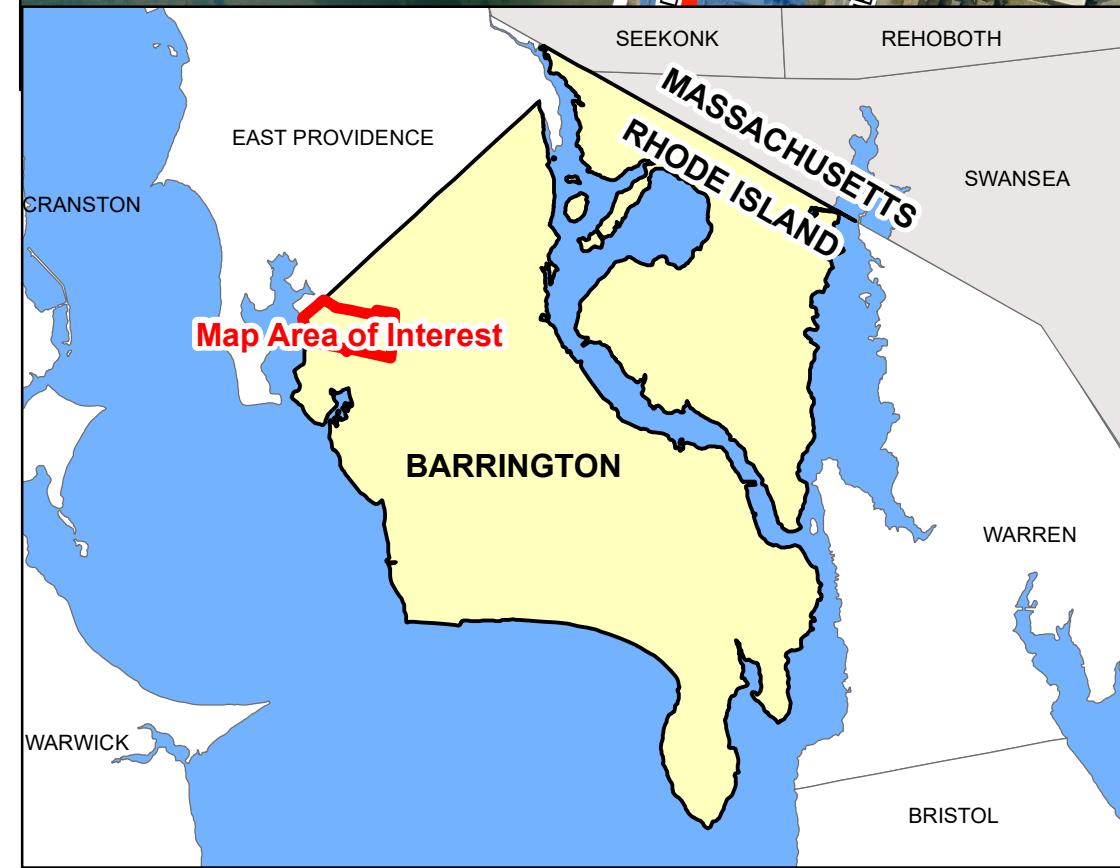
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Flood Water Depth, 2 Foot Sea Level Rise
10 YR Storm Return Period



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Barrington Boundary



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2 Foot Sea Level Rise,
10 Year Storm Return Period

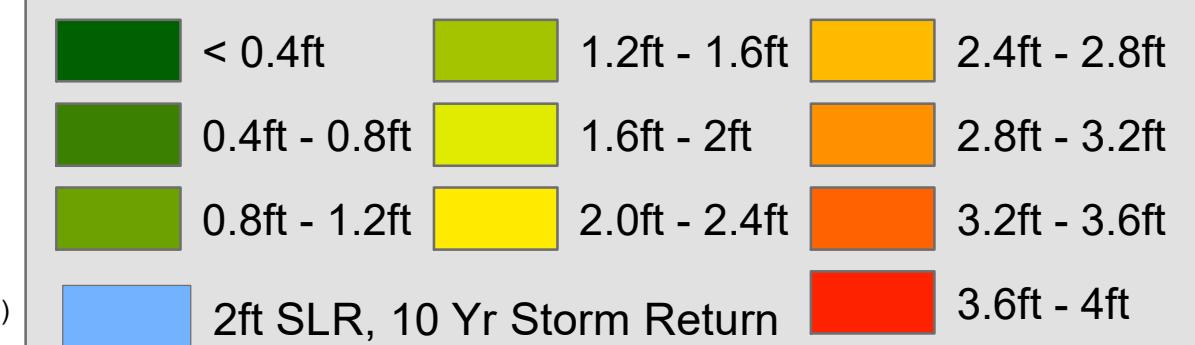
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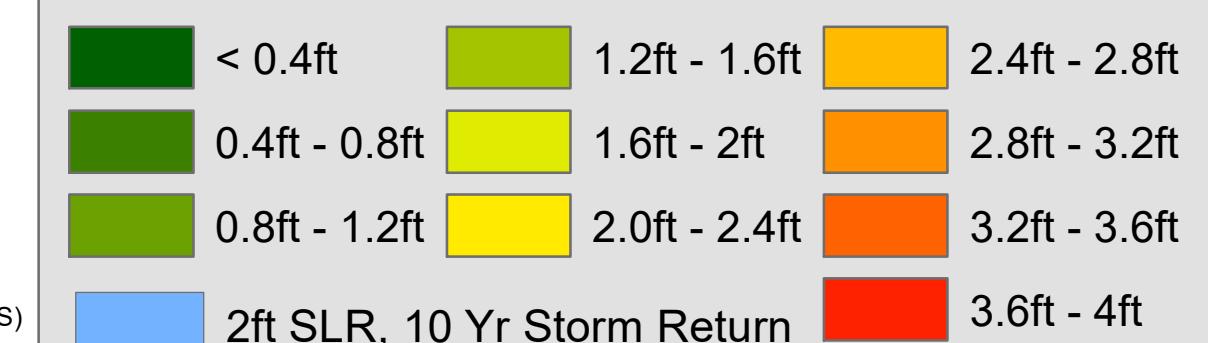
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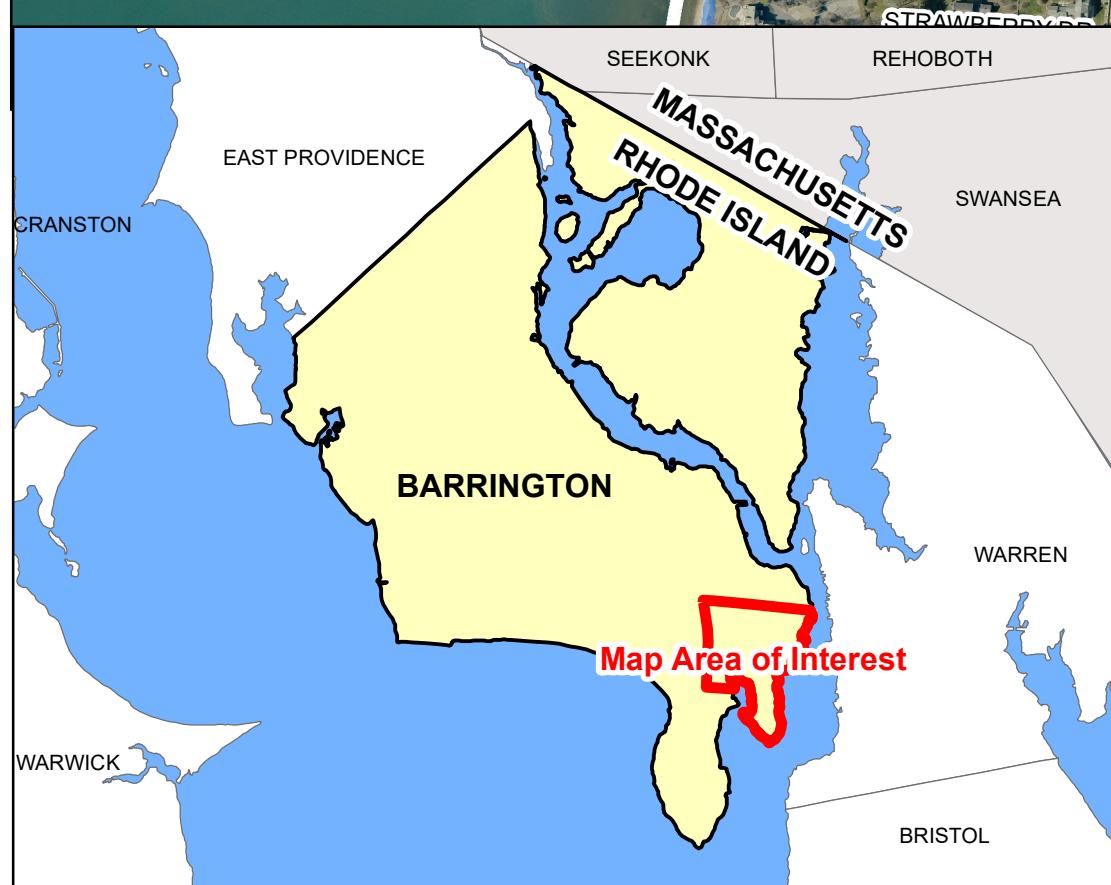
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10 YR Storm Return Period



Plat Map Index

Barrington Boundary



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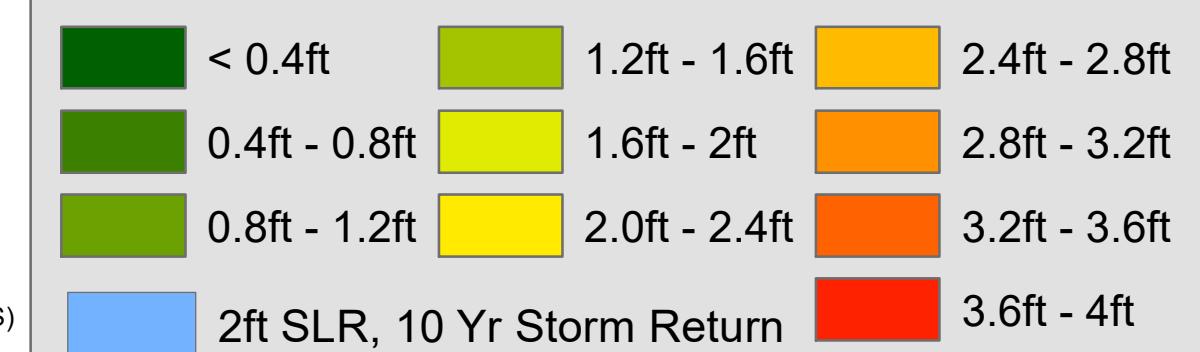
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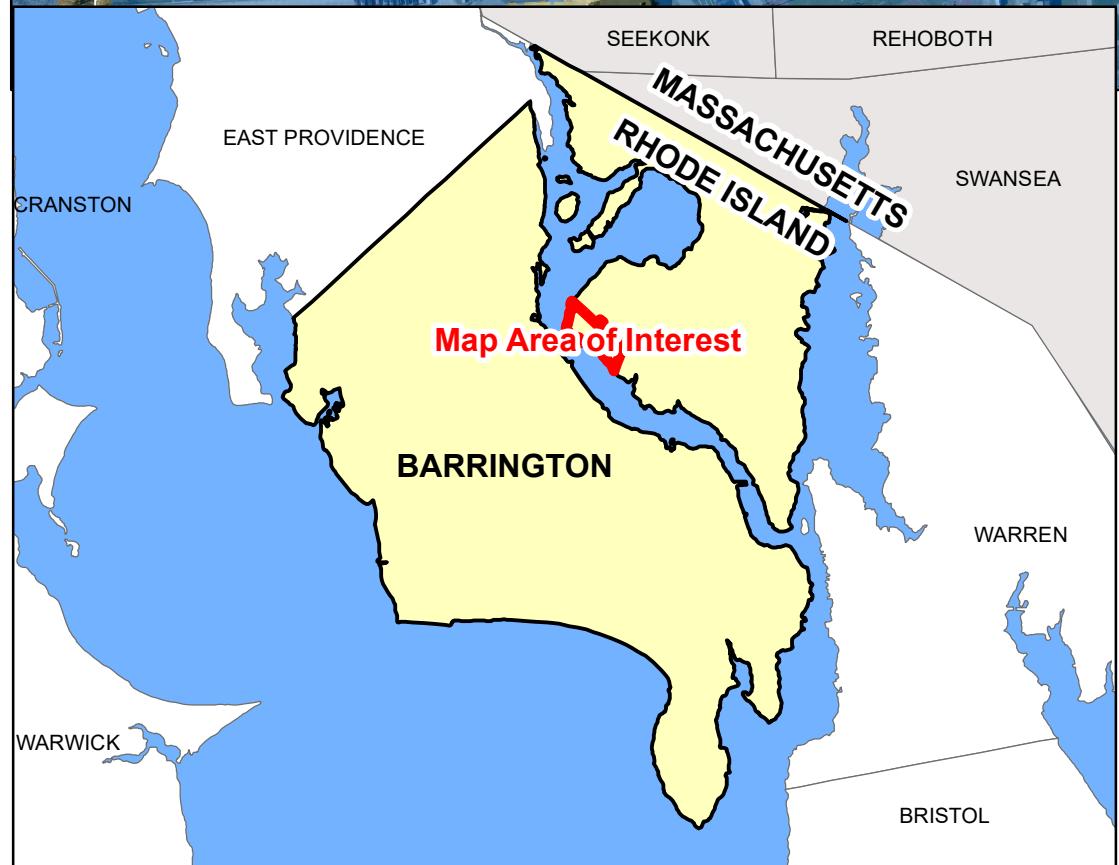
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APPENDIX 5-1

Planning and Regulatory Capabilities

Appendix 5-1

Planning and Regulatory Capabilities

As part of plan integration, and in accordance with CRS Activity 510 Planning Process - Step 7, the Town reviewed, amongst other items, preventive activities including zoning, stormwater management regulations, building codes, subdivision ordinances, and the preservation of wetlands and open space.

With respect to local capabilities, a **Level of Effectiveness** rating has been assigned to assist in determining which measures should continue to be supported or enhanced. Capabilities with a low or moderate rating were further reviewed to determine if the measure should be updated or if the 2025 Comprehensive Plan or another planning document will take the place of the less effective capability.

Where applicable, a hyperlink for the capability is provided.

Local Capability: Level of Effectiveness

High: Capability is working well and is regularly followed

Moderate: Capability could use some revisions but is followed

Low: Capability is not working and needs revisions

LOCAL *(the capabilities have been listed in alphabetical order)*

Description	Area Served	Effectiveness & Enforcement/ Maintenance	Key Discussion Points/ Plan Integration Considerations
Barrington Geographic Information System (GIS)			
<p>The Town Tax Assessor is responsible for maintaining GIS data such as updates related to new subdivisions and street extensions. The Department of Public Works is responsible for maintaining GIS data related to the infrastructure under their authority (storm drainage and sanitary sewer system). The Town Planning Department is currently working with the Conservation Commission's Tree Committee to develop an inventory of trees along Town roadways. When complete the tree inventory will be added as a layer to the Town's GIS. Improvements to the Town's geodatabase and mapping is completed by Town Departments or their consultants.</p> <p>Various Town Departments utilize the GIS data for planning, mapping, or reference.</p> <p>An on-line web viewer provides Town Departments and the public easy access to Barrington's GIS mapping which includes the following layers:</p>	Town-wide	<p>Effectiveness: High</p> <p>Enforcement/ Maintenance: Managed by Tax Assessor, DPW, and Dept PB&R</p>	<p>The Town GIS was used extensively during the development of the <i>HM&FMP</i> both for mapping and data analysis.</p> <p>The geodatabase is an excellent tool to illustrate ideas through maps, and qualitatively and quantitatively assess hazard impacts for decision making. As detailed in several Sections throughout the <i>Plan</i>, GIS mapping and analysis assisted the Steering Committee in understanding the extent of current and future hazard impacts.</p> <p>Building and maintaining the Town's GIS is an ongoing process which will benefit hazard mitigation planning. The Town is currently working with consultants to collect field data to improve the storm drainage system geodatabase. The updated information will assist the Town in analyzing drainage system improvements to mitigate flooding.</p> <p>The Town has made significant improvements in their geodatabase over the past five-years. Although it will continue to be necessary for various departments to guide improvements of specific GIS layers, it would be beneficial for the Town to identify an individual, department, or consultant to function as the Town's GIS manager.</p>

<ul style="list-style-type: none"> Locally maintained data: easements and paper streets, parcels, sanitary sewer system, storm drainage system, tax map index, water distribution system and hydrants (BCWA), and zoning, etc. State-maintained (RIGIS) data: address points (E911), bathymetry, bike path, buildings (tennis courts/pools), cemetery, contours, flood zones, hiking trails, land use, major gas lines, roadways, sidewalks, soils, streams and water bodies, town boundaries, watershed, water supply district, and wetlands, etc. 			<p>In spring 2014, the Town updated its town-wide aerial photography, which is available to all Town departments for viewing via the Pictometry website. Funding to complete aerial flyovers is included in the Town's Capital Improvement Program as needed.</p> <p>Improvements to the community's GIS may qualify for points under CRS Activity 440.</p>
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Bay Spring Neighborhood Resilience Plan (2020)			
<p>The Bay Spring neighborhood is in a low-lying area of Town highly vulnerable to flood- and wind-related hazards. The Town worked with engineering consultant Fuss & O'Neill and Save The Bay to engage the community in the development of a resilience plan for the area.</p> <p>This plan outlines projects and initiatives that can be implemented in the Bay Spring area to help mitigate potential hazard impacts.</p>	Town-wide	<p>Effectiveness: High</p> <p>Enforcement/ Maintenance: Dept PB&R</p>	<p>The Town of Barrington recognizes that sustained resilience requires community engagement and a partnership with residents & businesses. The development of this neighborhood resilience plan embraced that philosophy and the Town would like to build on this model in other areas of Town.</p> <p>The actionable items in the Bay Spring Neighborhood Resilience Plan have been reviewed for consideration in the 2022 HM&FMP Action Plan. This plan should be consulted and updated on an annual basis in conjunction with the annual HM&FMP review.</p> <p>Refer to Appendix 6.1 for an overview of the Bay Spring Neighborhood Resilience Plan actions and measures that were reviewed for inclusion in the <i>HM&FMP Action Plan</i>. Those selected have been noted accordingly in the <i>Action Plan</i>.</p>

Comprehensive Community Plan (2015 -Amended July 2019)			
<p>The Town of Barrington created a Comprehensive Community Plan (CCP) in 2002 in order to control and guide development in alignment with community goals.</p> <p>In 2009, the Comprehensive Plan was updated (receiving State approval in January 2010). The Plan went through an additional update in 2015. The 2015 update is the current version which was approved by the State and adopted by the Town. In 2019 the Town reviewed and amended the 2015 CCP. The CCP is available on the Town's website.</p> <p>The Town's Comprehensive Plan identifies goals, policies, and actions for growth and development that reflect the values of the community. It provides a framework for decision making by establishing a basis for initiating and evaluating the consistency of proposed regulations, policies, and capital expenditures, and addresses increased development pressures, open space, recreation, public services and facilities, and economic development.</p>	Town-wide	<p>Effectiveness: High</p> <p>Enforcement/ Maintenance: Planning Board, Zoning Board of Review, and Dept PB&R</p>	<p>The planning efforts associated with the <i>HM&FMP</i> have been coordinated with the Town's Comprehensive Plan. In compliance with the Rhode Island Comprehensive Planning and Land Use Act amendments of 2011, the current CCP includes a Natural Hazards Element. The Natural Hazards Element describes critical issues, planning opportunities and sets of goals, strategies and actions related to natural hazards, including the threat of sea level rise. To ensure alignment between the documents, the Natural Hazard Element's Goals, Objectives, Policies and Actions were reviewed in developing this <i>HM&FMP</i>.</p> <p>Hazard mitigation strategy was integrated into a number of the other 2015 CCP Elements, for example:</p> <p>Natural and Cultural Resources Element: Open Space Acquisition Criteria</p> <p>The CCP establishes criteria for evaluating open space acquisition and recognizes the value of open space in mitigating risk from sea level rise and flooding (Policy NCR-1.1.1).</p> <ul style="list-style-type: none"> • Protection of upland areas adjacent to coastal wetlands that are projected to migrate landward due to impacts from sea level rise. • Property providing storm water storage, flood protection, or groundwater recharge.

			<p>The CCP should be reviewed on an annual basis concurrent with the <i>HM&FMP</i> review in order to consider revisions that would further align with the goals of the <i>HM&FMP</i>. In future updates, the Town will continue to look for opportunities to integrate the <i>HM&FMP</i> objectives and action items into CCP Elements (including Housing & Neighborhoods, Economic Development, Natural & Cultural Resources, Natural Hazards, and Land Use). Incorporating the <i>HM&FMP</i> into the Comprehensive Plan will more fully integrate the documents thereby strengthening the Town's position to implement the <i>HM&FMP</i> as it will carry the full legal weight and authority of the CCP.</p> <p>Refer to Appendix 6.1 for an overview of the Comprehensive Plan actions and measures that were reviewed for inclusion in the <i>HM&FMP Action Plan</i>. Those selected have been noted accordingly in the <i>Action Plan</i>.</p>
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Comprehensive Plan to Restore Water Quality in Hundred Acre Cove (2021)			
<p>In this Report, Save The Bay compiled a comprehensive list of water quality and habitat restoration and adaptation projects that had previously been identified but not yet completed. Additionally, new projects were identified by project partners in response to renewed focus on the Runnins River watershed, which is a major driver of water quality in Hundred Acre Cove. Projects and recommendations fall into three broad categories:</p> <ul style="list-style-type: none"> • Policies and programs to reduce pollution from wastewater and stormwater runoff. • Projects to help habitats adapt to intensifying impacts of climate change. • Financing and funding to support priority actions. 	Vicinity of Hundred Acre Cove	<p>Effectiveness: High</p> <p>Enforcement/ Maintenance: Dept PB&R</p>	<p>Restoring Hundred Acre Cove's waters and helping its salt marshes adapt to climate change is an immense challenge, in part because it is a resource shared by two states and three municipalities with different governance structures, policies, and regulations. It also requires a commitment from the homeowners and communities upstream, particularly along the Runnins River.</p> <p>Barrington is committed to helping restore this estuary and appreciates the partnership with Save The Bay. Marshes are an important ecological feature as they clean pollutants from water. They also protect communities against storm surges and erosion, and are important in the fight against climate change because they are better than forests at capturing carbon.</p>

Emergency Operation Plan (2022)			
<p>In 2020, the Town hired a part-time Emergency Management Coordinator, who amongst other initiatives updated the Town's Emergency Operation Plan.</p> <p>This plan outlines the process and actions to manage emergency operations. The Emergency Operations Plan (EOP) is a preparedness document that addresses Barrington's planned response to extraordinary emergency situations associated with natural disasters, technological incidents, and nuclear emergency operations through the coordination and cooperation of Town Departments with the State of Rhode Island and Federal Government authorities. It provides operational concepts relating to the various emergency situations, identifies components of an organized emergency response, and describes the overall responsibilities and actions required to save lives, protect property, and mitigate suffering.</p>	Town-wide	<p>Effectiveness: High</p> <p>Enforcement/ Maintenance: Emergency Management Director (Fire Chief) and Town Manager</p>	<p>The EOP is maintained by the Emergency Management Director (Fire Chief) in conjunction with the Town Manager. It is important that the EOP is reviewed on an annual basis in order to take advantage of the latest data and remain effective. Any changes should be coordinated with the State of Rhode Island Emergency Management Agency (RIEMA) Telecommunications Section which retains computerized master plans for all communities in the State as a support function.</p> <p>An annual review was conducted by EMA in April 2022 in conjunction with development of the <i>HM&FMP</i> and determined no additional changes are required at this time.</p>

Geospatial Analysis of Sea Level Rise for Rhode Island Municipalities (2021) – and associated maps & geodatabase			
During the fall of 2020/Spring 2021, the Coastal Institute hired Patrick MacMeekin, a Graduate Student in the Masters of Environmental Science and Management Program, Department of Natural Resources at URI, as an intern to complete a geospatial analysis for the Towns of Barrington, Warren, and Bristol (Bristol County). The analysis examines potential flood risk to structures and roadways from future sea level rise and storm events.	Town-wide	Effectiveness: High Enforcement/ Maintenance: Dept PB&R	Due to its low elevation, Barrington is particularly vulnerable to the impacts of future climate change and already experiences regular nuisance flooding with costly impacts on the town's residences, businesses, and infrastructure. The analysis takes into account future sea level rise and storm event conditions in order to identify opportunities to reduce future flood losses. This project resulted in a suite of GIS data products that were used in conjunction with the development of this <i>HM&FMP</i> and will assist Town officials in medium and long-term planning decisions in response to sea-level rise and storm surge flooding.
Harbor Management Plan (2018)			
Barrington enjoys nearly 20 miles of historically important, economically significant, visually attractive, and natural resource rich shorelines. This plan guides the use of Barrington's shoreline recreation and industry use to ensure that these economically, socially, and historically important resources are preserved and protected so that they may continue to benefit all Barrington citizens both today and for generations to come.	Water-front & Harbor Areas	Effectiveness: High Enforcement/ Maintenance: Harbormaster	The <i>HM&FMP</i> should be consulted when reviewing/updating the Harbor Management Plan to determine the current and projected impact of natural hazards to the waterfront and harbor areas. It is recommended that the Harbor Management Plan be reviewed on an annual basis concurrent with the <i>HM&FMP</i> . With respect to flood mitigation, updates to the Plan should address future SLR projections as adopted by CRMC. Refer to Appendix 6.1 for an overview of the Harbor Management Plan actions and measures that were reviewed for inclusion in the <i>HM&FMP Action Plan</i> . Those selected have been noted accordingly in the <i>Action Plan</i> .
Housing-Land Use Study (2008)			
As a nearly built-out community, Barrington has limited options to meet affordable housing goals. This Study considered strategies outlined in the Town of Barrington Affordable Housing Plan to provide a range of housing types, meet affordable housing goals, and establish senior residential communities that also preserve and protect the sense of place and community unique to Barrington. The plan focuses on the 37-acre Zion Bible College campus, the 15-acre Sowams Nursery site, a 1.8-acre Town-owned parcel at 562-568 County Road, and residential and mixed-use infill in the Neighborhood Business zone on Maple Avenue.	Town-wide	Effectiveness: Low Enforcement/ Maintenance: Planning Board, Zoning Board of Review, Town Council	The Town of Barrington embraces the need for quality low- and moderate- income housing. Portions of this plan have become outdated and are superseded by the 2015 Comprehensive Plan (Amended 2019).
*** THIS DOCUMENT - 2022 Hazard Mitigation & Flood Management Plan			
This document - the 2022 <i>HM&FMP</i> - was developed with an understanding of the increased importance of identifying and implementing community centric strategies to reduce the impacts of future hazard events on people, property, and the environment. The <i>Plan</i> describes critical issues, planning opportunities, and sets of goals, strategies, and actions related to natural hazard mitigation. This Plan will supersede the Town's 2017 Hazard Mitigation Plan.	Town-wide	Effectiveness: Anticipated to be High once adopted by the Town Council Enforcement/ Maintenance: Managed by the EMC/HM&FMP Steering Committee (Director of PB&R, Chair)	The <i>HM&FMP</i> Steering Committee will be responsible for the annual <i>HM&FMP</i> review. The Committee consists of the heads of the following departments, alongside residents and other stakeholders. Most of the following departments will assume a lead role in implementing one or more of the actions identified in the Action Plan. Fire Dept; Planning, Building & Resiliency; DPW; Police Dept, and Harbor Master Once conditionally approved by RIEMA and FEMA, this <i>Plan</i> will be presented to the Town Council for adoption. As the <i>HM&FMP</i> has been developed with respect to CRS Activity 510, this plan should qualify for CRS credit.

Hazard Mitigation Plan (2017)			
The 2017 HMP was used as a basis for this HM&FMP. The 2017 plan describes critical issues, planning opportunities, and sets of goals, strategies, and actions related to natural hazard mitigation. The 2017 Natural Hazards Mitigation Plan will be superseded by the 2022 HM&FMP (This document)	Town-wide	Effectiveness: High Enforcement/ Maintenance: Managed by the Emergency Management Committee	The Emergency Management Committee, which consists of the heads of the following departments, was responsible for the annual Plan review and assumed lead roles in implementing many of the actions identified in the 2017 Action Plan. Fire Department; Planning & Community Development; Office of Building and Zoning; DPW; Harbor Master; and Police Department A detailed review of the status of the 2017 Action Plan has been provided in Section 5.3 . As shown in Appendix 6.1 , all of the non-completed 2017 HMP actions were reviewed for inclusion in the <i>HM&FM Action Plan</i> . Those selected have been noted accordingly in the <i>Action Plan</i> .
Municipal Resilience Program Community Resilience Building Workshop Summary of Findings (2019)			
This report provides a summary of the Town of Barrington's Community Resilience Building (CRB) Workshop that was held in September 2019. The workshop was part of the Resilient Rhody: Municipal Resilience Program (MRP), an initiative of the RI Infrastructure Bank in partnership with The Nature Conservancy. The Workshop, a joint initiative with the Town of Warren, provided a community-driven process to assess current hazard and climate change impacts and to identify projects, plans, and policies for improved resilience.	Town-wide	Effectiveness: High Enforcement/ Maintenance: Managed by the Dept PB&R	Numerous hazard mitigation actions were identified and prioritized through this community-driven process, including actions to mitigate flooding. Measures identified in this report have the potential for funding assistance through the MRP Action Grant Program. Refer to Appendix 6.1 for an overview of the SOF actions and measures that were reviewed for inclusion in the <i>HM&FM Action Plan</i> . Those selected have been noted accordingly in the <i>Action Plan</i> .
Open Space Plan (2011) – tentatively scheduled to be updated in 2023			
The 2011 Open Space Plan is the Town's first overall plan to provide a specific set of cohesive strategies and criteria for identifying and acquiring additional areas that are of the highest priority for protection. The Open Space Plan, an initiative of the Town's Comprehensive Community Plan, was developed under the direction of the Open Space Ad Hoc Committee, with input from the Barrington Land Conservation Trust , the Conservation Commission, Planning Board , Park and Recreation Commission and others. Current opportunities to protect open space include: <ul style="list-style-type: none">• Land Acquisitions by the Town• Land Acquisitions by the Barrington Land Conservation Trust (BLCT)• Acquisition of Development Rights• Land Donations• Farm, Forest, and Open Space Program In lieu of purchasing property, the Town may want to consider implementing tax incentives for wetland buffers.	Town-wide	Effectiveness: Medium Enforcement/ Maintenance: Managed by Conservation Commission, Dept PB&R, Planning Board, and Park & Recreation Commission	Open space properties contribute greatly to our quality of life in the form of parks and trails, scenic views, woodlands, farmlands, stream buffers, meadows, fields, and marshlands. Open spaces serve functions vital to the environment – providing wildlife habitat, protecting water quality, and handling storm water drainage. The Town intends to update the 2011 Open Space Plan (tentatively in 2023). Any update should consider revisions that would further align with the goals of the HM&FMP, particularly actions that will reduce future flood losses. The update should identify property that if acquired by the Town or BLCT would benefit floodplain management in terms of: protecting upland areas adjacent to coastal wetlands that are projected to migrate landward due to impacts from sea level rise; and property providing storm water storage, flood protection, or groundwater recharge. If the updated Open Space Plan is developed with respect to CRS Activity 420, it may qualify for CRS credit. Further, depending on how open space is preserved, it may also qualify for credit under CRS Activity 420.

Preparing for Resilience: Barrington and Warren Mixed-Use Climate Response Demonstration Site (2019)
Preparing for Resilience: Barrington, Warren and Bristol Mixed-Use Climate Response Demonstration Site (2021)

<p>The aim of this initiative is to explore adaptation strategies that will promote resilience of coastal municipalities and enhance ecosystem sustainability. The demonstration sites will draw from adaptation practices currently being implemented in RI and other coastal regions and will strive to test, monitor, and “demonstrate” the resiliency response to adaptation actions. Collaboration with state and municipal governments, planners and policymakers, businesses, homeowners, community groups, conservation organizations, academia, and others, is fundamental to the success of this effort.</p>	<p>Town-wide with emphasis on flood-prone areas</p>	<p>Effectiveness: High Enforcement/Maintenance: Managed by the Dept PB&R</p>	<p>This document serves to highlight the urgency to plan now for nuisance and catastrophic flooding and implement bold adaption measures. This document will be periodically updated as the demonstration site initiative continues to move forward. As that process ensues, consideration of the <i>HM&FM Action Plan</i> should serve as a catalyst for initiatives.</p> <p>As detailed in Appendix 6.1, the outcomes associated with various workshops and initiatives identified in this report were reviewed for inclusion in the HM&FM Action Plan. Those selected have been noted accordingly in the <i>Action Plan</i>.</p>
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Rhode Island General Law, Chapter 23-27.3 State Building Code

<p>Rhode Island administers a State Building Code through the Rhode Island Building Code Commission (BCC). The BCC is tasked with protecting public health, safety and welfare by establishing minimum standards of construction in Rhode Island. Safe structures are achieved through a combination of code-based design & construction practices, and an inspection process that ensures compliance with the established standards. The building codes of Rhode Island adopt the International Building Code.</p> <p>The International Building Code (IBC) is a model building code developed by the International Code Council (ICC). It has been adopted for use as a base code standard by most jurisdictions in the United States. The International Code Council (ICC) is the leading global source of model codes and standards and building safety solutions that include product evaluation, accreditation, technology, training, and certification. The Code Council's codes, standards, and solutions are used to ensure safe, affordable, and sustainable communities and buildings worldwide.</p> <p>The Building Code is implemented statewide and enforced locally through the building official. The Code consists of uniform regulations to control construction, reconstruction, repair, removal, demolition, and inspection of all buildings.</p> <p>Barrington's Building Official is responsible for ensuring new structures and substantial improvements meet Building Code requirements. Before a building permit is issued for construction in the SFHA (A or V flood zones), an elevation certificate that verifies a proposed structure meets the minimum first-floor elevation requirements, must be submitted to the Building Official.</p>	<p>Town-wide</p>	<p>Effectiveness: High Enforcement/Maintenance: Building Official</p>	<p>The NFIP standards for wind, and snow loads are an integral part of the RI State Building Code, ensuring that all new construction and substantial improvements meet national flood resistant standards through consistent statewide application of the NFIP minimum criteria.</p> <p>Key Building Code requirements related to hazard mitigation include:</p> <ul style="list-style-type: none"> • Structures are required to be able to withstand 110-mile-per-hour winds, or a Category 2 hurricane • Residential and commercial structures must be designed and built to resist the effects of earthquake motions based on site-specific elements such as soil profile and ground motion • Bridges must be built to withstand seismic forces based on the bridge classification and site-specific geophysical conditions <p>The Town should support revisions to the building code that more stringently mitigate flood damage to structures.</p> <p>Maintaining Elevation Certificates per CRS guidelines may qualify for credit under CRS Activity 310. Additional building code related credit may be obtained under CRS Activity 430.</p>
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Strategic Energy Plan (2011) – in the process of being updated			
The 2011 Strategic Energy Plan (SEP) is outdated and in the process of being updated by the Planning, Building & Resiliency Department in coordination with the Resilience & Energy Committee. This updated plan will provide a high-level comprehensive assessment of energy use throughout Barrington's municipal operations, including facilities, vehicles, and public lighting. Based on this assessment, the Strategic Energy Plan will identify specific strategies for the Town to implement to reduce overall energy use and associated costs. In addition to costs, the Town recognizes that reducing energy consumption will also reduce the Town's environmental impact, specifically its contribution to emitting greenhouse gases, which are known to cause climate change.		Effectiveness: The 2011 Plan is outdated – once updated the SEP is anticipated to be highly effective Enforcement/ Maintenance: Managed by the Dept PB&R	The Town of Barrington embraces strategic energy planning and is in the process of updating the 2011 SEP. Over the past five years the Town has instituted a number of improvements and initiatives to use less energy and for a greater portion of the energy used to come from renewable energy sources. Some of the measures include: <ul style="list-style-type: none">• In 2015-16 and 2017-18 completed two rounds of the Solarize Barrington program• In 2019/20 installed four EV fast charges at Town Hall and four regular EV chargers at Police Cove• The Town/Schools are participating in a Virtual Net Metering Project• In the process of moving to a Community Choice Aggregation (CCA) for Barrington• Currently exploring solar on Town buildings and properties• Currently participating in a Fleet Vehicle Study to determine electric/hybrid vehicle opportunities• Currently working with a State OER Shared Energy Manager to assess potential energy efficiencies Greenhouse gases are known to cause climate change which is linked to an increase in the intensity and frequency of various natural hazards, including flooding, storm surge, and SLR. A reduction in the Town's energy consumption and/or purchasing a greater amount of renewable energy sources, such as solar and wind power, will reduce the Town's carbon footprint and is therefore a notable cross-over objective with the HM&FMP. As detailed in Appendix 6.1 , the outcomes associated with various workshops and initiatives identified in this report were reviewed for inclusion in the HM&FM Action Plan; those selected have been noted accordingly.
Technical Report: A Future with Water: Sea Level Rise in Rhode Island (2019)			
In 2018, ten graduate students from UPenn School of Design comprised a studio team that worked in collaboration with their instructors, Scott Page/Jamie Granger, and the Barrington and Warren Mixed-Use Climate Response Demonstration Site Team, to produce this technical report suggesting many adaptation strategies for both communities. The adaptation actions were categorized as <i>Reinforce</i> (elevate buildings, building code enforcement, risk communication); <i>Retreat</i> from vulnerable areas (establish a “coastal risk overlay zone” where no new non-floodable structures would be permitted and existing homes would be eligible for government-sponsored buyout programs) and; <i>Restore</i> inundated lands to natural habitat and open space.	Town-wide with emphasis on flood-prone areas	Effectiveness: High Enforcement/ Maintenance: Managed by the Dept PB&R	This document serves to embrace the theme “Instead of resisting the rising sea, Barrington and Warren must evolve to live with water - to give room to the rising sea and to inhabit a landscape of wetness.” As detailed in Appendix 6.1 , the adaptation actions identified in this Report have been reviewed for inclusion in the <i>HM&FM Action Plan</i> . Those selected have been noted accordingly in the <i>Action Plan</i> .
The Code of the Town of Barrington RI: Chapter 78 – Outdoor Burning			
These regulations help to prevent fire hazards within the Town.	Town-wide	Effectiveness: High Enforcement/ Maintenance: Fire Department	The Outdoor Burning Regulations will assist in mitigating human initiated wild/brush fires. In Barrington, it is prohibited to conduct outdoor burning without obtaining a permit from the Barrington Fire Chief. All outside burning is prohibited during high or extreme fire dangers.

The Code of the Town of Barrington RI: Chapter 91 Article V – Storm Drainage System: Post-Construction Stormwater Control			
This chapter establishes the administrative mechanisms necessary for the Town of Barrington to ensure proper storm water management of runoff from new development and redevelopment projects, and conforms with RIDEM's Pollutant Discharge Elimination System Storm Water Discharge policies.	Town-wide	Effectiveness: High Enforcement/ Maintenance: Managed by Building Official and DPW	As proper stormwater management can have a positive impact on flood mitigation, enforcement of these regulations is important. The Stormwater Ordinance was last updated in 2009, to incorporate State stormwater management and erosion control requirements during site development. These regulations may qualify for CRS Activity 450 credit.
The Code of the Town of Barrington RI: Chapter 185 - Zoning Ordinance			
The Zoning Ordinance has may Articles that support the goals and objectives of the HM&FMP. The following two articles are of particular importance: ARTICLE XXIII – Development in Areas of Special Flood Hazard: The purpose of this article is to ensure public safety, minimize hazards to persons and property from flooding, to protect watercourses from encroachment, and to maintain the capability of floodplains to retain and carry off floodwaters. The Town of Barrington elects to comply with the requirements of the National Flood Insurance Act of 1968. ARTICLE XXV – Wetlands Overlay District: The Wetlands Overlay District shall consist of coastal wetlands, defined as salt marshes bordering on tidal waters, and freshwater wetlands, defined as those areas of 1/2 acre or greater, that are inundated or saturated with surface and/or ground water at a frequency or duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The boundaries of the Wetlands Overlay District are generally shown as Coastal Wetlands, Freshwater Wetlands or Hydric Soils on that map titled "Wetlands Area Map" (Town of Barrington, Rhode Island Comprehensive Community Plan) and filed at the office of the Building Official.	Town-wide	Effectiveness: High Enforcement/ Maintenance: Planning Board and Zoning Board of Appeals	As zoning provides the legal framework for land governance and can impact hazard mitigation, enforcement of these regulations is important. The Town has enacted regulatory restrictions that are designed to reduce the potential impacts of flooding to property by limiting development in and around wetlands and flood-prone areas. The Development in Areas of Special Flood Hazard section of the Zoning Ordinance was amended in June 2014 as required by FEMA to be consistent with the new Flood Insurance Rate Maps that became effective on July 7, 2014. The Article requires a permit for all construction or other development within a special flood hazard area (the AE or VE zone). Development projects include any filling, grading, excavation, mining, drilling, storage of materials, and temporary stream crossings. If the construction or other development within a special flood hazard area is not covered by a building permit, all other nonstructural activities are to be permitted by either the CRMC and/or the RI Department of Environmental Management (DEM), as applicable. The Article further specifies enforcement procedures and use regulations. In 1994 the Town adopted a Wetlands Overlay District Zoning Ordinance that requires a special use permit from the Zoning Board for proposed activities within the 100-foot wetland setback. The ordinance also prohibits any reduction in flood storage capacity, and the storage of materials or equipment which could cause damage under flood conditions. In addition, the ordinance requires any construction occurring in the Velocity Zone to take place above the mean high tide line. Some zoning regulations may qualify for credit under CRS Activity 430.
The Code of the Town of Barrington RI: Chapter 200 - Land Development and Subdivision Regulations			
All development and subdivision projects in the Town of Barrington are reviewed by the Planning Board in accordance with RI General Laws and the Town Planning Board Rules and Regulations. In Barrington the planning process is collaborative and the Planning Board has the authority to call upon other departments, boards, committees and officials of the Town of Barrington and upon regional, state, and federal agencies for information and assistance in the performance of its duties. Open Space Dedication (Section 200-48) This Section states that the Planning Board will consider acceptance of a proposed	Town-wide, with emphasis on coastal and flood-prone areas	Effectiveness: High Enforcement/ Maintenance: Planning Board, Zoning Board of Review, Building Inspector, and Dept PB&R	The Planning Board, Conservation Commission, and Building Official all exercise a high level of regulatory control over proposed new construction and renovations in flood-prone areas. Regulating development in flood-prone areas is a critical component in flood mitigation and is a requirement for participating in the National Flood Insurance Program (NFIP), of which Barrington is a member. The Special Flood Hazard Areas (Section 200-51) regulations was first adopted in 1994. No revisions have been made to this section since its adoption; however, the section incorporates criteria and specifications in the State Building Code by reference, so plans must comply with the latest requirements of the Building Code.

<p>dedication of open space where the property is of “unique natural character or is included in the Barrington Comprehensive Community Plan or Open Space Plan...or where the proposed development or subdivision is of sufficient size so as to warrant consideration of the provision of a recreation site to serve future residents of the development or subdivision.”</p> <p>Stormwater and Erosion Control (Sections 200-49 & 200-50)</p> <p>Applicants for qualifying development activity must develop and submit a stormwater management plan consistent with the Rhode Island Stormwater Design and Installation Standards Manual and the Rhode Island Soil Erosion and Sediment Control Handbook. The Planning Board in recent years has approved plans with low impact development (LID) features, where for example surface runoff from the street drains into a retention pond, rather than through culverts and pipes. The Board has also granted waivers allowing private streets for subdivisions of up to two lots, allowing access through shared driveways that require much less pavement compared to development of a street to Town standards.</p> <p>Special Flood Hazard Areas (Section 200-51)</p> <p>This Section requires the mapping of flood zones, including base flood elevation data, on all master plan sketches and all preliminary and final plats. Further, the regulations require the following design standards:</p> <ul style="list-style-type: none"> • The design of the development or subdivision is consistent with the need to minimize flood damage. • Public improvements, facilities, and utilities are constructed or installed in a manner that will minimize flood damage. • Adequate drainage will be provided to minimize the accumulation of water. • Where a development or subdivision is located in a special flood hazard area, the finished ground grades in the area of the proposed building locations shall not be below the base flood elevation specified for such area. 		<p>Subdivision and development regulations allow for an important review process. Those with input into this process should familiarize themselves with the <i>HM&FMP</i>. How development in the floodplain is handled is critical in terms of flood mitigation. Environmental Impact Statements can be requested to help assess the short- and long-term cumulative environmental impacts including flooding and drainage.</p> <p>Depending on the recommendations and implementation of a project, credit may be obtained under CRS Activities 520 or 530.</p>
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STATE *(the capabilities have been listed in alphabetical order)*

Description	Area Served	Key Discussion Points/ Plan Integration Considerations
Coastal Resources Management Council (CRMC)		
The CRMC plans for and manages RI's coastal resources. Their Management Program includes numerous policies and programs for the protection of coastal resources, including coastal wetlands and other shoreline features. The adoption of Section 145	Coastal Areas	Various CRMC's resources and tools, including those listed below, were used in developing this <i>HM&FM Plan</i> and should be consulted when reviewing/updating the <i>HM&FMP</i> and as applicable when implementing actions.

<p><i>Climate Change and Sea Level Rise Policy</i> has helped prepare the State and local communities through adaptation efforts and assist with coastal resiliency.</p> <p>CRMC has statutory authority to restrict the alteration of coastal wetlands for preservation purposes, and to implement regulations requiring erosion setbacks, coastal buffer zones, and to prohibit construction on beaches, in dunes, and on barrier spits that are identified as undeveloped or moderately-developed.</p>	<p>In 2018, CRMC adopted the Shoreline Change Special Area Management Plan (Beach SAMP) it developed in conjunction with URI, various State and local agencies, stakeholders, and coastal residents. The plan provides science-backed policies and planning tools to assess flood inundation coupled with SLR and shoreline erosion, to better inform State and local planning efforts and decision-making. Through a five-step permitting process, the plan targets the areas most vulnerable to climate change, including beaches, historic waterfronts, bluffs, peninsulas, and salt marshes. The Coastal Hazard Application Process will be implemented by regulatory amendments to CRMC's Red Book to address the coastal hazard issues detailed in the Beach SAMP chapters.</p> <p>The Coastal Property Guide provides regulations and policies adopted by Federal and State regulatory agencies and encourages people to understand what it means to live and build along the water.</p> <p>STORMTOOLS is a method to map storm inundation, with and without sea level rise, for varying return period storms that covers all of Rhode Island's coastal waters. STORMTOOLS uses an ArcGIS platform and can be accessed online.</p> <p>RI STORMTOOLS Design Elevation Maps (SDE) have been designed to represent the once in one-hundred-year flooding and associated wave environment, and explicitly include the effects of sea level rise. Following FEMA methodology, the maps are provided in the form of Base Flood Elevations (BFE) and can be used to assist in the design of structures and infrastructure in the state. They have also been specifically structured to support CRMC's Coastal Hazard Application permit requirement.</p> <p>The purpose of Sea Level Affecting Marshes Model (SLAMM) Maps is to show how coastal wetlands will likely transition and migrate onto adjacent upland areas under projected sea level rise scenarios of 1, 3 and 5 feet in the coming decades.</p> <p>RI Coastal Environmental Risk Index (CERI) has been designed as an online Geographic Information System (GIS) based tool, and hence is fully compatible with current flooding maps, including those from FEMA. The basic framework and associated GIS methods can be readily applied to any coastal area. The approach can be used by local and state planners to objectively evaluate different policy options for effectiveness and cost/benefit.</p> <p>RI CRMC Coastal Hazard Application (CHA) Worksheet and Viewer is to notify the applicant of potential coastal hazards that should be taken into consideration when planning shoreline development. These hazards include sea level rise (SLR), storm surge and associated flooding and shoreline erosion. The CRMC's goal is to increase understanding and awareness of these potential hazards among the development community (property owners, builders, realtors, financial institutions and insurers) with the hope of guiding development and investment away from vulnerable areas.</p> <p>Rapid Property Assessment and Coastal Exposure (Rapid PACE) is a tool for identifying coastal flooding risk and possible impacts on your property and community.</p>
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Eastern Rhode Island Conservation District (ERICD)

<p>ERICD was established in 1944 to promote and improve long-lasting and environmentally-friendly practices that protect natural resources such as soil, water, and air.</p>	<p>Town-wide</p>	<p>The ERICD is a good partner for outreach and education programs as well as a resource for stormwater management best practices.</p>
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Narragansett Bay National Estuarine Research Reserve (NBNERR)		
The Narragansett Bay National Estuarine Research Reserve is one of 30 National Estuarine Research Reserves located around the country. Established to provide long-term protection of coastal lands so they can serve as platforms for research, education and recreation. The Reserve is supported and administered by NOAA and managed by the RIDEM.	Coastal Areas	The NBNERR is a good partner for outreach and education programs as well as a resource for science-based publications.
Rhode Island Building Codes		
As indicated in the LOCAL section above, Rhode Island administers a State Building Code through the Building Code Commission. The Building Code is implemented statewide and enforced locally through the building official. The Code consists of uniform regulations to control construction, reconstruction, repair, removal, demolition, and inspection of all buildings.	Town-wide	As discussed in the LOCAL section above, Building Codes are an important regulatory tool for hazard mitigation.
Rhode Island Department of Administration (RIDOA) - Rhode Island Division of Statewide Planning (RIDSP)		
RIDOA plays a role in hazard mitigation and risk reduction in the State and manages the Rhode Island Climate Change website and other online resources. Technical assistance is provided by RIDOA divisions that have hazard mitigation and risk reduction capabilities, including the Office of Management and Budget and Division of Statewide Planning. The Division of Statewide Planning prepares, maintains, and encourages the implementation of plans within the framework of the State's development goals and policies.	Town-wide	<p>Various RIDOA resources, including mapping and modeling tools, were consulted when developing the <i>HM&FMP</i> and should continue to be consulted for future updates and to assist in prioritizing <i>HM&FMP</i> projects and implementing community outreach.</p> <p>The Climate Change Website serves as the State's primary portal for information and resources on climate change and resiliency. It addresses how to adapt to the projected effects of climate change such as coastal hazards like sea level rise and storm surge, as well as high heat, drought, and inland flooding.</p> <p>Risk Reduction for Small Business Resilience Experience shows that 40% of small businesses affected by disaster never reopen; another 25% that do reopen fail. In an effort to reduce this impact to our businesses and our communities, the Risk Reduction for Small Business Resilience in RI project developed tools to support small businesses (less than 50 employees) to better prepare for extreme weather events. Barrington has received a supply of magnets and the following sector booklets: service providers, lodging & accommodations, construction services, retail businesses, water dependent businesses, restaurants & food service, and real estate & property management.</p> <p>Statewide Planning's 2015 Technical Paper 164 - Vulnerability of Transportation Assets to Sea Level Rise assesses transportation assets under state jurisdiction.</p> <p>Statewide Planning's 2016 Technical Paper 167 - Vulnerability of Transportation Assets to Sea Level Rise and Storm Surge assesses transportation assets under state jurisdiction.</p> <p>Barrington, RI Coastal Sea Level Rise and Storm Surge Transportation Fact Sheet provides municipal leaders and practitioners with a survey of Barrington's transportation infrastructure elements that may be affected by sea level rise and storm surge.</p> <p>Barrington RI Socioeconomics of Sea Level Rise Coastal Factsheet To support local planning efforts, Statewide Planning developed the Socioeconomics of Sea Level Rise project. Among other things, the project identifies population characteristics of the people located within sea level rise (SLR) inundation zones 1, 3, 5 and 7 feet.</p>

Rhode Island Department of Environmental Management (RIDEM)			
RIDEM serves as the chief steward of the state's natural resources, with a mission to protect, restore, and promote the environment. RIDEM protects resources through development and enforcement of environmental laws; and works with partners to restore lands and waters, to conserve wildlife and marine resources, and to monitor environmental quality in order to build healthy, more resilient communities.	Town-wide	<p>Various RIDEM resources were consulted when developing the <i>HM&FMP</i>. The RIDEM website should be perused on a regular basis for information that will support hazard mitigation decision making in the Town of Barrington.</p> <p><i>Implications of Climate Change for RI Wastewater Collection & Treatment Infrastructure</i> assesses the projected implications of climate change on the state's nineteen public wastewater treatment systems and recommends adaptive strategies.</p> <p>The following resources should be utilized in implementing stormwater related actions from this <i>Plan</i>:</p> <p>Effective management of stormwater requires attention to both the quantity (volume and peak rate) and quality of stormwater runoff. All stormwater management practices in RI must be consistent with the <i>RI Stormwater Design and Installation Standards Manual (Amended March 2015)</i> and the <i>RI Soil Erosion and Sediment Control Handbook</i>. This includes demonstrating that a proposed project provides for protection of life and property from flooding.</p>	
Rhode Island Department of Health (RIDOH)			
The mission of RIDOH is "To prevent disease and protect and promote the health and safety of the people of Rhode Island."	Town-wide	<p>When applicable, RIDOH resources, including the following, should be used to assist in implementing community outreach for a variety of topics including climate change, water quality, and assisting vulnerable populations during hazard events.</p> <p>The <i>Climate Change and Health Program</i> has a number of resources that raise awareness about the connection between climate change and health. Program Publications:</p> <p>Brochures</p> <ul style="list-style-type: none"> • Climate Change and Air Quality (English) (Spanish) • Climate Change and Heat (English) (Spanish) • Climate Change and Mosquitoes (English) (Spanish) • Climate Change and Storms / Flooding (English) (Spanish) • Climate Change and Ticks (English) (Spanish) • Climate Change and Water (English) (Spanish) <p>Guides</p> <ul style="list-style-type: none"> • Climate Change and Health Teaching Resources • Climate Change and Your Health: A Guide for Rhode Islanders (English) (Spanish) (Portuguese) • Sustainability Pledge and Guide <p>Plans</p> <ul style="list-style-type: none"> • RI Climate Change Health Adaptation <p>Reports</p> <ul style="list-style-type: none"> • Climate Change and Health Needs Assessment (2021) • Climate Change and Health Resiliency (2015) <p><i>The Rhode Island Climate Change and Health Program: Building Knowledge and Community Resilience</i> discusses improving climate resiliency is a key strategy to help the Rhode Island Department of Health meet its overarching goals of addressing the socio-economic and environmental determinants of health for all Rhode Islanders.</p> <p><i>Rhode Island Special Needs Emergency Registry</i> allows first responders to better prepare for and respond to community needs during a hurricane, storm, or other emergency. The Town of Barrington encourages those who may need extra help during an emergency to register.</p> <p><i>SafeWater RI: Ensuring Safe Water for Rhode Island's Future</i> helps to address the implications of climate change to drinking water utilities.</p>	

Rhode Island Department of Public Safety (RIDPS)		
The Department of Public Safety oversees all the State of Rhode Island's public safety agencies to ensure efficient delivery of the services those agencies provide.	Town-wide	RIDPS supports hazard mitigation through its E 911 Uniform Emergency Telephone System which provides prompt transfers of emergency 911 calls to the appropriate responding public safety and rescue agencies utilizing call location technology
Rhode Island Department of Transportation (RIDOT)		
RIDOT designs, constructs, and maintains state designated roads, bridges, and bike paths, some of which are within the Town of Barrington. In 2016, RIDOT underwent a complete restructuring based on passage of the \$5 billion RhodeWorks legislation that provides planning, execution, management and funding to bring Rhode Island's infrastructure into a state of good repair by the year 2025. The Rhode Island State Transportation Improvement Program (STIP) is prepared by the Division of Statewide Planning and implemented through RIDOT.	Town-wide	The East Bay communities of Barrington, Warren, and Bristol have important transportation infrastructure that is vulnerable to sea level rise. As such consideration of actions related to transportation improvements and the accessibility of the Town's emergency evacuation route during hazard events was a consideration in the HM&FMP . The Town is interested in working with RIDOT and neighboring municipalities to ensure roadway vulnerabilities, including SLR, is adequately addressed.
Rhode Island Emergency Management Agency (RIEMA)		
RIEMA's mission is "to reduce the loss of life and property for the whole community while ensuring that as a state we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all natural, human-caused, and technological hazards."	Town-wide	<p>The RIEMA website contains information on hazard mitigation, floodplain mapping, floodplain regulations, flood insurance, etc. It is an excellent resource and should be perused on a regular basis for information that will support hazard mitigation decision making in the Town of Barrington.</p> <p>RIEMA's 2019 State Hazard Mitigation Plan (SHMP) Update was a particularly useful resource in the development of this HM&FMP. The SHMP provides comprehensive guidance for hazard mitigation with the intent of making homes, businesses, and communities in RI more resilient to the impacts of climate change, hurricanes, floods, tornadoes, earthquakes, winter storms, wildfires, and other natural hazards.</p> <p>Refer to Appendix 6.1 for an overview of the RI State Hazard Mitigation Plan actions and measures that were reviewed for inclusion in the HM&FMP Action Plan. Those selected have been noted accordingly in the Action Plan.</p>
Rhode Island Energy - PPL Corporation (formerly National Grid/Narragansett Electric)		
<p>The Narragansett Electric Company was sold by its parent company, National Grid, in February 2022. The new owner, PPL Corporation, has changed the name to Rhode Island Energy.</p> <p>In 2020, National Grid released its Net Zero by 2050 Plan. The Plan outlines the company's approach to exploring a wide range of solutions until they can deliver the affordable, reliable clean energy future customers want and deserve. It is unclear if PPL will implement the Net Zero by 2050 Plan which identifies 10 key areas of focus:</p> <ul style="list-style-type: none"> • Reducing demand through energy efficiency and demand response; • Decarbonizing the gas network through use of renewable natural gas and hydrogen; • Reducing methane emissions from our own gas network while working with the industry to reduce emissions through the entire value chain; • Integrating innovative technologies to decarbonize heat; 	Town-wide	<p>In compliance with State law, each year National Grid would submit a National Grid Gas and Electric Infrastructure Safety and Reliability Plan to the State of Rhode Island. The Plan was designed to enhance the reliability of their distribution system.</p> <p>The Town appreciated National Grid's Net Zero Plan which supports hazard mitigation through helping to curb climate change by decreasing greenhouse gas emissions.</p> <p>In the past, National Grid conducted tree inspection of its power line corridors roughly every three years and would take down problem limbs/trees as needed. With increased storm events that can jeopardize the electrical grid, the Town supports PPL introducing an accelerated tree maintenance program.</p>

<ul style="list-style-type: none"> • Interconnecting large scale renewables with a 21st century grid; • Enabling and optimizing distributed generation; • Utilizing storage; • Eliminating SF6 emissions; • Advancing clean transportation; and investing in large scale carbon management. 		
Rhode Island Geographic Information System (RIGIS)		
The Rhode Island Geographic Information System (RIGIS) is a group of government and private organizations which promote the use of the latest GIS data. They manage and provide free access to an extensive database of geospatial data for the state.	Town-wide	Many of the Town's ArcGIS layers were acquired from RIGIS and used to prepare the maps in the <i>HM&FMP</i> . As it is important to maintain a current geodatabase, on an annual basis the Town should review their RIGIS layers and update or add new layers as appropriate.
Rhode Island Office of Energy Resources (RIOER)		
RIOER's mission is "to lead the state toward a clean, affordable, reliable, and equitable energy future. OER develops policies and programs that respond to the state's evolving energy needs, while advancing environmental sustainability, energy security, and a vibrant clean energy economy."	Town-wide	<p>RIOER supports hazard mitigation through developing, administering, and monitoring a variety of programs designed to promote energy efficiency, renewable energy, and alternative fuels which will help to curb climate change by decreasing greenhouse gas emissions.</p> <p>The Town is currently working with an OER Shared Energy Manager to perform an energy audit on Town owned buildings.</p>
Rhode Island Sea Grant		
Rhode Island Sea Grant is a state-based program with federal funding from NOAA. They collaborate with scientists from URI and other institutions, to further understand the science and policy implications of climate change. They also work with coastal communities, including Barrington to support long-term, sustainable solutions.	Town-wide	<p>Various resources from the Sea Grant website were consulted during development of the <i>HM&FMP</i>. The Sea Grant often collaborates on research including fact sheets to highlight impacts to the built environment, public health and welfare, and natural resources. Some of the documents consulted include:</p> <ul style="list-style-type: none"> • <i>Precipitation and Storms in Rhode Island: Trends and Impacts</i> • <i>Sea Level Rise in Rhode Island: Trends and Impacts</i> • <i>Smart Growth for Coastal and Waterfront Communities</i> • <i>Climate Change in Rhode Island: What's Happening Now & What You Can Do</i> <p>Sea Grant resources should be considered especially when implementing hazard mitigation education and outreach activities.</p>
Save The Bay		
Save The Bay is a nonprofit organization which works to protect and restore the ecological health of the Narragansett Bay region through advocacy, education, and habitat restoration and adaptation projects. Save The Bay has been a welcomed partner with the Town of Barrington on numerous projects.	Town-wide	As applicable, when implementing actions from this <i>Plan</i> , coordination with Save The Bay should be considered. Their knowledgeable staff have proven an asset to many projects in Barrington and across the State. Save The Bay's bi-annual <i>Tides Magazine</i> is a good resource to maintain awareness of Save The Bay action updates including education, restoration, and advocacy.
URI Coastal Institute		
The Coastal Institute was founded to advance knowledge, encourage interdisciplinary partnerships, and develop solutions to environmental problems in Rhode Island's coastal ecosystems. The Institute works in partnership with local, state, federal, and international agencies, and has been a welcomed partner with the Town of Barrington on numerous projects.		<p>The Coastal Institute has a number of publications, reports, and videos that were reviewed during development of the <i>HM&FMP</i>. Two reports are of particular significance and were included above in the LOCAL section:</p> <ul style="list-style-type: none"> • <i>Technical Report: A Future with Water: Sea Level Rise in Rhode Island (2019)</i> • <i>Preparing for Resilience: Barrington and Warren Mixed-Use Climate Response Demonstration Site (2019)</i> • <i>Preparing for Resilience: Barrington, Warren and Bristol Mixed-Use Climate Response Demonstration Site (2021)</i> <p>As applicable, when implementing actions from this <i>Plan</i>, coordination with the Coastal Institute should be considered.</p>

FEDERAL *(the capabilities have been listed in alphabetical order)*

Description	Area Served	Key Discussion Points/ Plan Integration Considerations
Americans with Disabilities Act Guide for Small Towns		
The Americans with Disabilities Act gives civil rights protections to individuals with disabilities. This guide presents an informal overview of some basic ADA requirements and provides cost- effective tips on how small towns can comply with the ADA.	Town-wide	In the development of the <i>HM&FMP</i> , it was important for the Town to recognize how various vulnerable populations might be more severely impacted from certain hazards. In doing so, the opportunity to mitigate these impacts exists.
Federal Emergency Management Agency (FEMA)		
FEMA was established in 1979 through an Executive Order signed by President Carter that gave the agency the dual mission of emergency management and civil defense. The agency's authorities were further defined and expanded by the Disaster Relief and Emergency Assistance Amendments of 1988 also known as the Stafford Act. The Stafford Act provided clear direction for emergency management and established the current statutory framework for disaster response and recovery through presidential disaster declarations.	Town-wide with some resources more applicable to coastal and inland areas subject to inundation	<p>Numerous FEMA resources were consulted during the development of the <i>HM&FMP</i>. The FEMA website contains information and tools related to hazard mitigation, floodplain mapping, floodplain regulations, flood insurance, emergency management, grants, etc. It is an excellent resource and should be perused on a regular basis for information that will support hazard mitigation decision making in the Town of Barrington. Some of the resources used can be found on the following webpages:</p> <ul style="list-style-type: none"> • https://www.fema.gov/emergency-managers/risk-management/hazard-mitigation-planning • https://www.fema.gov/emergency-managers/national-preparedness/climate-change • https://www.fema.gov/flood-maps/tools-resources/flood-map-products/hazus • https://www.hurrevac.com/ • https://www.floodsmart.gov/ <p>As discussed in Section 4 of this <i>Plan</i>, the Town has consistently taken the required steps, and will continue to do so, to participate in the federally-backed flood insurance program. Additionally, the Town has applied for participation in the CRS Program.</p> <p>National Flood Insurance Program (NFIP): Regulating development in flood-prone areas is a critical component in flood hazard mitigation and is a requirement for participating in the NFIP, of which Barrington has been a member since April 1971(CID 445392). The NFIP makes flood insurance available to communities that enact minimum floodplain management regulations. The Town's Building Official, who is in the process of being certified as a Floodplain Manager, is the designated keeper of flood maps for Barrington.</p> <p>Community Rating System (CRS): The Community Rating System (CRS) is a voluntary incentive program designed to encourage communities to engage in various community focused activities, promoting a comprehensive approach to floodplain management beyond the minimum NFIP requirements. As the Town of Barrington applied for participation in the CRS program, the Steering Committee followed the 10-Step planning process used for FEMA's CRS Activity 510 in developing the <i>HM&FMP</i>.</p> <p>Note: the Association of State Floodplain Managers Flood Science Center has created a Community Rating System Green Guide which has useful examples and success stories highlighting how communities can earn credit through the CRS program while also enhancing beneficial floodplain functions. The guide is intended to be used alongside the CRS Coordinator's Manual.</p>

National Oceanic and Atmospheric Administration (NOAA)		
<p>"NOAA's mission to better understand our natural world and help protect its precious resources extends beyond national borders to monitor global weather and climate, and work with partners around the world. Our agency holds key leadership roles in shaping international ocean, fisheries, climate, space and weather policies. NOAA's many assets — including research programs, vessels, satellites, science centers, laboratories and a vast pool of distinguished scientists and experts — are essential, internationally recognized resources. We work closely with other nations to advance our ability to predict and respond to changes in climate and other environmental challenges that imperil Earth's natural resources, human life and economic vitality."</p> <p>NOAA has a number of line offices including:</p> <ul style="list-style-type: none"> • National Weather Service (NWS) • National Marine Fisheries Service • National Ocean Service • National Environmental Satellite, Data, and Information Service (NESDIS) • Oceanic and Atmospheric Research • Office of Marine and Aviation Operations & NOAA Corps 	<p>Town-wide with some resources more applicable to coastal and inland areas subject to inundation</p>	<p>In preparing this <i>HM&FMP</i>, numerous NOAA resources were used. NOAA provides reliable science-based information and should continue to be used by the Town on a regular basis to support hazard mitigation decision making. A few of the resources used include:</p> <p><i>Adapting to Climate Change: A Planning Guide for State Coastal Managers, NOAA (2010)</i>, which highlights guidance on adaptation planning to the built environment, public health and welfare, and natural resources.</p> <p>The National Hurricane Center's <i>Sea, Lake and Overland Surges from Hurricanes (SLOSH)</i> model for Narragansett Bay which uses the bathymetry of the Bay and the topography of coastal Rhode Island to predict the coastal flooding effect from hurricanes that could be experienced in the region. The SLOSH model is used to determine the potential for storm surge and delineate hurricane evacuation zones.</p> <p>NOAA sponsored <i>Office for Coastal Management</i> has some excellent tools (for example Digital Coast) to address issues commonly associated with a changing climate and a growing population.</p> <p>The following is a summary of NOAA facilities, staff, programs, and activities based in, or focused on Rhode Island:</p> <ul style="list-style-type: none"> • NOAA Ship Henry B. Bigelow Newport RI-1 • NOAA Ship Okeanos Explorer Kingston RI-2 • Narragansett Laboratory Narragansett RI-2 • Office of Ocean Exploration and Research Regional Office Narragansett RI-2 • Narragansett Bay National Estuarine Research Reserve Prudence Island RI-2 • The state of Rhode Island also has two Labs and Field Offices and one National Estuarine Research Reserves

APPENDIX 5-2

Administrative and Technical Capabilities

Appendix 5-2

Administrative and Technical Capabilities

LOCAL <i>(the capabilities have been listed in alphabetical order)</i>
Barrington Public Library <p>The Barrington Library has undergone a number of renovations, continually improving the space and experience for users. In 2017 a renovation of the second floor was completed, including a modernized children's room, creating a separate auditorium and gallery space, and improving a number of meeting rooms. The library venue is often used for meetings, workshops, presentations, and programs related to hazard mitigation. The library is well-equipped to manage and publicize programs on special topics.</p> <p>The library also houses books and publications, including FEMA publications required to obtain credit for a community flood protection library under CRS Activity 350.</p>
Coordination with Area Colleges and Universities <p>The Town of Barrington regularly coordinates with area colleges and universities and will continue these efforts with respect to hazard mitigation and other planning initiatives. Two partners that Barrington has worked with on a regular basis include the University of Rhode Island in Kingston, RI and Roger Williams University in Bristol, RI.</p>
Coordination with Local Business Community <p>Town Council established an Economic Development Commission to help support local businesses. The purpose of the Committee is to foster the economic well-being of the Town and its residents, consistent with the Town's Comprehensive Community Plan, by supporting existing businesses as well as attracting new businesses to Barrington. The Board consists of nine members with staggered terms. The Economic Development Officer is the Planning, Building & Resiliency liaison to the Committee.</p> <p>The Town of Barrington has over 500 businesses and there is a privately funded local organization, the Barrington Business & Community Association (BBCA), that promotes and serves as a liaison between businesses in the community.</p>
Coordination with Neighboring Municipalities <p>The Town of Barrington has a positive relationship with neighboring municipalities and works to identify vulnerabilities from shared risks and coordinate applicable efficiencies. The Town will continue to coordinate with these communities on hazard mitigation planning, specifically transportation vulnerabilities including evacuation plans. Upon request neighboring communities support one another with mutual aid. The communities bordering Barrington include: Warren RI, East Providence RI, Seekonk MA and Swansea MA.</p>
Drills and Exercises <p>The Town of Barrington has participated in a number of drills and exercises to better prepare for an emergency event. To ensure personnel are adept with equipment, policies, procedures, and maintaining necessary skills, the Fire Department holds monthly trainings. The Fire Chief/EMA Director also attends trainings such as Code Red and MedPod. In addition, the EMPG Grant requires that the EMA Coordinator participate in at least one FEMA or RIEMA sponsored training annually. Barrington's EMA is scheduled to participate in RIEMA's <i>MGT461 Evacuation Planning Strategies</i> class scheduled for 6-21-2022.</p> <p>In November 2021, the Town held a workshop (Operation Recover Barrington) focused on recovery from a natural hazard. Former FEMA Administrator, Peter Gaynor, was the Guest Speaker. Other speakers included Robert Grimley, FEMA Region I Recovery Division Director; Armand Randolph, RIEMA Recovery Branch Chief; and Ray Laprad with ARMADA Ltd. There were roughly 60 attendees including Barrington Town staff, staff from neighboring municipalities, and other stakeholders.</p>
Map Information Services <p>As a public service (free of charge), upon request the Building & Zoning Office will provide inquirers with information from the community's Flood Insurance Rate Maps (D-FIRMs) and other sources to inform about the local flood hazard and flood-prone areas that require special protection because of their natural functions. Key information provided includes:</p> <ul style="list-style-type: none">• Whether a property appears to be in or out of the Special Flood Hazard Area (SFHA) as shown on the current D-FIRM• Additional flood insurance data for a site, such as the FIRM zone and the base flood elevation or depth, if shown on the FIRM• The Town makes available a handout on the flood insurance purchase requirements that can help people who need a mortgage or loan for a property in the SFHA• The Town makes available copies of completed FEMA Elevation Certificates for buildings built in the floodplain. These certificates can also be accessed through the Town's GIS portal.

Community education and outreach on the hazards associated with flooding and sea level rise is an important goal of the *HM&FMP*. As such, this ongoing activity aligns with the goals of the *HM&FMP* and, if documented per FEMA requirements, may qualify for points under CRS Activity 320.

Municipal Administration and Staff

Municipal officials, staff, boards, and commissions all work together to develop, implement, and update policies and plans to promote the safety of residents and minimize risk to the community. Town staff participate in associations and organizations that support natural hazard risk reduction capabilities. Public services and facilities provided by the Town are crucial resources for preparing for natural hazard events, as well as responding to and mitigating such events. The Town has enacted and enforces a number of regulatory restrictions designed to reduce the potential impacts of flooding to property by limiting development in and around wetlands and floodplains. An overview of key staff engagement in hazard mitigation is provided below in alphabetized order. **The Town continues to expand on and improve its capabilities in order to effectively address hazard mitigation and floodplain management.**

Conservation Commission

The Conservation Commission consists of seven members appointed by the Town Council for three years, with staggered terms. The Commission serves the Town Council in an advisory capacity on conservation matters including many that are directly related to hazard mitigation - in particular, that of flooding: flood plain protection, compliance with Freshwater Wetlands Acts, stormwater runoff, compliance with soil erosion and sediment control regulations, compliance with regulations that protect coastal areas, protection of conservation, recreation, and open space areas, and protection of trees.

Tree Commission

The Conservation Commission, in its capacity as Tree Commission, assists the Tree Warden in the following areas:

- Regulating and enacting the maintenance, removal and planting of trees within the public rights-of-way to ensure public safety.
- Preserving the aesthetics of the public right-of-way with regard to trees.
- Protecting the value and health of Barrington trees as a whole.
- Making recommendations for the regulation of the cultivation, planting, maintenance and preservation of trees and all forestry functions, including the planting, care and removal of trees within the jurisdiction of the Town of Barrington.

The Tree Commission also communicates and works with civic and public interest groups concerned with tree care, management, preservation and planting. Amongst other things, these functions will help to reduce wind and storm related tree damage and an increased tree inventory will help to lower surface and air temperatures by providing shade and through evapotranspiration. The Tree Commission is in the process of creating a web-based tree inventory.

Department of Public Works (DPW)

The DPW works to mitigate flood issues throughout the Town; engages in clean-up measures associated with hazard events; and strives to reduce illegal connections of private sump pumps and floor drains that exacerbate heavy wastewater flows in excess of the design of the sewer system which can cause manhole overflows and sewer backups into residences. With respect to the stormwater drainage system, the Town of Barrington is a Municipal Separate Storm Sewer Systems (MS4) regulated community. MS4 is part of the Rhode Island Pollutant Discharge Elimination System (RIPDES) Program. A key goal of the program is to reduce the contamination of stormwater runoff and prohibit illicit discharges. MS4 communities are required to submit an Annual Report documenting progress made towards achieving the requirements of the program, as well as reporting ongoing maintenance of their stormwater system. Successful hazard mitigation is an ongoing process with many actions requiring regular maintenance and repair. The Town aggressively engages in maintenance and repair measures which help to ensure the safety of residents and mitigate impacts from natural hazards. The DPW is critical in the implementation and maintenance of projects that support the *HM&FMP*.

In general, DPW responsibilities include:

- Street, sidewalk, sanitary sewerage system, and storm drainage maintenance
- Street sweeping
- Streetlights
- Maintenance of municipal buildings/grounds and parks
- Snow plowing, roadway treatments, and storm cleanup
- Tree trimming/tree maintenance (parks and Town-owned public rights of way)
- Oversight of the leaf compost site at Walker Farm

Emergency Management Committee

The Town of Barrington Emergency Management Committee (EMC) is the primary body tasked with developing a mitigation strategy for the community and for reviewing, updating, and helping to ensure the *2022 Hazard Mitigation & Flood Management Plan* is implemented. The current members of the EMC are the: Director of Planning, Building & Resiliency, Fire Chief/Emergency Management Director, Police Chief, Building Official, Director of Public Works, and Harbormaster. The membership represents the departments responsible for implementing the majority of the *HM&FMP* actions and collectively have authority over all six categories of flood mitigation activities.

The **HM&FMP Steering Committee** currently consists of the EMC members and 7 members of the public. The Steering Committee actively engaged in all aspects of *Plan* development, with emphasis on reviewing the impact of hazards on people and property; considering a variety of ways to reduce and prevent damage from flooding and other hazards; and recommending appropriate and feasible measures to improve community resilience through implementation of mitigation actions.

Finance Department

The Finance Director is appointed by the Town Manager. The Finance Department is critical in managing the financial aspects of hazard mitigation projects and associated grant funding.

Harbor Management Commission

The Harbor Management Commission consists of nine members appointed by the Town Council for three years, with staggered terms. The Commission serves the Town Council in an advisory capacity with respect to matters relating to the conditions, uses, management, maintenance and improvements of harbor and other water and waterfront infrastructure, facilities, resources and related programs, projects and services; and assists the Harbor Master in carrying out their duties and responsibilities.

Harbor Master

Barrington enjoys nearly 20 miles of historically important, economically significant, visually attractive, and natural resource rich shoreline. The Town's Harbor Master, in conjunction with the appropriate State and Federal agencies, is responsible for coordinating all harbor activities and enforcing the regulations in order to ensure the safety of navigation and the security of the harbor. This includes preparation for, response to, and recovery from storm or other hazard events.

Planning Board

The Planning Board consists of nine members (7 full members and 2 alternates) appointed by the Town Council for three years, with staggered terms. The Planning Board acts in an advisory capacity to the Town Council in all matters concerning the Comprehensive Plan, land use, Zoning Ordinance and Subdivision Regulations, physical growth and development of the Town of Barrington in a manner consistent with State law, and Town Ordinances. As these factors impact hazard mitigation, it is important this Committee is familiar with the *HM&FMP* goals and actions. The Planning Board has the discretion to require applicants to submit a peer review fee to the Town to cover third-party engineering review of development/ subdivision proposals, including compliance with storm water regulations, erosion control, and standards related to development within the flood plain and/or within proximity to a wetland or coastal feature.

The **Technical Review Committee (TRC)** supports the Planning Board by conducting technical reviews of Planning Board applications, approves sign applications, and provides guidance to an applicant with regard to procedure, technical requirements, and overall project design. It consists of seven members who serve 3-year terms (5 members are appointed by the Planning Board and two Planning Board members appointed by the Planning Board Chair).

Planning, Building & Resiliency Department

Both the Director of Planning, Building & Resiliency and the Building Official are educated on the current NFIP policies and ordinances. The Director of Planning, Building & Resiliency (Town Planner) also serves as the Planning Board Administrative Officer. The Town Planner enforces requirements of the Land Development & Subdivision Regulations involving subdivision of land and major land development projects. The PB&R Department is critical in the development and implementation of projects and initiatives that support the *HM&FMP*.

Building/Zoning

The Town of Barrington has a proactive Building/Zoning Office. The Town's Building Official, who is in the process of becoming a Certified Floodplain Manager, implements and enforces the State Building Code ensuring new structures or those substantially renovated are compliant. The current and historical FIRMs, flood insurance studies, and Letters of Map Amendment are maintained within the Building/Zoning Department. A FIRM is a map developed and issued by FEMA for floodplain management and insurance purposes. The Building Official also retains copies of completed FEMA Elevation Certificates for buildings constructed in the floodplain. Elevation Certificates are used to obtain the elevation of a building to determine whether it is within the floodplain and, if so, by how much. The cost of flood insurance for a property is related to the information on the Elevation Certificate. If an Elevation Certificate has been prepared for your property, you may be able to obtain a copy from the Building/Zoning Department. Elevation certificates are also available through the Town's GIS web portal (new elevation certificates are generally updated in the geodatabase once a year). If an elevation certificate is not available and a resident requires one, they can hire a licensed land surveyor to prepare it. Additionally the Building Official incorporates the Association of State Floodplain Managers (ASFPM) *No Adverse Impact Floodplain Management (NAI)* into local floodplain management programs and municipal plans. For the convenience of both property owners and contractors, the Town of Barrington employs an *online permit system*.

Economic Development Officer

In 2019 the Town hired a full-time Economic Development Officer, working in the Planning, Building & Resiliency Department, to help promote economic development and assist applicants through the local approval process.

Resilience Planning Consultant

In 2019 the Town hired a part-time Resilience Planning Consultant to assist with Town programs associated with hazard mitigation and floodplain management. The Town intends to continue and potentially expand this position in the future.

Public Safety

In 2000 the Public Safety Building, housing both the **Police and Fire Departments**, was built at 100 Federal Road, an area outside of the 100-year Flood Zone and beyond the surge inundation areas for Category 1 and 2 hurricanes. This action allowed the Town to demolish the old police station, which was at risk of flooding due to its location in the 100-year Flood Zone near the Barrington River. The old police station site has been redeveloped as a park (Police Cove Park), which was completed in 2016.

The Police Department has a force that consists of a Police Chief, 25 full-time police officers, and seven civilian support personnel (four dispatchers, an animal control officer, and administrative staff). The Fire Department has one fire station staffed by a Fire Chief and 28 full-time firefighters. In 2014, the Hampden Meadows Volunteer Fire Department, stationed at 168 Sowams Road, closed. The station was razed in 2016 to clear room for two new houses.

The Emergency Operations Center (EOC) is based at the Public Safety Building. The Town in 2017 utilized a Homeland Security grant and local funds to improve communications at the EOC, upgrading from a VHF to 800 MHz system. The new system eliminated a problem with dead zones in town and allows for better and safer communications among local, state and federal agencies.

EMA Coordinator

In 2020 the Town hired a part-time EMA Coordinator under the direction of the Fire Chief. The Town intends to continue and potentially expand this position in the future.

Town Council

The Town of Barrington operates under a charter form of government, which provides for a five-member Town Council that is elected at large, for staggered four-year terms, at the regular biennial elections. They are responsible for enacting local legislation, and appointing a Town Manager who executes the laws and oversees the administration of the Town government.

Town Manager

The Town Manager is appointed by the Town Council and responsible for the day-to-day operation of Town Departments and services. The Town Manager provides the leadership that helps to ensure the *HM&FMP* actions are implemented across Town Departments. Also, in terms of drought management, the Town Manager is responsible for coordinating with BCWA and the RI Water Resource Board in periods of drought or extended dry conditions that require an emergency response to reduce water usage.

Shelters and Evacuation Zones and Routes

Shelters

Shelter use is not easily predicted because each emergency situation has different variables that impact use. Variables include the severity of the impending hazard, warning period, necessity to evacuate, and awareness of the shelter location and facilities available. Shelter use may be higher in the winter if homes are without heat. In 2017, RIEMA regionalized all of the emergency shelters in Rhode Island and Barrington has been told that in the event of an emergency to direct all Barrington residents to use the East Providence High School as our designated regional emergency shelter. Previously the Town used Primrose Hill School as our local shelter. Primrose will no longer be used.

In terms of warming and cooling shelters, the Town will use the Barrington Public Library and the Public Safety Building lobby.

Evacuation

In 2013, the United States Army Corps of Engineers (USACE) Hurricane Evacuation Study created an **Evacuation Route Map** to reflect the areas in Barrington that are recommended to be evacuated during potential worst-case Hurricane Surge Inundation. As discussed in **Section 4-4**, portions of the evacuation route may be compromised due to flooding. In Rhode Island, the decision to evacuate is made by local officials. Due to low-lying roadways that may be compromised by flooding, the decision to evacuate should be made to accommodate safe evacuation prior to the commencement of heavy rainfall. The Town should consider an evacuation study that considers other routes or improvements to the existing route to mitigate flood risks.

Town of Barrington Website, i-Contact, Twitter, and Facebook

The Town's **website** is regularly updated and is currently undergoing a redesign to improve navigability and content. Updates are handled through the Planning, Building & Resiliency Department in conjunction with the Town Manager's office. To better prepare community members and reinforce individual pro-active hazard mitigation measures, the Town continues to improve its outreach and education programming efforts. A number of Town webpages, including the following have information related to hazard mitigation: **HM&FMP Project webpage**, **Emergency Information webpage**, **Building & Zoning Office webpage**, **Maps webpage**, and **Documents & Forms webpage**. In addition, the Town maintains a **Flood Preparedness Website** to assist the community in becoming more aware of the risks associated with flooding. Topics on the Flood Preparedness Website include:

• Flood Insurance

- ◊ How and Why to Buy
- ◊ Flood Damage – Costs and Coverage
- ◊ The Claims Process
- ◊ Lowering Your Insurance Costs

• Floodplain Parcels

- ◊ Elevation Certificates
- ◊ Assessing and Repairing Flood Damage
- ◊ Mitigation – Retrofitting Your House for a Flood
- ◊ Federal Mitigation Funding

- **Floodplain Info**

- ◊ Maps
- ◊ The Basics of Flood Zones and Floodplains
- ◊ Natural and Beneficial Functions of Floodplains
- ◊ Protecting the Floodplain

- **Flood Safety**

- ◊ Protecting Loved Ones
- ◊ Efficient Evacuation

The Town also communicates through **i-Contact** eblast (over 6000 followers), **Twitter** posts (@RI_Barrington - 949 followers as of April 2022), and **Facebook** (<https://www.facebook.com/barringtonri> - 1,753 followers as of April 2022).

The Town's website may qualify for points under CRS Activities 330 and 350.

Warning and Notification Systems

Barrington's Emergency Management Operation Center is located in the Public Safety Building (100 Federal Road). The Fire Chief functions as the Town's Emergency Management Director and oversees coordination and integration of all activities necessary to build, sustain, and improve the capability to mitigate against, prepare for, respond to, and recover from threatened or actual natural disasters, acts of terrorism, or other man-made disasters.

The Town of Barrington is a **StormReady** certified community which means it has complied with a set of standards including having a system that continually monitors local weather conditions and has mechanisms to alert the public to severe weather warnings. The Town monitors NOAA Weather Radio All Hazards (NWR), which is a network of radio stations broadcasting continuous weather information directly from a nearby National Weather Station (NWS) office.

The Town uses the **CodeRED Emergency Notification System** to alert residents and businesses in emergency situations through any or all of the following: telephone, cell phone, text message, and emails. The alert system is for an array of emergency situations including Amber Alerts, notifications of hazardous incidents, boil water advisories, evacuation notices, parking bans, and severe weather alerts. The Town encourages community members to sign up for this free program and recently upgraded the system to include a text to enroll option. CodeRED is promoted on the Town Website – there is a link to CodeRED on the main page, in the highly visible “Quick Links” section. The Town also promotes CodeRED at various community events. As of April 2022, the Town has 18,791 individuals signed up to receive CodeRED notifications. You do not have to be a Barrington resident to sign up for Barrington CodeRed alerts. This allows family members not residing in Barrington, or residents of other local jurisdictions that do not use CodeRed, to be serviced by this automated process.

If the Fire Chief/EMA Director decides it would be advantageous to alert people in vulnerable areas via a siren alarm, the Town's emergency vehicles are equipped with sirens and PA systems.

The Town's warning and notification systems may support CRS Activity 610.

STATE *(the capabilities have been listed in alphabetical order)*

Resilient Rhode Island Act

In 2014, the General Assembly approved the **Resilient Rhode Island Act** which established the **Executive Climate Change Coordinating Council (EC4)** which is a 12-member council chaired by the RIDEM Director. The Council was charged with taking a lead role in developing a comprehensive approach, including both emissions reductions and adaptation planning, to address the potential threats from climate change to the state's environment, economy, and people. The EC4 will track greenhouse gas emissions to determine if the program targets are achieved. The targets are in terms of a reduction below 1990 levels of: 10 percent by 2020; 45 percent by 2035; and 80 percent by 2050. The Resilient Rhode Island Act also set specific greenhouse gas emissions reduction targets; established an advisory board and a science and technical advisory board to assist the Council; and incorporated consideration of climate change impacts into the powers and duties of all state agencies.

Resilient Rhody

In 2017, Governor Gina Raimondo signed an Executive Order appointing the State's first Chief Resilience Officer, Shaun O'Rourke, to drive climate resilience efforts across the state, both within government and in collaboration with business, academic, and nonprofit partners, with the mission to develop a Statewide Climate Resilience Action Strategy by July 2018.

In July 2018 Governor Raimondo introduced the **Resilient Rhody: Municipal Resilience Program (MRP)** which outlines a comprehensive Climate Resilience Action Strategy for the State. Through the MRP program the State is providing support to communities to engage in a municipal-driven process referred to as Community Resilience Building (CRB) which was developed by The Nature Conservancy. In March 2019, the Town of Barrington and its neighboring Town of Warren submitted a joint application to participate in the Municipal Resilience Program and were selected as first round recipients to complete the CRB process (September 2019) and be designated as Resilient Rhody Municipalities. Additional Information on the Town's CRB Workshop is provided in **Section 2.2**.

Rhode Island Red Cross

The **American Red Cross in Rhode Island** offers a variety of programs to help adults and children better prepare for emergencies. Their website houses several free online preparedness trainings for both adults and children.

StormSmart Coasts Rhode Island

A resilience-related web resource that provides tools for collaboration and is dedicated to helping decision makers in coastal communities address the challenges of storms, flooding, sea level rise, and climate change.

FEDERAL *(the capabilities have been listed in alphabetical order)*

Clean Water Act

The Federal Clean Water Act (CWA) employs regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's surface waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water." Evolution of CWA programs over the last decade has included a shift from a program-by-program, source-by-source, pollutant-by-pollutant approach to more holistic watershed-based strategies. Under the watershed approach, equal emphasis is placed on protecting healthy waters and restoring impaired ones. A full array of issues is addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining water quality and other environmental goals is a hallmark of this approach.

Federal Disaster Mitigation (some key Acts)

FEMA was established in 1979 through an Executive Order signed by President Carter that gave the agency the dual mission of emergency management and civil defense. The agency's authorities were further defined and expanded by the **Disaster Relief and Emergency Assistance Amendments of 1988** also known as the **Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988**. The Stafford Act provided clear direction for emergency management and established the current statutory framework for disaster response and recovery through presidential disaster declarations. The Stafford Act authorizes technical, financial, logistical, and other assistance from the Federal government to state and local governments during declared major disasters and emergencies.

The **Disaster Mitigation Act of 2000** amended the Stafford Act and the Public Works Act to include grants for economic development and to require local governments to prepare hazard mitigation plans as a precondition for receipt of Hazard Mitigation Grant Program project funds. The Disaster Mitigation Act encourages communities to reduce preventable, repetitive disaster losses by mitigating natural hazards, vulnerability, and risk.

The **Post Katrina Emergency Management Reform Act (PKEMRA) of 2006** clarified and modified the Homeland Security Act with respect to the organizational structure, authorities, and responsibilities of FEMA and the FEMA Administrator. It enhanced FEMA's responsibilities and its authority within DHS and transferred many functions of DHS's former Preparedness Directorate to FEMA. Per PKEMRA, FEMA leads and supports the Nation in a risk-based, comprehensive emergency management system of preparedness, protection, response, recovery, and mitigation. The FEMA Administrator reports directly to the Secretary of Homeland Security, and FEMA is a distinct entity within DHS.

National Flood Insurance

The **National Flood Insurance Act of 1968** established the **National Flood Insurance Program (NFIP)** with the intent of reducing the need for post-disaster Federal aid by allowing property owners in participating communities to purchase federally backed flood insurance. Nationwide, over 21,000 communities participate in the NFIP by adopting and enforcing floodplain management ordinances to reduce future flood damage. The Town of Barrington meets the minimum requirements and participates in the National Flood Insurance Program. The Town has also applied to participate in NFIP's **Community Rating System (CRS) Program** designed to encourage communities to engage in various community focused activities, promoting a comprehensive approach to floodplain management beyond the minimum NFIP requirements.

In addition to providing flood insurance and reducing flood damages through floodplain management regulations, the NFIP identifies and maps the Nation's floodplains. Mapping flood hazards creates broad-based awareness of the flood hazards and provides the data needed for floodplain management programs and to actuarially rate new construction for flood insurance. Additional information on the National Flood Insurance Program can be found in **Section 4-4**.

The **Biggert-Waters Flood Insurance Reform Act of 2012** made significant changes to the NFIP. This act requires the NFIP to raise subsidized insurance rates to actuarial rates in an effort to make the program more financially stable. Rate increases began on January 1, 2013, for owners of subsidized policies on non-primary/secondary residences in a Special Flood Hazard Area (SFHA) with 25% increases annually until rates reflect true risk. On October 1, 2013, the same increases were applied to owners of subsidized policies on property that had experienced severe or repeated flooding and on business/non-residential properties in a Special Flood Hazard Area.

National Warning and Alert Systems

The **National Warning System (NAWAS)** is used to convey warnings to United States-based Federal, state and local governments, as well as the military and civilian population. NAWAS has proven invaluable to local emergency managers responding to or coping with natural disasters.

The **Emergency Alert System (EAS)**, is a national public warning system that requires TV and radio broadcasters, cable TV and wireless cable systems, satellite digital audio radio service providers, direct broadcast satellite service providers and wireline video service providers to offer to the President the communications capability to address the American public during a national emergency. The system also may be used by state and local authorities to deliver important emergency information such as AMBER (missing children) alerts and emergency weather information targeted to a specific area. A state emergency manager can use the EAS to broadcast a warning from one or more major radio stations in a particular state. EAS equipment in other radio and television stations, as well as in cable television systems in that state, can automatically monitor and rebroadcast the warning.

Nationwide Programmatic Environmental Documents

In order to receive federal funding, projects must comply with the **National Environmental Policy Act (NEPA) of 1969**, which requires Federal agencies to consider the effects of proposed projects on the natural and human environment. In order to eliminate repetitive discussions, nationwide programmatic environmental documents have been developed. If a given project meets the scope, impacts, and mitigation covered in the related programmatic environmental document, then no further NEPA documentation will be required. The documents differ somewhat per FEMA Region. Region 1 documents are accessible through the following link: **Region 1 - Environmental Documents and Public Notices**

Pandemic and All-Hazards Preparedness Act

The **Pandemic and All-Hazard Preparedness Act of 2006** had broad implications for the Department of Health and Human Service's preparedness and response activities, including providing new authorities for programs such as development and acquisition of medical countermeasures and the establishment of a quadrennial National Health Security Strategy. The act was reauthorized in March 2013.

Voluntary Organizations Active in Disasters (VOAD)

In 1970, seven national disaster response organizations convened for the first time to find a way to better coordinate responses and more effectively serve disaster survivors and their communities. As an outcome, *National VOAD* was formed as a forum for sharing knowledge and coordinating resources, money, materials and manpower throughout the disaster cycle: preparation, response, and recovery.

APPENDIX 5-3

Financial Capabilities

Appendix 5-3

Financial Capabilities

LOCAL *(the capabilities have been listed in alphabetical order)*

Town Budget - Capital Improvement Program (CIP)

The annual Financial Town Meeting (FTM) is typically held on the fourth Wednesday in May each year. Registered voters at the FTM vote on the municipal and school budget, including the annual capital budget, as recommended by the Committee on Appropriations (COA). The budget forwarded to the FTM by the COA is first developed by the Town Manager and approved by the Town Council (potentially with revisions) and the School Committee. In addition to operating and capital budgets for the Town and Schools, voters at the FTM also may approve bonds to finance capital projects. Authority to issue bonds may also be decided by referendum as part of Town-wide elections.

Annual capital budgets are developed as part of a six-year Capital Improvement Program, updated each year. This plan helps identify projects that should be undertaken in the next six years. This long-range planning is essential in addressing the future development and growth of the Town. The Town has continually funded its capital requirements each year, in the \$1.6 million range (5-year average), and maintains a pay as you go funding for most of its capital needs, which limits its borrowing requests. The School Department in recent years has designated annual budget surpluses for use in funding its capital needs.

Net position can serve over time as a useful indicator of a government's financial position. According to the Town's FY2021 Comprehensive Annual Financial Report, the Town's combined net position (government and business-type activities) totaled \$68,562,073 at the close of FY2020-21. Governmental activities cover most of the Town's basic services such as police, fire, school, library, public works, and general administration. Property taxes finance most of these activities, supplemented by charges for services and state funding.

Business-type activities are fees charged to customers to cover the costs of certain services it provides; including the Town's sewer system. In FY2021-22, the municipal budget totaled \$75,349,567 million; the School budget totaled \$56,790,991 million, including a \$8,388,954 million State share. The School budget typically is about 70 percent of the overall operating budget. The capital budget, including \$388,595 in school capital, totaled \$2,255,595 million (*Town of Barrington. Certified Detailed Budget 2021-2022*).

REGIONAL *(the capabilities have been listed in alphabetical order)*

Eastern RI Conservation District (ERICD) - Grass Roots Fund

The vision of ERICD is to promote and improve long-lasting and environmentally-friendly practices that protect natural resources such as soil, water, and air. In addition to other programs and support they also administer several grants through their **Grass Roots Fund**.

Narragansett Bay Estuary Program (NBEP)

The **Narragansett Bay Estuary Program**, through its host, **Roger Williams University**, is providing oversight for the **Green Infrastructure Project Planning Grant Program**. Grant funding will support planning activities that advance future implementation of green infrastructure projects in the Narragansett Bay, Little Narragansett Bay, Coastal Ponds, and their watersheds in Rhode Island, Massachusetts, and Connecticut.

Southern New England Program (SNEP)

SNEP Watershed Grants provide funding assistance to municipalities and other local organizations in Rhode Island and Massachusetts to accomplish the goals of EPA's SNEP program: a resilient ecosystem of safe and healthy waters, thriving watersheds and natural lands, and sustainable communities. The SNEP Network is managed by the **New England Environmental Finance Center (EFC)**, one of 10 university-based Environmental Finance Centers in the nation and serves the 6 New England states of EPA Region 1. Its mission is to build local capacity to pay for the growing costs of protecting the environment and to be better prepared to manage the chronic and acute problems of environmental protection and finance. The New England EFC is based at the University of Southern Maine.

STATE *(the capabilities have been listed in alphabetical order)*

Rhode Island Department of Environmental Management (RIDEM)

319 Non-Point Source Grant

The RIDEM Office of Water Resources administers funding from the US Environmental Protection Agency (EPA) under Section 319 of the Federal Clean Water Act for grants to assist in the implementation of projects that protect and restore water quality from nonpoint sources of pollution and to improve or restore aquatic habitats.

Clean Water & Drinking Water

Matching funds for the Clean and Drinking Water State Revolving Funds to ensure our drinking and recreational waters – including Narragansett Bay – are clean and safe.

Climate Resilient Fund Grant

To support the implementation of climate resilience projects – specifically restoring and improving the climate resilience of vulnerable coastal habitats, as well as river and stream floodplains and related habitat.

DEM's Green Space Grant Programs fund land conservation, recreational land acquisition and development, and recreational trail development and improvements. Each of the following programs operates under a set of rules and regulations with Committee and Department oversight:

- **Local Open Space Grants** - This grant program provides up to 50% matching funds to municipalities, land trusts and non-profit conservation land organizations to preserve valuable open space throughout the state.
- **Outdoor Recreation Grants** - This grant program provides matching funds for the acquisition, development, and renovation of outdoor recreational lands and facilities.
- **Recreational Trail Grants** - This grant program provides financial assistance to municipalities and non-profit organizations for the development and maintenance of recreational trails and trail-related projects.

Natural & Working Lands Program

This program protects farmland and forested lands and the associated economic and ecosystem benefits.

Rhode Island Emergency Management Agency (RIEMA)

RIEMA administers the **Emergency Management Preparedness Grant (EMPG) Program** which assists local units of government in building, sustaining, and delivering a whole community emergency management program. The funding objective is to sustain current capability levels and fills identified gaps in Planning, Organization, Equipment, Training, and Exercise activities in order to prevent, protect against, mitigate, respond to, and recover from acts of terrorism or catastrophic events.

Rhode Island Foundation

The Foundation was organized at the Rhode Island Hospital Trust Co. in June 1916 by a small group of prominent Rhode Islanders. It was modeled after the first community foundation established in Cleveland two years earlier. "There is a growing belief that the charitable problems of each generation can better be, and should be, solved by the best minds of each generation," the founders wrote. The Foundation administers a number of grant programs, each having a different purpose, application requirement, and deadline. The **Community Grant Program** which supports community-building activities in cities and towns throughout Rhode Island, may be applicable for certain hazard mitigation or resilience activities.

Rhode Island Infrastructure Bank (RIIB) – MRP Action Grant

MRP Action Grants are available to each cohort for eligible projects in the year they participate, and as directed by RIIB may be available in subsequent years. Eligible projects are required to be identified through the Community Resilience Building process, improve climate resilience, and a capital investment resulting in construction. MRP Action Grants are not available for research-related activities such as studies and strategic plans. Grant eligibility must fall under Rhode Island Infrastructure Bank's broad portfolio of programs and can include but not limited to, dam repair and removal, road elevation, hardening or elevation of pump stations, berms and levies, culvert repair, green stormwater infrastructure, back-up power and energy efficiency, watershed restoration, urban tree planting, and coastal erosion control. Municipalities will be required to match grants with a 25% local project cost share.

FEDERAL *(the capabilities have been listed in alphabetical order)*

Department of Homeland Security Grant Program (HSGP)

State Homeland Security Program (SHSP) - The SHSP is the core assistance program in this suite - it provides funds to build capabilities at the state and local levels and to implement the goals and objectives included in state homeland security strategies and initiatives in their State Preparedness Reports. At least 25% of these funds are dedicated toward anti-terrorism activities.

Federal Emergency Management Agency (FEMA)

FEMA administers a number of grant programs related to hazard mitigation and resilience including:

- **Hazard Mitigation Grant Program (HMGP)** - Assists in implementing long-term hazard mitigation planning and projects following a Presidential major disaster declaration.
- **Flood Mitigation Assistance (FMA) Program** - Provides funds for planning and projects to reduce or eliminate risk of flood damage to buildings that are insured annually under the National Flood Insurance Program.
- **Building Resilient Infrastructure & Communities (BRIC)** - Support for states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards.
- **Pre-Disaster Mitigation (PDM) Program** - Provides funds annually for hazard mitigation planning and projects.

US Army Corps of Engineers Programs

USACE administers a number of grant and assistance programs including:

- Planning Assistance to States (PAS) Program
- Flood Plain Management Services Program (FPMS)
- Continuing Authorities Program (CAP)
- Inspection of Completed Works (ICW) Program
- Rehabilitation and Inspection Program (RIP)
- Beach Restoration and Shoreline Protection Program
- General Investigation (GI)

US Department of Agriculture Natural Resources Conservation Service (USDA)

The USDA NRCS has several financial assistance programs including:

- **Agricultural Management Assistance (AMA)** - which helps agricultural producers use conservation to manage risk and solve natural resource issues through natural resources conservation.
- **Conservation Stewardship Program (CSP)** - which helps agricultural producers maintain and improve their existing conservation systems and adopt additional conservation activities to address priority resources concerns.
- **Environmental Quality Incentives Program (EQIP)** - which provides financial and technical assistance to agricultural producers to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, increased soil health and reduced soil erosion and sedimentation, improved or created wildlife habitat, and mitigation against increasing weather volatility.

US Department of Housing and Urban Development

HUD CDBG Disaster Recovery Assistance (CDBG-DR):

This program makes funding available to prevent further damage to an affected area after a disaster. The focus is on assisting communities in low-income areas. The goals of the program align with those in the SHMP, especially in regard to those most at risk. Although this program is focused on the recovery process, the leading mitigation technique for this funding program is Plans and Regulations through code enforcement and slum/blight prevention after a disaster occurs. These grants may be used for infrastructure improvement, public services, or development and planning. 70% of the project must benefit low-and moderate-income persons. CDBG-DR money can be used as matching funds for the FEMA HMA grant programs.

HUD Block Grant Program (CDBG):

U.S. Housing and Urban Development Community Development Block Grant Program - a flexible program that provides communities with resources to address a wide range of unique community development needs, particularly the Disaster Recovery Assistance Program which provides grants to help cities, counties, and states recover from residentially-declared disasters, especially in low-income areas, subject to availability of supplemental appropriations.

US Economic Development Administration

U.S. Economic Development Administration - empowers distressed communities to revitalize, expand, and upgrade their physical infrastructure to attract new industry, encourage business expansion, diversify local economies, and generate or retain long-term, private sector jobs and investment.

APPENDIX 6-1

Possible Actions

Appendix 6-1

Possible Actions

As it is good practice, and in support of CRS Activity 510 Planning Process - Step 7, an array of possible activities was reviewed for inclusion in the *2022-2027 Action Plan*. The activities considered were those previously identified in the following Town of Barrington planning documents and those identified by the Public Opinion Survey respondents.

- Town of Barrington Hazard Mitigation Plan (2017)
- Town of Barrington Comprehensive Community Plan (2015 – Amended 2019)
- Rhode Island State Hazard Mitigation Plan (2019)
- Town of Barrington - MRP Community Resilience Building Workshop Summary of Findings (2019)
- Technical Report: A Future with Water: Sea Level Rise in Rhode Island (2019)
- Preparing for Resilience: Barrington & Warren Mixed-Use Climate Response Demonstration Site (2019)
- Bay Spring Resilience Plan (2020)
- Preparing for Resilience: Barrington & Warren Mixed-Use Climate Response Demonstration Site (2021)
- Comprehensive Plan to Restore Water Quality in Hundred Acre Cove (2021)
- Public Opinion Survey (2022) - *HM&FMP Outreach Activity #3*

In undertaking this extensive plan integration process, the Town has successfully linked these documents with the 2022 hazard mitigation strategy and actions. The Town also reviewed actionable suggestions made by residents and other stakeholders as part of the Public Opinion Survey. The actionable items were extracted from the Public Opinion comments and organized into 20 categories, many of which have been integrated into the *2022 Action Plan*.

Each of the possible actions in the following resources has been identified as being included or not in the *2022 Action Plan*. For actions included, the 2022 Action number has been provided. It should be noted that the specification “included” refers to the general intent of the reviewed action (i.e. the wording may vary or some particular aspects may not be included – however, the action is essentially represented). Similar actions from various sources were combined and the proposed 2022 actions went through a number of iterations based on input from the Steering Committee. For actions not included in the 2022 Action Plan, a reason has been provided.

Town of Barrington Hazard Mitigation Plan (2017)

Please refer to **Section 5.3** for a detailed review and status of the 2017 HMP actions listed below.

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Goal 1	Action 1.A—Complete community-wide storm surge and sea level rise impact assessment.	Action 2022-1.7	
	Action 1.B—Complete infrastructure projects in order to protect critical assets.	Action 2022-1.2	
	Action 1.C—Revise regulations to reduce future risk of natural hazards.	Action 2022-1.6	
	Action 1.D—Publish design, site guidelines for elevation projects.	Action 2022-1.6	
	Action 1.E—Adopt LID standards to reduce amount of impervious surfaces within new subdivisions and other private development projects.	Action 2022-1.8	
	Action 1.F—Improve stormwater facilities at public facilities.	Action 2022-1.3	
	Action 1.G—Improve GIS capabilities, including enhancements to the Town's web-based mapping program, to help users identify flood risk throughout town.	Action 2022-1.5	
Goal 2	Action 2.A—Prioritize and complete Coastal adaptation projects.	Action 2022-2.2	
	Action 2.B— Implement tree management program.	Action 2022-2.1	
	Action 2.C—Complete hydrology studies.	Action 2022-2.5	
	Action 2.D—Develop and complete projects identified in Walker Farm saltmarsh restoration plan.		Scheduled for Substantial Completion in Fall 2022
	Action 2.E—Protect vulnerable areas from development through acquisition, easements and other mechanisms.	Action 2022-2.4	
Goal 3	Action 3.A— Complete steps to enroll in Community Rating System.	Action 2022-3.2	
	Action 3.B— Engage/provide training for Certified Flood Manager.	Action 2022-3.4	
	Action 3.C—Develop and enact tracking system to monitor HMP implementation progress, with updates on a semi-annual basis.	Action 2022-3.1	
	Action 3.D—Work with property owners to mitigate properties in areas at risk of flooding, including acquisition and elevation projects.	Action 2022-3.3	
Goal 4	Action 4.A—Initiate program such as "High Water Mark" initiative to increase public awareness of flooding risk and potential future high tide levels from sea level rise.	Action 2022-4.8	
	Action 4.B—Conduct community outreach to increase awareness and improve preparedness for impacts of natural hazards.	Action 2022-4.1	
	Action 4.C—Establish process to inform vulnerable populations about procedures in place before and after a natural hazard event.		Completed

Town of Barrington Comprehensive Community Plan (2015 – Amended 2019)

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Community Services & Facilities Goal CSF-1	D. Incorporate best management practices, where feasible, by retrofitting outdated drainage facilities within municipal and school parking lots and local streets, to limit stormwater runoff and enhance water quality. Develop watershed plans as needed to prioritize projects.	Action 2022-1.7 & Action 2022-2.5	
	E. Continue to develop GIS data and provide necessary software and technology to allow Public Works to monitor the wastewater infrastructure to avoid disruptive failures, as well as assist with maintenance of stormwater facilities, to include information on maintenance responsibilities.	Action 2022-1.5	
Community Services & Facilities Goal CSF-2	B. Promote water conservation practices to include: <ul style="list-style-type: none"> Develop policy for Town and School properties to reduce water usage through watering practices and use of xeriscaping on public grounds, including cemeteries Consider implementing a program to offer rain barrels at reduced cost to Barrington residents and businesses. Work with area farms that lease public or Land Trust property to develop and implement water use conservation plans for their operations. 	Action 2022-2.3	
	C. Amend the Barrington Emergency Operations Plan to establish a water emergency response plan outlining responsibilities of the Town and Bristol County Water in coordinating and communicating with the Water Resources Board in response to water supply shortage events, in compliance with Rhode Island Water 203 0 – State Guide Plan Element 721. Plan shall address: implementation of water reduction strategies in times of dry summers and droughts, coordination of the response including identification of responsibilities among agencies, and effective public outreach strategies (see also Natural Hazards Goal NH-4, Action "B").		Process governing water emergency response exists
Natural & Cultural Resources Goal NCR-1	C. Seek grants and other funding sources to protect open space, including habitat areas and farmland, through acquisition and conservation easements.	Action 2022-2.4	
	D. Establish deed restrictions to ensure high priority Town-owned conservation parcels, as determined based on Policy NCR-1.1.1, cannot be sold or otherwise disposed of.		Consider including in 2023 Open Space Plan Update
	E. Rezone properties with conservation values, consistent with the Future Land Use Map (see Maps LU-6 and LU-7 in the Land Use element).	Action 2022-1.6	
Natural & Cultural Resources Objective NCR-1.2	C. Secure funding to research, inventory, and digitally map wetlands in town to improve the accuracy of the locations of wetland edges. The primary goal of this inventory would be to establish existing wetland types and approximate wetland edges, identify jurisdictional review, document distance from existing structures, and map interconnections between wetlands and other water bodies, including larger rivers and bay.		Consider for 2027 HM&FMP Update
	E. Amend drainage and site plan design standards in the Land Development & Subdivision Regulations to encourage low-impact development techniques.	Action 2022-1.8	

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Natural & Cultural Resources Goal NCR-3	A. Complete a watershed study within priority areas, including Town Beach and Brickyard Pond, to identify and prioritize future stormwater / water quality improvement projects, with an emphasis on “green infrastructure” such as rain gardens, where feasible. Prepare detailed plans as necessary to determine estimated costs and capitalize on funding opportunities available through the State or other sources.	Action 2022-2.5	
Natural Hazards Goal NH-1	A. Complete an assessment of potential impacts, including physical and financial, of projected sea-level rise on publicly and privately owned buildings and sites, roads, storm-water systems, sewer systems and other utilities.	Action 2022-1.7	
	B. Include in the six-year capital improvement program critical projects required to mitigate threats to infrastructure and properties.	Action 2022-1.2	
	C. Consider requiring smaller lot sizes, such as through a cluster subdivision design, to ensure development is outside the existing or projected floodplain, reducing potential impacts of rising sea levels.	Action 2022-1.6	
	D. Provide support for property owners to help take advantage of funding opportunities—such as FEMA Hazard Mitigation Grants and Emergency Management Performance and Homeland Security Grants—that assist with covering the cost of mitigating risk such as elevating or retrofitting existing structures located in designated flood zones, or acquisition and relocation of structures outside high-risk zones.	Action 2022-1.6	
	E. Publish illustrated design guidelines to provide ideas for designing building elevations that are compatible with the surrounding neighborhood. Include best practices to mitigate impacts of elevations that require relief from the height limit.	Action 2022-1.6	
	F. Adopt low-impact development standards to reduce the amount of impervious coverage, such as reduced street widths and a maximum impervious lot coverage percentage.	Action 2022-1.8	
	G. Provide measures to improve stormwater retention in the planning and design of park improvements and construction of schools and other new public buildings.	Action 2022-1.3	
	H. Evaluate restrictions on changes to grades around buildings within 100-year flood zone.	Action 2022-1.6	
	I. Improve Geographic Information Systems (GIS) capabilities to support assessment and planning activities	Action 2022-1.5	
Natural Hazards Goal NH-2	A. Prioritize and implement coastal adaptation projects, working with Save the Bay, the State and other stakeholders, to reduce flood risk and the potential damage to vulnerable infrastructure, allow the expansion of wetlands and other purposes.	Action 2022-2.2	
	B. Implement a tree management program to reduce risk to property due to winds, heavy snow/ice or other natural hazard impacts, to include: <ul style="list-style-type: none"> Identification of tree species that will be most resilient to climate change and use these species in public projects. Requiring resilient tree species in new subdivisions and land development projects. 	Action 2022-2.1	
	C. Complete hydrology study that includes: inventory of ponds on private and public property; assessment of streams and condition of and impacts of dams; prioritization of projects needed to maintain/improve water flow.	Action 2022-2.5	
	D. Develop plan to allow restoration of natural areas at Walker Farm.		Completed
	E. Work with the local land trust and other stakeholders to identify and protect from development: <ul style="list-style-type: none"> Low-lying land vulnerable to impacts from flooding and sea level rise. Areas adjacent to coastal wetlands susceptible increased inundation due to sea level rise. 	Action 2022-2.4	

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Natural Hazards Goal NH-3	A. Complete steps required to enroll in the NFIP Community Rating System, with a minimum starting CRS score of "9".	Action 2022-3.2	
	B. Engage a consultant or provide staff training for a certified floodplain manager to coordinate implementation of CRS activities and implementation of the Town's Hazard Mitigation Plan.	Action 2022-3.4	
	C. Complete the required Hazard Mitigation Plan five-year update that addresses effects of climate change and includes activities that would achieve a CRS goal of "7" by 2020. Update the plan as necessary to address impacts of new significant natural hazard events such as severe flooding, wind damage and storm surge.		This Plan is the 5-Year update
	D. Establish an administrative team to meet quarterly to review progress on implementation of the Hazard Mitigation Plan and activities resulting in CRS credit	Action 2022-3.1	
Natural Hazards Goal NH-4	A. Use informational signs at areas of historic flooding showing the 1938 surge elevations along the bay and rivers and update as necessary based on March 2010 flooding. These signs could be as simple as a painted blue ring around a telephone pole or a plaque indicating where floodwaters have reached previously. It is especially important to include inland areas where the risk is less obvious.	Action 2022-4.8	
	B. Conduct community outreach, including public forums and publication/posting of information at Town facilities and the website, on natural hazard mitigation initiatives, preparedness and response. Program should include: <ul style="list-style-type: none"> Preparedness for emergency situations, especially during hurricane season immediately before an event. Threats of natural hazards, including impacts of flooding and long-term sea level rise projections. Opportunities property owners can take to mitigate future impacts; include "how-to" sessions on mitigation activities including house elevation projects. Publicize spaces (shelters, "warming centers," etc.) available to the public in times of power outages, loss of heat and other secondary impacts resulting from natural hazards. State and FEMA brochures and other information... Water restrictions, as applicable, during drought conditions. Consider direct mailing of information to residents /property owners who rely on well water. 	Action 2022-4.1	
	C. Establish a process to directly contact special populations such as those who are particularly vulnerable, due to location or age and infirmity, to ensure their understanding of procedures immediately before and after an event.		Completed

Rhode Island State Hazard Mitigation Plan (2019)

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Barrington Specific	Activity 2019-48: Beach Ecosystem Preservation (Lead Agency CRMC; Low Priority; Potential Funding Sources HMGP/PDM/FMA)	Action 2022-2.4	

Town of Barrington - Municipal Resilience Program Community Resilience Building Workshop Summary of Findings (2019)

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Higher Priority Capacity Building	Continue to strengthen the integration of resilience via the Resilience and Energy Committee	Action 2022-4.5	
	Seek to further integrate resilience into planning and action by the Barrington Community Support Coalition		Outside BCSC Scope
Higher Priority Project	Advance project to reduce erosion at Latham Park (south of revetment at Narragansett Avenue) using nature-based solutions.	Action 2022-2.2	
	Explore and prioritize additional shoreline adaptation projects for low-lying, dead-end roads at the shore across municipality which may include pavement removal and green infrastructure to manage runoff and erosion.	Action 2022-2.2	
	Complete GIS stormwater system mapping effort.	Action 2022-1.5	
	Secure additional portable generators to ensure all sewer pump stations have adequate power throughout major storm events.		Completed
	Clean out waterways and drainage areas associated with culverts to help increase conveyance and minimize localized flooding from stormwater runoff.	Action 2022-1.3	
	Identify best management practices for stormwater management at Town Beach and install proper green stormwater infrastructure projects to minimize localized flooding and erosion.	Action 2022-1.3	
	Continue to conduct tree maintenance operations in partnership with municipality and RIDOT on higher priority power corridors.		PPL Responsibility
	Conduct additional community outreach to increase participation in Code Red System with sign-ups at municipal functions and via direct mailer.	Action 2022-4.8	
	Investigate and make improvements to culverts along New Meadow Road.		RIDOT Responsibility
	Seek to identify and install remediation projects for the neighborhoods and approaches to the White Church Bridge.	Action 2022-1.2	
	Strengthen evacuation route awareness and way finding via more robust and prominent signage installation.	Action 2022-1.1	
	Accelerate existing and proposed salt marsh restoration projects that improve ecological health, reduce risk, and enhance a public amenity (i.e. "resilient triple bottom line").	Action 2022-2.2	
	Identify appropriate location and install living shoreline projects and other shoreline stabilization efforts in Hundred Acre Cove.	Action 2022-2.2	
	Work to reduce identified issues at Walker Farm including allowing for the potential of salt marsh advancement, curtailing mowing in identified areas, and addressing use conflicts involving access for boaters.	Action 2022-2.2	
	Continue to ensure that fresh water wetlands such as Echo Lake remain largely invasive free and can continue to accommodate flood storage.		Echo Lake is currently under private ownership
	Seek ways to ensure private facilities (e.g. Atria Bay Spring Village, Barrington Cove Apartments) have generators installed to provide heat for residents which may require passing legislation.	Action 2022-4.6	
	Consider flood control project for low-lying sections of Sowams Road.	Action 2022-1.2	

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Higher Priority Plans, Preparedness, Studies, Outreach	Conduct a travel model for full town evacuation to identify pinch points and critical locations for signage.	Action 2022-1.1	
	Explore benefits of establishing a special needs registry within municipality as well as setting up and running an Adopt a Neighbor Program.	Action 2022-4.7	
	Bolster outreach and education on hazards and risk to elderly population via Senior Center, Fire Department, and Department of Health efforts.	Action 2022-4.1	
	Explore the benefits of removing causeway on bike path bridge to allow more water to move with less restriction (lower velocity, reduce scour) along the Barrington River.		RIDOT evaluated; not included in design
	Comprehensively assess existing and future vulnerabilities and options to reduce risk for Route 114 including rerouting and raising, amongst others.	Action 2022-1.4	
	Conduct outreach and education to residential property owners located in flood zone with focus on flood insurance.	Action 2022-4.1	
	Maintain and update Flood Preparedness Website as well as continue community outreach to help inform consideration of flooding risk to residents and their properties.	Action 2022-4.1	
	Conduct municipal-wide stormwater infrastructure assessment to determine priority needs for upgrades, retrofits, and/or replacement to accommodate current/future storms & ground water table.		Implement identified projects now and consider Town-wide assessment for 2027 HM&FMP Update
	Look for potential of conducting adaptation actions via a long-term planning effort at Walker Farm.	Action 2022-2.2	
Moderate Priority Project	Elevate the importance of forests and trees across municipality via local municipal nursery establishment to supply native trees and shrubs that are more resilient to changes in climate and increased community-based planting opportunities.	Action 2022-2.1	
	At Nockum Hill, continue to protect Diamond Back Terrapin as well as increase communications regarding the use of pesticides and advance natural resources conservation and restoration.		Consider including in 2023 Open Space Plan Update
	Seek to reduce stormwater runoff into wetlands and waterways via the use of green stormwater infrastructure (i.e. rain gardens, bioswales) across municipality.	Action 2022-1.3	
	Continue to support Save The Bay and Barrington Conservation Land Trust in work to enhance Mussachuck Beach and Marsh system with further consideration of living shoreline projects to reduce erosion and improve shoreline stabilization.	Action 2022-2.2	
	Work with utility to secure long-term underground installation of power lines.		Consider including in 2023 SEP Update
	Protect western shore beaches with natural and hybrid infrastructure projects.	Action 2022-2.2	
	Inspect and design alternative approach to maintaining Bay Spring area culverts.	Action 2022-1.2	
	Maintain Mathewson seawall.	Action 2022-1.2	

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Moderate Priority Plans, Preparedness, Studies, Outreach	Initiate a longer-term planning effort to assess impacts to quality of life for residents dependent on access via Mathewson Road.	Action 2022-1.7	
	Increase education and awareness amongst coastal residents in areas with routinely flooding roads as well as install signage to alert residents of flooding issues.	Action 2022-4.8 & Action 2022-4.1	
	Assess the longer-term impacts from flooding to new Public Safety Building located in the floodplain.	Action 2022-1.7	
	Explore contingency plan for low-lying power substation.		Consider including in 2023 SEP Update
	Initiate dialogue with RIDOT regarding management options during major events for the tide gate at Washington Road.		RIDOT Authority
	Engage with marina owners and operators to ensure the best available information about extreme weather and climate change are provided in hopes of more informed decisions about operations and investments longer term.	Action 2022-4.1	
	Examine current conserved open space and consider how lands could be managed to increase the overall resiliency of the municipality and its ecosystems.		Consider including in 2023 Open Space Plan Update
	Establish a master planning effort for the Hundred Acre Cove area that takes into account the ecological viability, existing uses, and longer-term implications of continued growth, extreme weather, and climate change.		Consider including in 2023 Open Space Plan Update
	Increase awareness amongst residents about the benefits of parks that can absorb and store flood waters.	Action 2022-4.1	
	Conduct an assessment of local alternate routes for evacuation across and out of municipality during major events.	Action 2022-1.1	
	Explore intersection of residential homes in existing (i.e. 2014 FEMA FIRMS) and future flood zones to proactively educate on potential future home elevation, voluntary buyouts, and/or relocation.	Action 2022-1.7	
	Increase outreach to business community to ensure continuity and recovery plans are in place.	Action 2022-4.6	
	Examine the feasibility of securing and installing microgrids in select areas of municipality.		Consider including in 2023 Open Space Plan Update
	Work with Fire Department and management to ensure assisted living facilities, group homes, and elderly apartments have disaster and resilience plans in place.	Action 2022-4.6	
	Conduct education on proper residential yard management and ordinances that include no cut zones and lower fertilizer application to minimize impacts to water quality in Brickyard Pond, Prince's Pond, Volpe Pond, and Echo Lake.		Consider including in 2023 Open Space Plan Update
	Seek to reduce impacts from residential septic systems on adjoining waterbodies and uses such as aquaculture operations.		Consider including in 2023 Open Space Plan Update

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Low Priority Project	Install flood resilience projects including nature-based solutions and green infrastructure at Barrington High School as well as relocate facility utilities in second floor or on roof.	Action 2022-1.2 & Action 2022-1.3	
Low Priority Plans, Preparedness, Studies, Outreach	Secure adequate quantity and quality drinking water for current and future population size in municipality through back-up water supply connection from BCWA.		Pawtucket Pipeline Project scheduled to be completed in 2026
	Examine the existing boat wake limits and consider modification to reduce erosion of shoreline natural resources at Hundred Acre Cove.		Consider for 2027 HM&FMP Update
	Conduct water quality study (sources, amounts, options) for Hundred Acre Cove.		Completed by STB in 2021
	Explore longer-term options for dependable beach replenishments for public amenities.	Action 2022-2.2	
	Identify and plan for municipal-wide land acquisition to accommodate future salt marsh advancement zones.	Action 2022-2.4	
	Conduct assessment of vulnerability of cemeteries across municipality.		Consider for 2027 HM&FMP Update

Technical Report: A Future with Water: Sea Level Rise in Rhode Island (2019)

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Identified Projects	Older properties should be retrofitted to meet current building code requirements.		Based on State Building Codes
	Retrofit pumping stations to withstand temporary inundation so they can remain functional.		Currently discussing with Army Corps
	Re-evaluate the Town's emergency evacuation route and identify roads that should be raised	Action 2022-1.1	
	Identify areas of the Town that could be designed to hold more water.	Action 2022-1.3 & Action 2022-2.2	
	Consider the concept of microgrids for ensuring future water and power reliability.		Consider including in 2023 Strategic Energy Plan Update

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Identified Projects	Consider implementing greywater and blackwater recycling programs to manage wastewater and provide a new, localized water supply.		Address through other mechanisms
	Expand on existing outreach programs to educate the community on the risks of climate change and SLR.	Action 2022-4.1	
	Develop potential future coastal risk overlay zones within which no permanent, non-floodable structures would be permitted and existing homeowners would be eligible for a state-sponsored buyout program.	Action 2022-1.6	
	Develop potential upland development overlay zones where higher density can be supported to accommodate households who relocate due to flood inundation – this will help to maintain the population and economic growth of the Town.	Action 2022-1.6	
	Wampanoag Trail is a State road, part of the hurricane evacuation route, and is used by roughly 25,000 vehicles per day. As portions will be compromised by SLR, it is essential to develop a long-term transportation network strategy for Barrington and surrounding jurisdictions.	Action 2022-1.4	

Preparing for Resilience: Barrington and Warren Mixed-Use Climate Response Demonstration Site (2019)

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Workshop: Land Use Planning Strategies (October 4, 2018)	Zone critical to moderate future flood hazard zones with two purposes: 1) make current and future owners aware of the possible flood scenarios; and 2) serve as areas where new building codes could be recommended for property renovations (e.g., elevate) or serve as areas that could be eligible for government sponsored buyout programs.	Action 2022-1.6	
	Identify high elevation upland areas in the towns that could support a greater density of development to accommodate those residences and business that may need to relocate.	Action 2022-1.6	
	Identify or zone areas as current or future stormwater storage areas or areas where habitats could migrate landward as sea level rises.	Action 2022-2.2	
	The implementation of rolling easements was offered as a planning strategy, whereby the town or other entity, such as a non-profit land trust, obtains or purchases an easement from the property owner with the requirement that the property owner must surrender the property to the town or other entity once it is substantially damaged due to coastal flooding. The surrendered land could then serve as open space, a flood retention area, and corridor for coastal habitats (e.g., salt marshes, beaches, bluffs) to migrate landward in response to sea level rise.		Consider including in 2027 HM&FMP Update

Bay Spring Resilience Plan (2020)

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Prioritized Projects	Latham Park Shoreline Protection The shoreline along the edge of the park experiences erosion due to wave action. Proposed improvements include accommodating marsh migration; hardened edge at the southern portion of Latham Park for protection of infrastructure; and consider establishing an oyster reef to dissipate wave action.	Action 2022-2.2	
	Allin's Cove Erosion Protection To mitigate shoreline erosion adjacent to Allin's Cove and protect upland infrastructure, maintain existing coir envelopes at the end of Byway Road, and stabilize the embankments and address concentrated stormwater flow at the southern end of Byway Road and to the east of the low point in Narragansett Avenue.	Action 2022-2.2	
	Road End Stormwater Management Currently much of the stormwater from the Bay Spring neighborhood flows directly from roadways toward the shoreline without treatment or retention. The following roads, that run perpendicular to the shore, are particularly suitable for retrofits to install road end stormwater management systems: Woodbine Ave, Adams Ave, and Green Ave.	Action 2022-1.3	
	Read Avenue Flooding Mitigation Assuming an increase in storm events and forecast sea level rise from climate change, it is anticipated that the section of Read Avenue between Lake Avenue and Spring Avenue (which is one of the lowest points of the Bay Spring neighborhood) will flood with more frequency and intensity. At some point in the future it may prove beneficial to remove a portion of the roadway in this area.	Action 2022-1.3	
	Bay Spring Avenue Culvert The existing culvert that carries Annawamscutt Brook beneath Bay Spring Avenue is in need of repair and may be undersized for forecasted increased flow during future storm events. In conjunction with the Barrington Cove Dam, it may be beneficial to model future hydrodynamic and hydraulic flows from future storm events to understand how the sizing of this culvert impacts flood risk within the system.	Action 2022-1.2	
	Barrington Cove Dam To the south of Bay Spring Avenue, the Annawamscutt Brook is impounded by historic dam that served the Barrington Lace Works (one of those buildings has since been converted to the adjacent Barrington Cove Apartments). In conjunction with the Bay Spring Avenue culvert, it may be beneficial to model future hydrodynamic and hydraulic flows from future storm events to understand flood risk within the system.	Action 2022-1.2	
	Resilient Code Overlay District The housing stock in the Bay Spring neighborhood varies in age, but the majority dates from the first half of the twentieth century and is composed of wood frame structures on low foundations. These types of structures can be vulnerable to severe storm and flooding events. In response to similar conditions, several communities in the United States have adopted Flood Resilient Building Guidelines to be applied within specially designated Flood Resiliency Zoning Overlay Districts. The intent of these guidelines is to promote best practices for flood resistant design measures to ensure that substantial rehabilitation or new construction in areas vulnerable to current and future flooding are prepared for potential coastal flood hazards.	Action 2022-1.6	

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Prioritized Projects	<p>Emergency Preparedness</p> <p>The Town of Barrington has a strong system of emergency preparedness through its Emergency Management Team and its professional Fire Department and Police Department, as well as associated assets such as the Harbor Patrol. Bay Spring neighborhood residents expressed a strong desire to be more prepared on the neighborhood level, in coordination with existing Town systems. Specific actions that can be taken on the neighborhood level include:</p> <ul style="list-style-type: none"> • increasing neighborhood participation in the Town's Code Red emergency notification and communications system; • communicating existing emergency preparedness and evacuation plans with all neighborhood residents so that they can take appropriate action when instructed, through multiple methods including a strong online information platform, distribution of information on annual neighborhood events. This can be done in conjunction with local officials, the Rhode Island Emergency Management Agency (RIEMA) and with the Federal Emergency Management Agency (FEMA) through its Citizen Corps program; • engaging neighborhood residents to help protect vulnerable populations such as older homeowners and residents of senior housing through programs such as "adopt a neighbor"; • forming a volunteer community working group/organization such as a Community Emergency Response Team (CERT) to become trained in basic disaster response skills and coordination with public safety (Police and Fire) and nonprofit (American Red Cross) agencies; • improving signage for emergency evacuation routes; • researching and building community understanding about the ways in which area businesses prepare for emergency events (including area marinas) including removing moored/docked boats, status of hazardous materials (fuel tanks, etc.) 	Action 2022-4.1, Action 2022-1.1, & Action 2022-4.7	
	<p>Post-event Recovery</p> <p>At some point in the future, the Bay Spring Neighborhood will be impacted by an emergency event caused by a climate change impact such as a hurricane, severe precipitation event or high heat event. Advanced planning for post-event recovery can be the key to a resilient community that bounces back from the event. There are a number of resources that the neighborhood and Town of Barrington can utilize prepare for this eventuality:</p> <ul style="list-style-type: none"> • Create a neighborhood-specific, post-event recovery plan that builds on existing Town and State plans for larger events; • Provide locations for temporary power supply that can be used during the period between resident return and reactivation of the electric grid. This can be a community building with a resilient generator and fuel source, which is estimated to cost \$44,000; • Plan for shared sources of supplies and materials for returning residents through community organizations or coalitions; • Understand and plan for systems by which the Town will process applications for emergency building stabilization and/or demolition in the event of structural damage during an emergency event. 		Post-event recovery actions will be address through other mechanisms

Preparing for Resilience: Barrington and Warren Mixed-Use Climate Response Demonstration Site (2021)

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Outcome of meeting with Town (February 4, 2020) to review MRP-CRB Workshop SOF and identify ideas for future pursuit	Convene a second Transportation Workshop with the goal of engaging RI DOT and the RI Division of Statewide Planning in transportation resilience discussions. The Route 114 corridor, which is under state jurisdiction, is vulnerable to flooding from sea-level rise and storm surge. The goals are to discuss the need for long-range planning to address resilience of vulnerable roadways, identify the need for site-specific transportation resilience planning studies, and identify transportation projects to be considered for federal funding through the State Transportation Improvement Program (STIP).	Action 2022-1.4	
	Buyouts is an important resilience strategy to continue pursuing at the state level. Buyouts of properties in highly vulnerable flood-prone areas could voluntarily apply for financial assistance to relocate or retreat to areas of higher elevation.		Ongoing through URI-CI partnership
	Online tracking of climate adaptation projects is important so the public and board members from the towns are aware of progress that has been made and future plans toward enhancing resilience of residences, businesses, infrastructure, and ecosystems from the impacts of sea-level rise and flooding.	Action 2022-4.2	
	Aggressively continue outreach and education on climate change and resilience topics, targeting the following five levels of audiences; elected officials, decision-makers/town boards, property owners, general public and middle school/high school students. Messages, especially to youth audiences, should provide positive elements – highlight actions being taken to enhance community and ecosystem resilience.	Action 2022-4.1	
	Annual “State of the Town” presentations and reports should include updates on all resilience and adaptation actions that have been taken. The Demonstration Site could assist with organizing this information.	Action 2022-4.2	

Comprehensive Plan to Restore Water Quality in Hundred Acre Cove (2021)

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Prioritized Actions & Projects	Accommodate marsh migration at Walker farm, area west of Route 114, area adjacent to Barrington Community Gardens parking lot, and at Osamequin Nature Preserve	Action 2022-2.2	

Public Opinion Survey (2022)

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Outreach & Education	The Town should make sure that information on what can be done is communicated to residents; Notify residents about what is currently being done (when/where), and what are the plans with respect to the increase of danger due to climate change factors; Hold meetings once or twice annually and invite the media, send regular mailings to residents and businesses; Educate the community on steps residents can take to better safeguard against the impacts from natural hazards; publish the 2020 flood plain chart; Create a committee to work with CRMC and other entities to help property owners make sensible improvements to the coastline	Action 2022-4.1	
Emergency Response	Organize groups of volunteers to assist emergency responders and social services with identifying and helping vulnerable neighbors (elderly, disabled, families with very young children); Game plan likely scenarios and communicate plans for different scenarios to residents (both for readiness purposes and to educate residents about risks)	Action 2022-4.7 & Action 2022-4.4	
Emergency Response	develop an integrated warning/communication system; create emergency notification system for residents		Process exists
Funding & Staff	Apply for federal grants for prevention; Set up a disaster fund and contribute annually to help save for the inevitable. The town can use these resources to help when needs arise; Employ experts; Consult professionals who have expertise in this area. Start budgeting for these services and things they might recommend; Increase DPW staff members; Apply for federal grants for prevention	<i>Funding & staffing are considered for all Actions</i>	
Planning	Obtain existing plans from similarly situated towns/cities in Mass, RI, MD, Delaware, etc. that are ahead of Barrington's planning stages. Identify if any are recognized as "best practices". In some cases, relevant plans may already exist; Look to low lying European countries like the Netherlands for ideas; take advantage of what the Dutch know about flood control: https://en.wikipedia.org/wiki/Flood_control_in_the_Netherlands	Action 2022-1.2	
Covid-19	Require employees of the town of Barrington to be vaccinated against Covid; apply the law = mask mandate; Reopen Covid testing center		Town adheres to State guidelines
Brush Fire	No leaf burning- and add extreme environmental laws		Leaf burning is not permitted in Town
Trees	Clear trees from power lines; Tree pruning to limit power outages; Continue to nurture the town tree nursery; Plant more trees, have more natural open spaces; Perform regular maintenance and/or repair of trees (especially near power lines); Trim trees along power lines; Please cut back the trees in the Hampden Meadows area; Plant trees; Plant more trees; Compulsory tree pruning	Action 2022-2.1	
Energy	Focus on renewables and sustainability; going to alternative energy - subsidize solar panels for homes and electrical charging stations - convert town electricity to solar; Prohibit the use of gas-powered leaf blowers; Do without the massive fossil fuel inputs (and petrochemical inputs) provide for its basic agricultural needs; Ban =Gas Leaf Blowers to start with; All government buildings should have solar panels; Ban all new construction if not net zero		Consider including in 2023 Strategic Energy Plan Update

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Above Ground Utilities	Bury all power lines; Increase vigilance around power lines; Move the power lines to underground; bury the power lines; Under road wires?		Consider including in 2023 Strategic Energy Plan Update
Flood-Related Hazards	High Risk Flood Zones: Prohibiting new building in flood prone areas and slowing growth throughout town, while restoring natural areas and reducing human impact on the land are likely the best mitigation tools we have; Start by not allowing new structures to be built-in high-risk flood zones; Stop development within flood zones; move town resources out of flood zones; Prevent construction in flood prone areas; At the very least, allow no building in designated flood zones; Do not issue building permits for flood zone areas; Stop building in or near SFHA zones; No building in floor prone areas, municipal, business or private residences; Limit building of new homes; Ban subsidized private building and major reconstruction in flood prone areas; Stop building in flood plains; Update the flooding zones to reflect climate change. Do not allow construction in areas expected to flood in less than 100 years; Preserve as much undeveloped land as possible. Return some developed land back into undeveloped land, if possible, specifically in flood-prone areas; Stop the development of housing on undeveloped land; stop residential single home building; Revise zoning- put a stop to waterfront development or improvements - harden infrastructure; Stop building homes on every plot of land that becomes available and instead preserve it as open space; Deny construction permitting for vulnerable areas; Do not encourage building in risk area	Action 2022-1.4	
	Transportation Network (Route 114): Additional work should be done to protect Rte. 114 along Hundred Acre Cove; Raise County Road (2x); Plan for erosion on rt 114 coming into town from E.P. (raise level of the road, think about a bridge in the future?)	Action 2022-1.4	
	Transportation Network (Evacuation Route): Assure that evacuation routes such as RT 114, County Road are maintained above the predicted flood levels; We will need new bridges to get out of town and to airport; Ensure that roads and evacuation routes can remain functional if an evacuation were needed for flooding, hurricane, etc.; make a better plan for evacuation	Action 2022-1.1	
	Transportation Network (Flooding): mitigate flooding on Hampden Meadows Road along the water during Lunar Tide; Raising and regrading the Mathewson Rd. Ferry Lane corner area which floods on many Spring tides. Paving the road would also be a good idea; Bolster bridges, embankments on rivers Improve upon sewer systems nearest rivers;	Action 2022-1.2	
	Transportation Network (Maintenance): repair of bridges over Barrington and Warren rivers; Fix what is currently broken (e.g., bike path bridge); Perform regular maintenance and/or repair of roads (including pavement and potholes)		Maintenance
	Infrastructure: Clean the culvert in the woods off of Bittersweet; have a plan to shore up the shoreline and to mitigate flood possibilities on the coast and all vulnerable rivers, ponds (Brickyard); There is a blocked/plugged culvert on Bittersweet that helps drain the water - if this was unblocked it could help with drainage in that area; Latham Park needs a protective jetty like it's neighbor across the cove in Riverside; Ensure electrical supply is interrupted to operate sump pumps, etc.; Update the sewer system; shelters with backup power; Inspect underground fuel tanks	Action 2022-1.2	

Category	Possible Activity	2022 Action Plan	
		Included	Reason Not included
Flood-Related Hazards	Stormwater Management: Improve drainage on roads; Reduce parking lots, no more new asphalt driveways, improve drainage, clean out old storm drains, dig out old stream beds so they flow better; work on establishing water runoff areas to absorb flooding, like where the boat dock is on County Road; maintenance of drainage systems; require new driveways to be of porous material (e.g., gravel, pebbles, not tar or cement); All rain grates in roads should be oriented so bicycle tire won't get snagged in them	Action 2022-1.3	
	Wetlands/Stems: preserve and enlarge marshes + wetlands; Build and maintain ways to prevent the rivers from flooding into the town; Continue restoration of natural wetlands to "absorb" the risk from rising sea levels; protect your natural infrastructure- e.g., salt marshes and adjacent migration pathways; Build up the wetlands surrounding the coastal areas; Stop the reduction of wetlands however small on private property especially. Restore wetlands as much as possible; Reduce polluted runoff to the bay/waterways, increase coastal natural protection and reduce coastal erosion (salt marsh, vegetation, trees), encourage native pollinator planting, encourage reduced lawn mowing and reduced lawn fertilizer use; Restore wetlands, less impermeable surfaces; Stick with sea grass, every other planting has succumbed to salt air winds and salt water; Perform regular maintenance and/or repair of wetlands and woods (e.g., removing dead and damaged trees and invasive species such as Chinese Bittersweet); Eliminate the use of all chemical fertilizers and adopt an organic approach instead; Aggressively work to remediate invasive plant species (potential fire hazards, also dramatically impacts property values & town tax base); reconstruct the economy based on organic agriculture and the development of equitable ecological science	Action 2022-2.2	
	Seawalls/Flood Barriers: Build appx. 3' seawall to keep water from roads. Consider seawall at all edges of town, working with property owners to determine best specific locations, and e.g. on northside of town beach parking lot; Build up storm walls in key areas of coastal flooding; Build proper seawall at Latham park; Build Break Walls; Consider building sea walls; Build a sea barrier against floods together with the State of RI; Increase height of sea walls; Reinforce sea wall between Allin's cove and Latham park; It seems it would be reasonably straightforward to use Washington Road as a flood barrier (consider flood gate on culvert under Washington Road); constructing natural barriers to flooding; We'll need some type of wall next to 100 acre cove or some way to elevate County Road; Start building flood walls along sides of main tributaries; Address the "wall" on Mathewson Lane. Build higher to mitigate/prevent flood water from washing over; consider walls along Hundred Acre Cove; Barrington should start building flood prevention structures (e.g., sea walls); Start construction of a wall to block rising water; Higher sea wall, especially on river facing streets		Army Corps of Engineers determined a sea wall between Barrington & Warren to be cost prohibitive; CRMC currently does not permit new seawalls, but existing seawalls can be maintained
	Elevate Structures: Seek federal funding to elevate private homes to reduce flood risks; Potentially get federal government support to subsidize homeowners to help them get out of potential flood areas; the area around the Yacht Club needs to be either rezoned for elevated structures, or shored up; provide subsidies or tax rebates for homeowners who want to buy generators, elevate home on stilts, or do other things to mitigate natural hazards	Action 2022-3.3	

APPENDIX 6-2

STAPLEE Analysis

Appendix 6-2

STAPLEE Analysis

In accordance with the *Disaster Mitigation Act 2000 (DMA)*, the Steering Committee undertook a process to prioritize actions for implementation in order to develop a realistic approach toward mitigating risks. Each of the actions reviewed received a priority score based upon a general set of criteria common to public administration officials and planners, known as STAPLEE. As indicated below, the acronym stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental. The STAPLEE method includes a general benefit-cost review as part of prioritizing actions.

Definition of Rating Scale

Cost	0 = no/insignificant cost		-1 = minimal cost		-2 = moderate+ cost	
Benefit	4 = exceptional	3 = highly beneficial	2 - beneficial	1 = somewhat beneficial	0 = not beneficial	

STAPLEE Criteria for Selecting Mitigation Measures

Category	Criteria
Social	Does the proposed project have (or can easily gain) the support and acceptance of the community and is it compatible with present and future community needs and values? Will the action cause social disruption? Does the proposed project benefit a critical facility/infrastructure? Is there public support both to implement and to maintain the project?
Technical	Is the proposed project technically feasible? How effective is the proposed project in avoiding or reducing future losses for the long term? Will it create more problems than it solves? Does it solve a problem or only a symptom?
Administrative	Can the community implement the action? Is there someone to coordinate and lead the effort? Is there sufficient funding, staff, and technical support available? Are there ongoing administrative requirements that need to be met?
Political	Will the proposed project comply with comprehensive plan and land use elements, zoning activities, transportation, environmental, flood zone, historical and other long-range plans? Is the action politically acceptable?
Legal	Will the proposed project comply with local, state, and federal regulations? Are the proper laws, ordinances, and resolutions in place to implement the proposed project? Are there potential legal consequences or is the proposed project likely to be challenged by stakeholders who may be negatively affected?
Environmental	Is the proposed project consistent with community environmental goals? Will the action need environmental regulatory approvals? Will it meet local and state regulatory requirements? Are endangered or threatened species likely to be affected?
Economic	How will this action affect the fiscal capability of the community? Has funding been secured for the proposed action? Does the action contribute to other community goals, such as capital improvements or economic development?

Goal 1: Reduce impacts from current and future natural hazards to the built environment.

Policy 1.1: Consider the effects of projected sea level rise and flooding in the site selection and planning of parks, buildings, and other public projects.

Policy 1.2: Reduce impact of development within the floodplain and other vulnerable areas.

Description of Action	Cost/ Benefit	Social	Technical	Administrative	Political	Legal	Environmental	Economic	Total	Prioritization
Complete neighborhood scale flood, storm surge, and sea level rise (SLR) impact assessments. Through a partnership with the URI Coastal Institute, a town-wide building and roadway SLR exposure assessment has been completed. Using the mapping and data from that project, in conjunction with the Coastal Environmental Risk Index Maps and STORMTOOLS Design Innovation, the Town will assess the potential impacts of projected SLR on high-risk neighborhoods. The assessment will include the impact on publicly and privately owned buildings and sites, roads, stormwater drainage system, sewer system, and other utilities. The scope will involve generating cost estimates for mitigation projects, establishing project priorities, and identifying the intersection of residential homes in current and projected future flood zones to proactively educate the community on potential future remediation strategies such as home elevation, voluntary buyouts, and/or relocation.	Cost	0	-1	-1	0	0	0	0	-2	18
	Benefit	3	4	4	2	2	3	2	20	
Complete infrastructure projects in order to protect critical assets including roadways. Include in the six-year Capital Improvement Program (CIP), and for projects under State jurisdiction work with the State to include in the State Transportation Improvement Program (STIP), critical short- and long-term projects required to mitigate threats to infrastructure and properties. Implement best practices and look to agencies and other stakeholders, as well as other jurisdictions (including from other states and countries) that have had success in implementing projects to protect critical assets.	Cost	0	-2	-1	0	-1	0	-1	-5	21
	Benefit	4	4	4	3	4	3	4	26	
Revise regulations to reduce future risk of natural hazards. Revise the Town's Zoning Ordinance and Land Development and Subdivision Regulations to lessen encroachment of development into the existing or projected floodplain; limit future development in the floodplain; reduce vulnerability of new construction to coastal flooding and storm surge due to rising sea levels; evaluate grading guidelines around buildings in the SFHA; and to rezone properties with conservation value (consistent with the Future Land Use Map in the Comprehensive Community Plan). Potential revisions include allowing flexible lot sizes, such as through a cluster subdivision design, establishing setbacks or buffers to account for SLR, and creating Coastal Risk Overlay Districts.	Cost	0	-1	-2	0	-2	0	0	-5	19
	Benefit	3	3	4	3	4	4	3	24	

Description of Action	Cost/ Benefit	Social	Technical	Administrative	Political	Legal	Environmental	Economic	Total	Prioritization
Review and adopt Barrington appropriate LID standards to reduce amount of impervious surfaces within new subdivisions and other private development projects. Although Barrington's high-water table may preclude some low-impact development (LID) measures, the Town will review and adopt pragmatic LID standards to lessen impervious coverage, such as reduced street widths and establishing a maximum impervious lot coverage percentage. This action will require revisions to the Town's Land Development & Subdivision Regulations.	Cost	0	-1	-2	0	-2	0	0	-5	18
	Benefit	3	4	4	3	3	4	2	23	
Increase DPW capacity to allow for more aggressive stormwater management for public facilities and roadways. Identify best management practices for stormwater management with emphasis on green infrastructure. Provide measures to improve stormwater retention in the planning and design of park improvements and construction of schools and other new public buildings. Retrofit existing public facilities, to reduce the amount of hardscape and improve stormwater measures, when parking lots or roadways need to be repaved or rebuilt (consider permeable materials where applicable). Strengthen maintenance on the storm drainage system town-wide; clean out waterways and drainage areas to help increase conveyance and minimize localized flooding from stormwater runoff. Seek to reduce stormwater runoff into wetlands and waterways via the use of low-impact nature-based stormwater infrastructure (ex. rain gardens, bioswales) across municipality.	Cost	0	0	-2	0	0	0	0	-2	21
	Benefit	3	4	4	3	2	4	3	23	
Continue to improve GIS capabilities. Improve Geographic Information Systems (GIS) capabilities to support property tax revaluations, planning, DPW activities (including infrastructure mapping and maintenance plans), and community use. Enhance the process to allow users to easily identify flood risk throughout Town. Purchase software and hardware to support programmatic improvements. The Town should hire a part-time GIS coordinator to facilitate this activity or adding funding to DPW/ Planning budget for GIS consultants.	Cost	0	0	-2	0	0	0	0	-2	19
	Benefit	3	4	4	2	2	4	2	21	
Coordinate with RIDOT/RIDSP on Route 114 Corridor Study. Route 114 is part of the hurricane evacuation route and used by roughly 25,000 vehicles per day. Sections of the corridor, which is under State jurisdiction, are vulnerable to flooding from sea-level rise and storm surge. In coordination with RIDOT/RIDSP to assess existing and future vulnerabilities and options to reduce risk including rerouting and raising, amongst others.	Cost	0	0	-1	0	0	0	0	-1	20
	Benefit	2	4	4	3	2	3	3	21	

Assess Hurricane Evacuation Route Vulnerabilities. Conduct an assessment to understand the impact on travel should sections of the hurricane evacuation route be inundated by flood water; identify potential alternate evacuation routes; identify opportunities to raise or protect roadways; and strengthen evacuation route awareness and way finding via more robust and prominent signage installation.	Cost	0	-1	-1	0	0	0	0	-2	24
	Benefit	4	4	4	4	4	2	4	26	

Goal 2: Preserve and enhance the capacity of the natural environment to improve Barrington's resilience against impacts of natural hazards.

Policy 2.1: Identify and protect critical open space areas that are vulnerable to natural hazards and sea level rise.

Policy 2.2 Plan and implement projects that allow natural systems to adapt over time to changes in sea level rise and the climate.

Description of Action	Cost/ Benefit	Social	Technical	Administrative	Political	Legal	Environmental	Economic	Total	Prioritization
Prioritize and complete adaptation projects. Prioritize and implement adaptation and shoreline stabilization projects. Work with STB, the State, and other stakeholders, to reduce flood risk and the potential damage to vulnerable infrastructure, and allow the expansion of wetlands and other areas that can hold more water. Prioritize nature-based solutions and implement slope stabilization efforts, such as planting brigades in spring, where appropriate.	Cost	0	-2	-1	0	0	0	0	-3	19
	Benefit	3	4	4	3	2	4	2	22	
Action 2.B— Increase DPW capacity to allow for more aggressive tree maintenance and management program. Improve program to further reduce risk to people or property due to winds, heavy snow/ice, extreme heat, or other natural hazard impacts. Identify native tree species that will be more resilient to climate change and have higher carbon sequestering rates, for use in public projects, and new subdivisions and land development projects. Elevate the importance of forests and trees; and increase community-based planting opportunities, including partnering with BLCT to implement tree planting projects on their properties. Complete a town-wide tree inventory, planting plan using native tree species, and updated debris management plan.	Cost	0	0	-2	0	0	0	0	-2	20
	Benefit	3	4	4	3	2	4	2	22	
Complete hydrology studies. Outfall Catchment Area Assessments: Delineate catchment areas for stormwater outfalls and provide a catchment area layer to the Town's geodatabase. For catchment areas with known flood issues, field inspect associated drainage system and streams, and complete a hydrology study to determine potential stormwater/water quality improvements. Prepare detailed plans as necessary to determine estimated costs; capitalize on funding opportunities available through the State or other sources.	Cost	0	-2	-1	0	0	0	0	-3	18
	Benefit	2	4	4	2	3	4	2	21	

<p>Watershed Assessments: Barrington's land falls within four sub-watersheds (Seekonk & Providence Rivers, Barrington & Warren Rivers, Palmer River, and Upper Narragansett Bay). As watersheds traverse jurisdictional boundaries, consider partnering with other municipalities and stakeholders to form watershed coalitions; seek funding opportunities to comprehensively assess watersheds and develop prioritized list of stormwater management and water quality projects.</p>																	
<p>Protect vulnerable areas from development through acquisition, easements, and other mechanisms.</p> <p>Work with the BLCT and other stakeholders to identify and protect from development low-lying land vulnerable to impacts from flooding and sea level rise, and areas adjacent to coastal wetlands, creeks, and streams susceptible to increased inundation due to flooding and SLR. This Action also will encourage beach ecosystem preservation and landward migration of other coastal habitats, such as estuarine beaches and dunes, as these features must be allowed to migrate in response to sea-level rise in order to continue to provide some level of natural storm protection. Take advantage of funding opportunities such as DEM open space acquisition grants, and other mechanisms, including conservation easements, to permanently protect these areas. In coordination with BLCT, develop a priority site list based on open space acquisition evaluation criteria in the Comprehensive Plan.</p>	<p>Cost</p> <table> <tr> <td>0</td><td>0</td><td>-2</td><td>0</td><td>-2</td><td>0</td><td>0</td><td>-4</td></tr> </table> <p>Benefit</p> <table> <tr> <td>2</td><td>4</td><td>4</td><td>3</td><td>3</td><td>4</td><td>3</td><td>23</td></tr> </table>	0	0	-2	0	-2	0	0	-4	2	4	4	3	3	4	3	23
0	0	-2	0	-2	0	0	-4										
2	4	4	3	3	4	3	23										
<p>Promote Water Conservation.</p> <p>Develop and implement programs to promote water conservation practices.</p>	<p>Cost</p> <table> <tr> <td>0</td><td>0</td><td>-1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>-1</td></tr> </table> <p>Benefit</p> <table> <tr> <td>2</td><td>4</td><td>4</td><td>2</td><td>2</td><td>4</td><td>2</td><td>20</td></tr> </table>	0	0	-1	0	0	0	0	-1	2	4	4	2	2	4	2	20
0	0	-1	0	0	0	0	-1										
2	4	4	2	2	4	2	20										

Goal 3: Protect public health, safety, and existing properties against impacts of flooding through implementation of Community Rating System (CRS) Activities, with emphasis on expanding flood insurance coverage and reducing NFIP flood insurance premiums for Barrington property owners.

Policy 3-1: Continue to comply with National Flood Insurance Program (NFIP) requirements.

Policy 3.2: Actively participate in the Community Rating System Program.

Policy 3.3: Maintain a FEMA-approved hazard mitigation plan that is based on the latest data and proposes mitigation strategies on natural hazards and climate change.

Description of Action	Cost/ Benefit	Social	Technical	Administrative	Political	Legal	Environmental	Economic	Total	Prioritization
Support Community Rating System activities. The Town has submitted an application to participate in the CRS program and awaiting FEMA to schedule a Community Assistance Visit. Complete CRS activities that will improve the Town's floodplain programs and correspondingly improve Barrington's CRS rating.	Cost	0	0	-1	0	0	0	0	-1	21
	Benefit	2	4	4	3	2	4	3	22	
Engage/provide training for Certified Floodplain Manager. Engage a consultant or provide staff training for a certified floodplain manager to coordinate implementation of CRS activities and implementation of the Town's HM&FMP.	Cost	0	0	-1	0	0	0	0	-1	20
	Benefit	2	3	4	3	3	4	2	21	

<p>Develop and enact tracking system to monitor HM&FMP implementation progress, with updates twice a year. Develop a tracking system in compliance with CRS Activity 510-Step 10, to monitor progress implementing this Plan's <i>Mitigation Strategy and Action Plan</i>. Semi-annual meetings will be held with updates provided by each department that include the status of action items completed/in-progress, potential CRS credit allocation, and any requirements for future prioritized actions (staffing, budget, etc.).</p>	Cost	0	0	-1	0	0	0	0	-1	22
	Benefit	4	4	4	3	2	4	2	23	
<p>Work with property owners to mitigate properties in areas at risk of flooding, including acquisition, flood-proofing, and elevation projects. The Town will provide the staffing resources needed to identify and apply for outside funding sources, such as the Hazard Mitigation Grant Program, to elevate or relocate structures out of the floodplain, and acquire property within the floodplain. Grant funding applications will be supported by the Town's 2021 URI-Cl exposure mapping, CRMC's CHA process, Army Corps RI Coastline Coastal Risk Management Project, and other stakeholder tools and research.</p> <p>The Town will consider putting in place mechanisms such as tax incentives to encourage property owners to adopt resilience measures (elevation, retreat landward, etc.). This effort also will include pursuing opportunities to acquire upland areas to relocate residences if the option of retreat is selected.</p>	Cost	0	-1	-2	0	-1	0	0	-4	20
	Benefit	4	4	4	3	3	3	3	24	

Goal 4: Through communication and educational outreach, improve the community's awareness and capacity to reduce or adapt to impacts from natural hazards.

Policy 4.1: Inform the public on the concept of community resilience and the risk of impacts from natural hazards, with an emphasis on stream and coastal flooding, storm surge, and winter storms.

Description of Action	Cost/ Benefit	Social	Technical	Administrative	Political	Legal	Environmental	Economic	Total	Prioritization
<p>Initiate High-Water Mark (HWM) and roadway signage programs to increase public awareness of flooding risk and potential future high tide levels from sea level rise. Develop and implement a program consistent with NFIP's HWM initiative to include posting informational signs and markers at public properties (ex. Town Beach, Walker Farm, Latham Park, Police Cove Park, and the Bay Spring Community Center) showing images of flood damage and high-water marks based on historic flood levels (hurricanes of 1938 and 1954, and possibly the 2010 flooding), and projected SLR elevations. Signage could include Coastal Cradle's to support photo documentation of shoreline change over time.</p>	Cost	0	-1	-1	0	-1	0	0	-3	18
	Benefit	3	4	4	3	2	3	2	21	

Description of Action	Cost/ Benefit	Social	Technical	Administrative	Political	Legal	Environmental	Economic	Total	Prioritization
Conduct community outreach to increase awareness and improve preparedness for impacts of natural hazards. Conduct community outreach, including public forums, publication/posting of information at Town facilities and the website, and mailings, on natural hazard mitigation initiatives, preparedness, and response. Engage stakeholders such as URI-Cl, STB, CRMC, NBEP, RI-EMA, RIDOH, RIDOT, etc. to participate in outreach activities. Target audiences include: general public; property owners in higher-risk hazard areas; seniors; middle & high school students; local businesses; and elected officials/decision-makers/Town boards.	Cost	0	0	-1	0	0	0	0	-1	26
	Benefit	4	4	4	4	3	4	4	27	
Continue to Integrate Resilience into Local Boards. Work with the local boards and commissions to encourage integrating resilience, to the extent practical, into their programs and activities.	Cost	0	0	-1	0	-1	0	0	-2	19
	Benefit	2	4	4	3	3	3	2	21	
Support Emergency Preparedness and Recovery for local social service sector businesses. Increase outreach to the local social service sector business community (including senior living facilities and group homes) to ensure continuity and recovery plans are in place; and they have emergency equipment, such as generators, if deemed critical for their continued operations.	Cost	0	0	-1	0	-1	0	0	-2	19
	Benefit	4	3	3	3	2	2	4	21	
Establish a process to support vulnerable populations before, during, and after a natural hazard event. Establish a mechanism such as an <i>Adopt a Neighbor Program</i> or similar, to assist those who may require additional support (due to location, age, infirmity, etc.) before, during, or after a natural hazard event.	Cost	0	0	-1	0	-1	0	0	-2	19
	Benefit	4	3	4	3	2	2	3	21	
Increase awareness of resilience and adaptation actions being implemented by the Town. Develop and implement programs to increase awareness of the Town's resilience and adaptation actions.	Cost	0	0	-1	0	0	0	0	-1	26
	Benefit	4	4	4	4	3	4	4	27	
Conduct annual emergency preparedness exercises. Building on the 2021 Operation Recover Barrington Workshop, the Town will conduct tabletop exercises or other emergency management exercises/drills on an annual basis.	Cost	0	-1	-1	0	0	0	0	-2	19
	Benefit	3	4	4	3	2	2	3	21	
Covid19 Response. Conduct a review of the regulatory and legal changes necessary to effectively respond to a pandemic; update Town Plans, Policies, and Procedures accordingly to lessen the impact of an infectious disease outbreak.	Cost	0	0	-1	0	-1	0	0	-2	23
	Benefit	4	4	4	4	4	1	4	25	

APPENDIX 7-1

Local Mitigation Plan Review Tool

Appendix 7-1

Local Mitigation Plan Review Tool

APPENDIX A: LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Processes; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: Town of Barrington Rhode Island	Title of Plan: Town of Barrington Rhode Island Hazard Mitigation & Flood Management Plan	Date of Plan: June 2022
Local Point of Contact: Teresa Crean	Address: Town Hall 283 County Road Barrington, RI 02806	
Title: Director of Planning, Building & Resiliency		
Agency: Town of Barrington, Rhode Island		
Phone Number: 401-247-1900 ext 347	E-Mail: tcrean@barrington.ri.gov	
State Reviewer:	Title:	Date:
FEMA Reviewer:	Title:	Date:
Date Received in FEMA Region (Insert #)		
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved		

SECTION 1: REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST	Location in Plan (section and/or page number)	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)	Met	Not Met
ELEMENT A. PLANNING PROCESS		
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Executive Summary (page Ex-1); Section 2 (pages 2-1 thru 2-4, and pages 2-6 thru 2-11)	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Section 2 (pages 2-4 and 2-6 thru 2-11); Appendix 2-3; Section 7 (page 7-2)	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Section 2 (pages 2-4 thru 2-10); Appendix 2-2; Section 7 (page 7-2)	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Section 2 (pages 2-11 & 2-12); Section 5 (pages 5-2 & 5-3, and pages 5-9 thru 5-17); Appendix 5-1; Section 6 (pages 6-8, and 6-10 thru 6-24); Appendix 6-1	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Section 7 (pages 7-4 thru 7-6)	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Section 7 (pages 7-3 thru 7-6)	
<u>ELEMENT A: REQUIRED REVISIONS</u>		

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)				
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))		Section 4 (pages 4-15 thru 4-71)		
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))		Section 4 (pages 4-12 & 4-13, and pages 4-15 thru 4-71)		
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))		Section 4 (pages 4-14 & 4-15, and pages 4-72 thru 4-116); Appendices 4-1, 4-2, 4-3, and 4-4		
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))		Section 4 (pages 4-78 thru 4-86)		
ELEMENT B: REQUIRED REVISIONS				
ELEMENT C. MITIGATION STRATEGY				
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))		Section 4 (pages 4-116 thru 4-121); Section 5 (pages 5-1 thru 5-8); Appendices 5-1, 5-2, and 5-3; Section 6 (pages 6-9 thru 6-24)		
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))		Section 4 (pages 4-78 thru 4-86)		
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))		Executive Summary (page Ex-5); Section 6 (pages 6-2 & 6-3)		
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))		Section 6 (pages 6-3 thru 6-6); Appendix 6-1		
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))		Section 6 (pages 6-3 thru 6-24); Appendix 6-2		
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))		Executive Summary (page Ex-7); Section 5 (pages 5-2 & 5-3); Appendix 5-1; Section 7 (page 7-3)		
ELEMENT C: REQUIRED REVISIONS				

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)				
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)				
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))		Section 4 (pages 4-116 thru 4-121)		
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))		Section 5 (pages 5-9 thru 5-17)		
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Section 5 (pages 5-9 thru 5-17); Section 6 (pages 6-1 thru 6-6); Appendix 6-1	Section 5 (pages 5-9 thru 5-17); Section 6 (pages 6-1 thru 6-6); Appendix 6-1		
ELEMENT D: REQUIRED REVISIONS				
ELEMENT E. PLAN ADOPTION				
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))		This will occur after FEMA conditional approval Executive Summary (page Ex-6); Section 7 (page 7-2); Appendix 7-2		
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))		Not applicable		
ELEMENT E: REQUIRED REVISIONS				
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)				
F1.				
F2.				
ELEMENT F: REQUIRED REVISIONS				

APPENDIX 7-2

Barrington Town Council Resolution

Appendix 7-2

Barrington Town Council Resolution

Town of Barrington Bristol County, Rhode Island

A RESOLUTION ADOPTING THE TOWN OF BARRINGTON 2022 HAZARD MITIGATION & FLOOD MANAGEMENT PLAN RESOLUTION NO. XXXX-XX

WHEREAS the Barrington Town Council recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS pro-active mitigation of known hazards before a disaster event can reduce or eliminate long-term risk to people and property; and

WHEREAS the Town of Barrington has prepared a multi-natural hazards mitigation plan in accordance with the Disaster Mitigation Act of 2000 (Public Law 106-390) requirements for pre- and post-disaster hazard mitigation programs; and

WHEREAS the 2022 HM&FMP identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Barrington from impacts of future hazards and disasters; and

WHEREAS adoption by the Town Council demonstrates their commitment to achieving the hazard mitigation and flood management goals outlined in the 2022 Hazard Mitigation & Flood Management Plan (HM&FMP).

NOW, THEREFORE, BE IT RESOLVED BY THE TOWN OF BARRINGTON RHODE ISLAND, THAT

The Town Council:

- 1) Adopts in its entirety, the Town of Barrington 2022 Hazard Mitigation & Flood Management Plan and resolves to support the execution of actions identified in the Plan.
- 2) Will use the HM&FMP to guide pre- and post-disaster mitigation of the hazards identified.
- 3) Will coordinate the strategies identified in the HM&FMP with other planning programs and mechanisms under its jurisdictional authority.
- 4) Will incorporate hazard mitigation planning as an integral component of government and partner operations.
- 5) Will at a minimum, provide an annual review of the Plan and update of the Plan every five years.

PASSED AND ADOPTED BY THE TOWN COUNCIL OF THE TOWN OF BARRINGTON ON THIS [insert date].

By: _____
Michael Carroll, Town Council President

ATTEST

By: _____
Meredith DeSisto, Town Clerk