2023 Hazard Mitigation Plan

University of Rhode Island

Kingston Campus and Narragansett Bay Campus

PREPARED FOR

University of Rhode Island
Kingston, RI 02881

PREPARED BY

1 Cedar Street
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Providence, RI 02903
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December 13, 2023

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THE
UNIVERSITY
OF RHODE ISLAND
OFFICE OF THE
PRESIDENT

THINK BIG WE DO℠

Green Hall, 35 Campus Avenue, Kingston, RI 02881 USA p: 401.874.2444 f: 401.874.7149 uri.edu/president

Marc B. Parlange, Ph.D., P.Eng.
President

FEMA Region I
99 High Street
6th Floor
Boston, MA 02110

November 21, 2023

To address the threat that natural hazards pose to people and property within the University of Rhode Island's campuses, the University has prepared a multi-hazard mitigation plan—"2023 Hazard Mitigation Plan, University of Rhode Island, Kingston Campus and Narragansett Bay Campus"—in accordance with federal laws, including the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended; the National Flood Insurance Act of 1968, as amended; and the National Dam Safety Program Act, as amended. This plan identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property at the University of Rhode Island's Kingston and Narragansett Bay Campuses from the impacts of future hazards and disasters.

I have approved adoption of the "2023 Hazard Mitigation Plan, University of Rhode Island, Kingston Campus and Narragansett Bay Campus." While content related to the University of Rhode Island may require revisions to meet the plan approval requirements, changes occurring after adoption will not require the University to re-adopt any further iterations of the plan. Subsequent plan updates following the approval period for this plan will require separate adoption resolutions.

Sincerely,

Marc Parlange

Marc Parlange

U.S. Department of Homeland Security
FEMA Region 1
220 Binney Street
Cambridge, MA 02142

FEMA

December 13, 2023

Marc R. Pappas, Director
Rhode Island Emergency Management Agency
645 New London Avenue
Cranston, Rhode Island 02920

Director Pappas:

The U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA) Region 1 Mitigation Division has approved the 2023 Hazard Mitigation Plan, University of Rhode Island, Kingston Campus and Narragansett Bay Campus effective **December 13, 2023** through **December 12, 2028** in accordance with the planning requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended; the National Flood Insurance Act of 1968, as amended; the National Dam Safety Program Act, as amended; and Title 44 Code of Federal Regulations (CFR) Part 201.

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

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

Thank you for your continued commitment and dedication to risk reduction demonstrated by preparing and adopting a strategy for reducing future disaster losses. Should you have any questions, please contact Alexis Meehan at (202) 394-6439 or Alexis.Meehan@fema.dhs.gov.

Sincerely,

Dean Savramis
Mitigation Division Director
DHS, FEMA Region 1

DS:am

cc: Rae-Anne Culp, State Hazard Mitigation Officer
Melinda Hopkins, Planning Branch Chief

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Executive Summary

This Hazard Mitigation Plan (HMP or the Plan) is a product of the University of Rhode Island (URI or the University) Hazard Mitigation Committee (HMC). It has been approved by the University President's Executive Council, the Rhode Island Emergency Management Agency (RIEMA), and the Federal Emergency Management Agency (FEMA) in accordance with the Disaster Mitigation Act of 2000. This Plan focuses on the natural hazards which affect the physical and human assets at both the Kingston Campus and the Narragansett Bay Campus. The W. Alton Jones Campus is mentioned as it relates to natural resources but the Feinstein Providence Campus (to be vacated in 2023) is largely covered by the planning efforts of the City of Providence.

Hazard mitigation is often defined as actions taken to reduce the effects of natural hazards on a place and its population. The University decided to develop this Plan because of increasing awareness that natural hazards, especially flood and wind, have the potential to affect people, physical assets, and operations within the URI community and additional campus holdings.

The risk assessment portion of the Plan confirms that the University has much to lose from these events. The identified vulnerabilities (in no particular order) include flood prone drainage systems, streets and infrastructure, bridges, wastewater systems, dams, critical municipal hazard response facilities, communication equipment, populations, businesses, schools, recreation facilities, and historic and natural resources.

To address these risks the 2023 HMP put forth a clear mission, a distinct set of goals and nine specific mitigation actions. The University's hazard mitigation mission is to protect public health and safety and limit loss of life, property, and natural resources/systems.

To implement the Plan, important goals must be met. The University's mitigation strategy was created to help protect its residents, staff, faculty, visitors, tenant businesses and property from the effects of various natural hazards.

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Introduction

Plan Purpose

The purpose of the University of Rhode Island (URI or the University) Hazard Mitigation Plan (HMP or the Plan) is to set forth guidelines of short-term and long-term actions, which will reduce the actual or potential loss of life or property from natural hazardous events such as hurricanes, Nor'easters, flooding, and high wind. This plan was constructed using input from a variety of University stakeholders involved in the planning process. This Plan serves as guidance to help the university reduce their losses and vulnerabilities relating to natural hazards.

Benefits of Hazard Mitigation

Hazard mitigation planning consists of a series of actions taken to identify specific areas that are vulnerable to natural and human-caused hazards within a community and seek to permanently reduce or eliminate the long-term risk to human life and property. It coordinates available resources and identifies community policies, actions, and tools for implementation that will reduce risk and the potential for future losses campus wide. The process of natural hazard mitigation planning sets clear goals, identifies appropriate actions, and produces an effective mitigation strategy that can be updated and revised to keep the plan current. In short, 'it's where we were, where we are and where we're going' in terms of hazard mitigation.

On October 30, 2000, the President of the United States signed into law the Disaster Mitigation Act of 2000, also known as DMA 2000. Among its other features, DMA 2000 established a requirement that to be considered and remain eligible for federal disaster assistance and mitigation grant funds, local and state governments must develop and adopt hazard mitigation plans. On February 16, 2002, the Federal Emergency Management Agency (FEMA) published an Interim Final Rule (IFR) that set forth guidance and regulations under which such plans are supposed to be developed. The IFR provides detailed descriptions of both the planning process that states and municipalities are required to observe and the contents of the plan that emerges.

The Building a Disaster Resistant University (DRU) guidance (FEMA 443, August 2003) closely follows the FEMA mitigation planning guidance for local communities and encourages coordinated efforts among university resources; community stakeholders; local, state, and federal government entities; nonprofit organizations; and private sector entities. **The DRU guidance is a planning initiative designed to develop campus hazard mitigation plans similar to city and county planning efforts, which promotes the need for campus disaster preparedness, mitigation, response, and recovery activities. This Plan responds to those requirements.**

The purpose of this Plan is to recommend actions and policies for the University to reduce loss or hardships resulting from natural hazards. These hardships include the loss of life, destruction of property, damage to critical infrastructure and critical facilities, interruption of learning and research activities, loss/interruption of jobs, loss/damage to businesses, and loss/damage to significant historical structures.

The University also recognizes the important benefits associated with hazard mitigation, its interaction with land use and infrastructure planning, and the need for a comprehensive planning approach, which accommodates these interdependencies.

This proactive planning approach would look for ways to combine policies, programs, and design solutions to bring about multiple objectives and seek to address and integrate social and environmental concerns.

A **natural hazard** is defined as an extreme natural event. **Natural disasters** occur when these extreme natural events come into contact with vulnerable people and property.

Natural hazard mitigation is any sustained action taken to permanently reduce or eliminate long-term risk to people and property from the effects of natural hazards.

Natural hazard mitigation planning is a process undertaken by a community to analyze the risk from natural disasters, coordinate available resources, and implement actions to minimize the damage to property, and injury or loss of life of its citizens before disaster occurs.

Another benefit of hazard mitigation allows for a careful selection of risk reduction actions through an enhanced collaborative network of institutional stakeholders whose interests might be affected by hazard losses. These stakeholders include, but are not limited to, university students, faculty, staff, researchers, alumni, affiliates, and community partners. Working side by side with this broad range of stakeholders can forge partnerships that pool skills, expertise, and experience to achieve a common goal. Proceeding in this manner will help the University ensure that the most appropriate and equitable mitigation projects are undertaken.

Lastly, the participation in a hazard mitigation planning process establishes funding priorities. The formal adoption and implementation of this Plan will qualify URI and its campus community to become more involved in several programs offered by FEMA including: the Building Resilient Infrastructure and Communities (BRIC) program[1]; the Flood Mitigation Assistance (FMA) Program; and the Hazard Mitigation Grant Program (HMGP). Money spent today on preventative measures can significantly reduce the cost of post-disaster cleanup tomorrow.

[1] The BRIC program has replaced the Pre-Disaster Mitigation (PDM).

Mitigation Planning Goals:

Goals are general guidelines that explain what URI wants to achieve. Goals are expressed as broad policy statements representing desired long-term results. URI's mitigation planning goals include:

- **Goal 1**: Improve capabilities, coordination, and opportunities to plan and implement hazard mitigation projects, programs, and activities to protect public health and safety.
- **Goal 2**: Maintain continuity of operations during and after natural hazard events, including transition to an on-line, electronic, or other type of virtual environment when facilities are inaccessible.
- **Goal 3**: Improve education and outreach efforts regarding potential impacts of hazards and the identification of specific measures that can be taken to reduce their impact.
- **Goal 4**: Pursue opportunities to protect new and existing campus facilities, assets, and infrastructure from identified hazards.

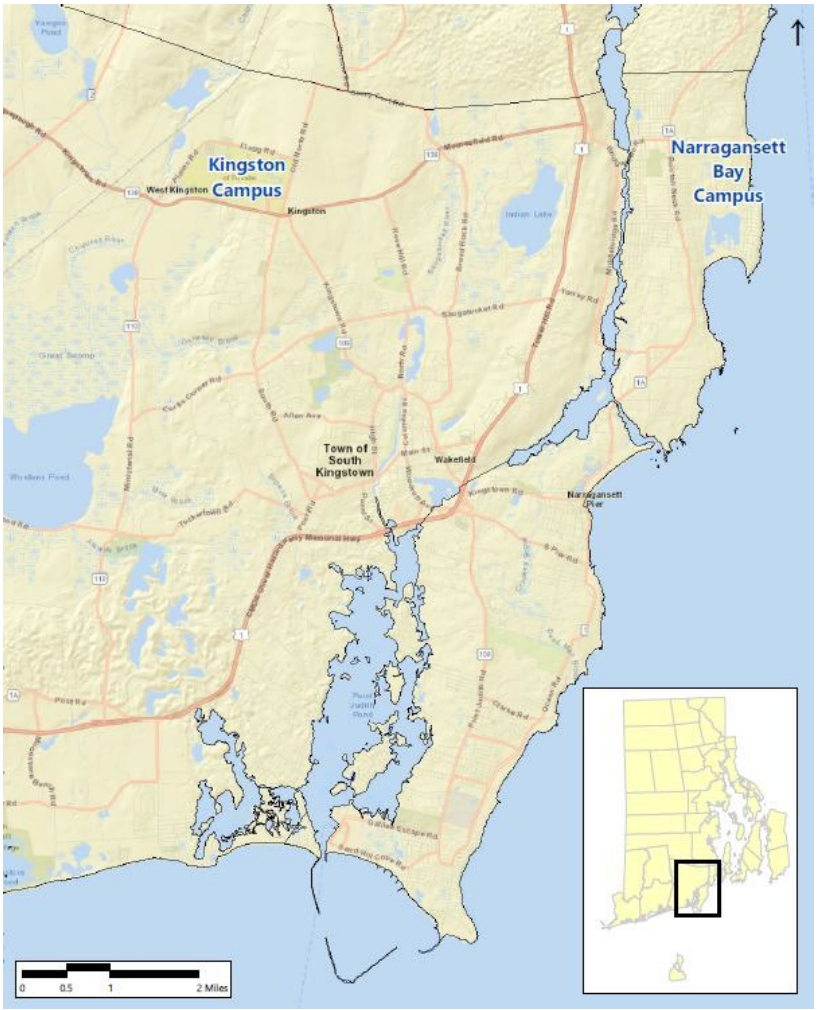
Background

The University of Rhode Island is a public, state-funded institution of higher education. URI is comprised of four distinct campuses throughout the state:

Kingston Campus: This 1,300-acre campus is located in the historic village of Kingston (Town of South Kingstown), 30 miles south of Providence. This campus is the primary campus of the University, and is home to the largest number of students, faculty, and staff.

Alan Shaw Feinstein College of Education and Professional Studies: Home to the School of Professional Studies and the Office of Strategic Initiatives, this campus is located in the heart of Providence. The campus serves non-traditional students and offers a variety of degree programs. Programs may move to Kingston campus in 2024.

Figure 1 Locus Map



Narragansett Bay Campus: Located on the West Passage of Narragansett Bay, this 230-acre campus is home to URI's Graduate School of Oceanography, and hosts the Ocean Engineering Department, and the College of Environment and Life Science. This campus also houses the University's Coastal Institute on Narragansett Bay.

W. Alton Jones Campus: Located on 2,300 acres in West Greenwich, Rhode Island, this campus is home to pristine forests, streams, ponds, and a 75-acre lake. The campus is currently closed to the public but has limited access for active university research. The campus had previously been home to the year-round National Center for Environmental Education along with facilities for conferences, retreats, field trips, and camps.

This Plan mainly focuses on the natural hazards which affect the physical and human assets at both the Kingston Campus and the Narragansett Bay Campus.

Kingston Campus

URI's main campus is the Kingston Campus, which includes 1,300 acres and approximately 205 buildings, housing the majority of its schools and colleges. The Kingston Campus is located 30 miles south of Providence, and is the most heavily populated campus, both in terms of people and in assets. The map in **Appendix C** illustrates the Kingston Campus and its assets.

The campus is located in the Village of Kingston, which is near the Town of South Kingston. Much of the Village is listed on the National Register of Historic Places, as the Kingston Village Historic District, designated in 1974. The Historic District is located just outside of the campus and contains 38 buildings that are examples of 18th and 19th century architecture. The Village of Kingston occupies slightly more than 1.5 mi^2 and is reported at an elevation of 246 feet above sea level. The core of the URI Kingston campus is designated as a Historic District and includes 29 acres of land around the center quadrangle.

The Kingston Campus comprises three areas: Kingston Main, East Farm, and Peckham Farm. Kingston Main Campus has 168 total building assets. East Farm has 27 total building assets. Peckham Farm has 10 total building assets. East Farm is located approximately .75 miles south of the Kingston Main Campus on Highway 108. Peckham Farm is located just south of Kingston Main campus across from the athletic complexes.

The climate in Kingston, like much of the state, can be described as humid, with cold winters and short summers. The average annual temperature is 50°F, with ranges averaging from 28°F in January to 73°F in July. Kingston does boast the record low temperature for the state, which was -23°, recorded in January 1942. Average annual precipitation is approximately 46", with snowfall averages of 37" per year.

The census block data that includes the Kingston Campus represents all of North Kingston town, in Washington County. As of the 2010 Census, this area had a population of 26,486. As expected in a college town, young adults represent the largest percentage of this population.

The University of Rhode Island is the largest employer in the Village of Kingston. Other notable employers in the area include the Arnold Lumber Company.

The university maintains a congenial relationship with the Town of South Kingstown. "The Town recognizes the historical, cultural, recreational and economic importance of the University of Rhode

Island to the community as a whole and is committed to working with the University in a proactive partnership that maintains and strengthens this relationship for the betterment of the Town and the University. The Town of South Kingstown and the University of Rhode Island will work collaboratively to address matters of mutual concern such as traffic flow, circulation, and housing. "[2]

Narragansett Bay Campus

Located on the West Passage of Narragansett Bay in the Town of Narragansett, this 230-acre campus is home to the University's Graduate School of Oceanography, and includes the Ocean Engineering Department, and the College for Environment and Life Science. The campus also houses the University's Coastal Institute on Narragansett Bay, which features an interactive coastal environment exhibit and a conference center.

The Narragansett climate is between humid continental and humid subtropical, which translates to warm summers, cold winters and almost year-round humidity. Typical of the state, January is the coldest month, and July the warmest. As is typical of the northeastern seaboard, Narragansett receives ample year-round precipitation, averaging 2.4 to 3.7 inches per month[3]. The campus is located directly on the Bay, making it more susceptible to coastal storms, such as Nor'easters and hurricanes.

There are no student housing facilities at the Narragansett Bay campus. This campus has 41 building assets that contain a mix of offices, research labs, classrooms, and meeting spaces. The campus also houses a research nuclear reactor not owned by URI.

Roughly half of the university students live off campus; many in the Town of Narragansett due to the availability of over 2,500 units of rental housing.[4]

History

Previously occupied by the Narragansett Nation, URI's Kingston Campus was chartered as the state's agricultural school in 1888. The Oliver Watson Farm was purchased as a site for the school, and the old farmhouse, now restored, still stands on the campus. The school became the Rhode Island College of Agriculture and Mechanic Arts in 1892, and the first class of 17 members was graduated two years later.

The Morrill Act of 1862 provided for the sale of public lands. Income from these sales was to be used to create at least one college in each state with the principal purpose of teaching agriculture and mechanic arts. From this grant of land comes the term "land grant," which applied to the national system of state colleges. In a later adaptation of the concept, federal funds given to colleges for marine research and extension are called "sea grants."

In 1909 the name of the college was changed to Rhode Island State College, and the program of study was revised and expanded. In 1951 the college became the University of Rhode Island by an act of the General Assembly. The Board of Governors for Higher Education appointed by the

[2] Town of South Kingstown Comprehensive Community Plan, 2021

[3] Weather Spark Narragansett Pier Climate, Weather By Month, Average Temperature (Rhode Island, United States) - Weather Spark

[4] Town of Narragansett Comprehensive Plan: Baseline Report, 2017

governor served as the governing body of the University from 1981 to 1999. In 2000, the Rhode Island General Assembly transferred governance of the University of Rhode Island to a newly appointed Board of Trustees.

Student Enrollment Data

The greatest concentration of residential housing units is located at the Kingston Campus. **Table 1** shows complete 2021 enrollment data for all four URI campuses (Kingston, Narragansett Bay, Feinstein Providence, and W. Alton Jones).

Table 1 Student Enrollment 2022-2023 Academic Year[5]

Category	Enrollment
Undergraduate Students	13,713
Graduate Students	1,386
PhD Students	671
Professional Doctorate (Pharmacy Doctorate)	742
Certificates	168
Non-Degree (high school students)	1,103
TOTAL ENROLLMENT	17,628

For the estimated 108,00 students, there are approximately 906 faculty and 3,800 staff employed by the University.

Government

The University of Rhode Island is a public, state-funded institution of higher education. The university's regulations and rules govern URI and its students, faculty and staff. The Vice President of Administration and Finance will present the final HMP to the President and Senior Leadership Council for approval and adoption.

Relevant Boards and Commissions

University of Rhode Island Board of Trustees. Composed of 17 members initially appointed by the governor, the board is a public corporation that appoints and reviews the president. The board is also responsible for establishing performance goals for the president and the University. Further, the board is responsible for the buildings, employees, and property of the University. The board also approves the budget, the awarding of degrees, and the awarding of tenure to faculty.

Campus Emergency Management Advisory Council (CEMAC)

The Campus Emergency Management Advisory Council, or CEMAC, is a stakeholder group that meets monthly to provide input on plans, procedures, and general development of the University's

[5] As per communication via email dated 1/5/2023 with the Associate Vice President for Enrollment and Student Success.

emergency management program. The CEMAC provides a forum for coordination and information-sharing across all units of the University and includes representatives from all key offices and departments. The following groups are represented: Communications, Facilities, Student Life, Housing and Residential Life, Dining, Greek Life, Public Safety, Academic Affairs, Research Integrity, Health Services, Athletics, Legal Counsel, Risk Management, Purchasing, Human Resources, Faculty Senate, Student Senate, and International Studies.

Land Use Patterns

Kingston Campus

The previous Kingston Campus Master Plan identifies five broad land use zones based largely on topography: academic, administrative/student service, athletic, residential, and service/physical plant. "The academic zone wraps around the northern, eastern, and southern sides of the main quadrangle, and extends south along Lower College Road to Route 138. The administrative/student services zone is concentrated on the west side of the main quadrangle, encompassing the Memorial Union, Roosevelt Hall, Carlotti Hall, Davis Hall, and most of the smaller buildings in that area.

The athletic zone includes almost the entire area west of the creek, from the tennis courts along Route 138 to the Ryan Center (Convocation Center). The residential zone encompasses most of the hillside, extending from the University/Graduate Village and Fraternity Circle on the south to Flagg Road on the north. The service/physical plant zone is a fairly concentrated area at the northwest corner of campus, near Plains Road and Flagg Road."[6]

The main Kingston Campus is bounded on all sides by the Town of South Kingstown. South and east of the campus lies historic Kingston Village, small scale commercial services and residential neighborhoods; north of the traditional campus are University holdings, environmentally sensitive settings and less dense residential areas; west of the campus are open spaces and agricultural areas and the Village of West Kingston, which, given the presence of major state roadways and Kingston Station, may provide an opportunity to enhance the west approach to campus as a more significant gateway to the University.[7]

In the center of the Kingston Campus is the historic Quadrangle which defines the essential image of the University of Rhode Island. The nationally registered district contains a tree-lined area of approximately 29 acres and numerous buildings that date back to the late 19th and early 20th centuries.

The Town of South Kingstown and the University function as partners in planning for future development and studying topics which affect the residents of the shared community.

[6] University of Rhode Island Kingston Campus Master Plan, January 26, 2000. https://web.uri.edu/planning/files/2000-KingstonCampusMP-HI2-blank-pages-removed-8-19-13-reduced-size-for-web.pdf

[7] Town of South Kingstown Comprehensive Community Plan 2019, University of Rhode Island https://www.southkingstownri.com/DocumentCenter/View/5300/13-SK-URI-Links

Narragansett Bay Campus

"The URI Narragansett Bay Campus is located at the eastern end of South Ferry Road in Narragansett, Rhode Island along the west coast of Narragansett Bay. The URI Narragansett Bay Campus is located adjacent to tidal waters. The Campus is bounded by undeveloped woodland on the south and west, Narragansett Bay on the east, a United States Environmental Protection Agency (EPA) facility to the north and residential properties on the south.

The developed portion of the Narragansett Bay Campus is located on the eastern portion of the State properties abutting South Ferry Road. Four large surface parking areas are located in the areas adjacent to South Ferry Road with several smaller lots located adjacent to individual buildings."[8]

Roads and Bridges

Kingston Campus

The developed area of the Kingston Campus is bound by Plains Road to the west, Flagg Road to the north, Old North Road to the east, and Route 138 to the south. The campus is also bisected by numerous east-west and north-south smaller roads and walking paths.

The University and the Town of South Kingstown are responsible for maintaining the roads on campus.

Narragansett Bay Campus

South Ferry Road is an urban collector public right-of-way for the Town of Narragansett that connects Route 1A (Boston Neck Road) to the Bay Campus. South Ferry Road bisects the Narragansett Bay Campus into a northern and a southern section with the majority of the Campus located to the south of South Ferry Road.

Pier Road provides connectivity to the southern section of the campus from South Ferry Road and wraps around to Aquarium Road and the Pier. Aquarium Road provides a second access point between the campus and South Ferry Road. Pier Road and Aquarium Road only provide access to Narragansett Bay Campus buildings.

[8] University of Rhode Island Narragansett Bay Campus Master Plan, 2016

Dams

The Old Mill #3 dam at the W. Alton Jones Campus in West Greenwich is a low hazard dam. There are no other dams on URI properties, but the University would be concerned about a large dam failure further up the line such as the Scituate Reservoir.

High Hazard Dam – where failure or misoperation will result in probable loss of human life

Significant Hazard Dam – where failure or misoperation will result in no probable loss of human life but can cause major economic loss, disruption of lifeline facilities or impact other concerns detrimental to the public's health, safety or welfare.

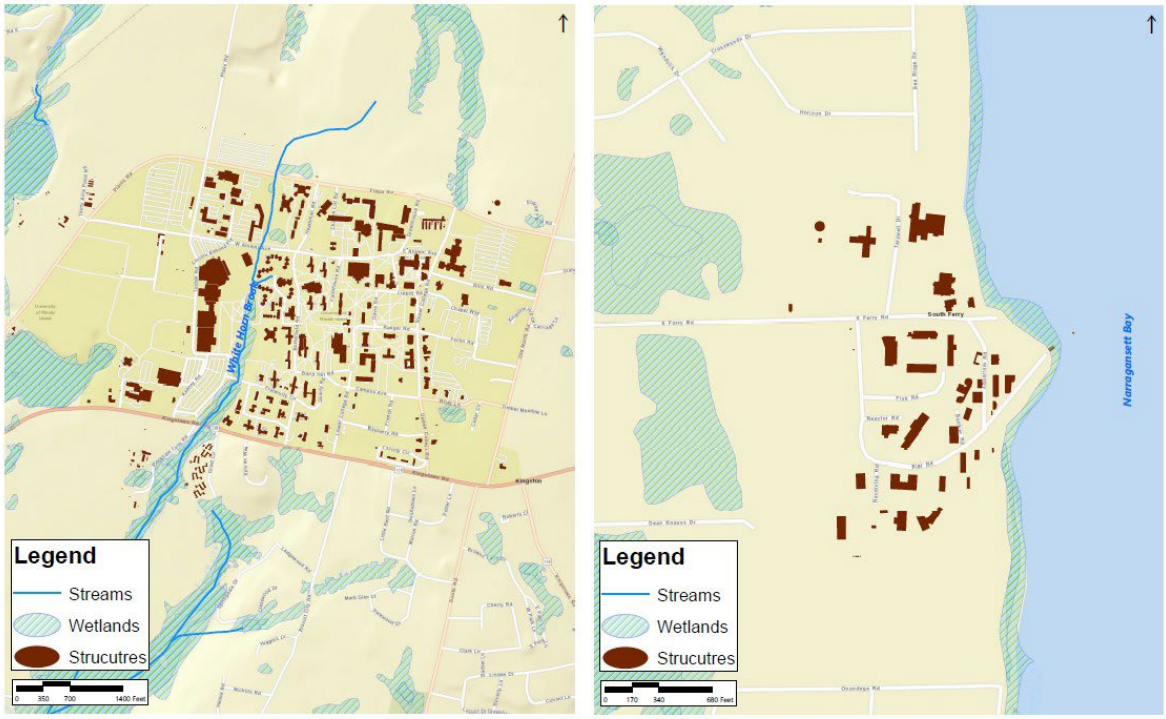
Low Hazard Dam – where failure or misoperation will result in no probable loss of human life and low economic losses.

Utilities

The following utility infrastructure are located at the Kingston and Narragansett Bay (Bay) campuses:

- Overhead electrical distribution lines and equipment at both the Kingston and Bay campuses. RI Energy owns the infrastructure at the Bay campus.
- Campus distribution systems (steam, natural gas, and electric)
- Five electric substations
- Three wells that pump water from the local Chipuxet Aquifer
- Water storage tank
- Water distribution pipe and equipment
- A dual fuel steam plant (natural gas/# fuel oil) and associated distribution system and mechanical rooms on Kingston Campus.
- Wastewater system (co-owned by URI, the Town of Narragansett, and the Town of South Kingstown).

Strong winds, ice, or extreme heat can all cause disruptions to these utilities. The HMP Committee did not identify any infrastructure that was more at risk to damage than another though power outages happen annually and significantly impact on campus operations. The University helps to reduce loss of power by maintaining generators, keeping trees trimmed around campus, and building redundancy into the campus electrical grid.



Water Resources

Kingston Campus

Most of the Kingston Campus is within the Chipuxet River-Pawcatuck River watershed. This watershed is partially drained by the White Horn Brook which runs through the campus. Although White Horn Brook mostly passes through non-developed areas, it does pass through commercial and residential areas in addition to the University. Elevated bacteria levels of enterococci have been noted at White Horn Brook. There are several potential sources of bacteria in the White Horn Brook watershed including stormwater runoff from developed areas, illicit discharges from leaking sewer pipes, malfunctioning onsite wastewater treatment systems, agricultural activities, and waterfowl, wildlife, and domestic animal waste.[9]

The drinking water system on the Kingston Campus is managed by the University under guidance from the Rhode Island Water Resources Board and the Rhode Island Department of Health. During a water emergency, the University has a backup connection to the Kingston Water District.

Narragansett Bay Campus

The Narragansett Bay Campus is adjacent to tidal waters of Narragansett Bay. These waters hold high scenic value and support low-intensity recreational and residential uses. These waters include seasonal mooring areas where good water quality, fish, and wildlife habitat are maintained.[10]

[9] Rhode Island Statewide TMDL for Bacteria Impaired Waters, White Horn Brook Watershed Summary, 2011.

[10] University of Rhode Island Narragansett Bay Campus Master Plan, 2016

The drinking water system on the Narragansett Bay Campus is serviced by SUEZ Water RI (a private company located in Wakefield, RI). The campus pressurizes and distributes the water. There is a closed back-up system that is tied to the Town of North Kingstown. URI has hired a consultant to assess the feasibility to stop using the domestic/fire pump system. The campus maintains 12-day supply of water. If the water is unable to be delivered via the existing system, a pool truck would have to deliver water to the Narragansett Bay Campus if it were to remain open.

Figure 2 Water Resources

Open Space

The developed and preserved open spaces on both URI campuses support their rural character and sense of place. The Kingston Campus has a large number of diverse open spaces including the Quadrangle, pedestrian linear spaces, open spaces surrounding residence halls, recreation fields, and scattering of upland forests, floodplain forests, wet meadows, and wetlands.

The open space uses at the Narragansett Bay Campus are less defined. Other than the Knauss Quad, the majority of open space is either undifferentiated or left-over from building development. The developed portion of the Narragansett Bay Campus encompasses about 25 acres of maintained open space and 20 acres of wooded areas.[11] One of the most prominent areas on campus is the beach at the end of South Ferry Road.

Cultural and Historic Resources

The historic core of the Kingston Campus, listed on the National Register of Historic Places, boasts many buildings from the late 19th century and the early 20th century. The Oliver Watson Farmhouse, built around 1796, is the oldest structure on the Kingston Campus. The structure, along with the 140-acre Watson Farm were purchased by the State of Rhode Island in 1888 to establish an agriculture school in Kingston.

Other recognized historic resources on both campuses include:

- Henry Eldred Farm
- Fayerweather Blacksmith Site (Moorsefield Rd.)
- Lambda Chi Site (Kingstown Rd.)
- URI Quadrangle
- Oliver Watson Farmhouse (c. 1796)
- Taft Hall (1889)
- College Hall/ Davis Hall (1890/1895)
- "Old Ben Butler" Civil War Cannon (186, brought to campus in 1892)
- Lippitt Hall (1897)
- East Hall (1909)
- Ranger Hall (1914)
- Washburn Hall (1921)
- Bliss Hall (1928)
- Edwards Hall (1928)
- Rodman Hall (1928)
- World War 1 Memorial Gateway (1922 and 1928)

[11] University of Rhode Island Narragansett Bay Campus Master Plan, 2016 (updated plan underway)

- President's House (1931)
- Green Hall (1937)
- Quinn Hall (1937)
- Eleanor Roosevelt Hall (1937)
- Robert L. Carothers Library and Learning Commons (1964, 1975, 1992, 1993)
- Five Bunkers at GSO, formerly Fort Kearney (WWII)

Recent Development Trends

Development pressures in the South County region have been increasing. The University recognizes the importance of balancing the uses the land currently serves for athletic fields and research programs against opportunities that may arise in the private sector to create partnerships for research and development focusing on biotechnology or agribusiness.[12]

[12] University of Rhode Island Kingston Campus Master Plan, January 26, 2000 (updated plan underway)

2

Planning Process

Overview

The University of Rhode Island initiated the hazard mitigation planning effort in 2022 at the recommendation of the University's Office of Emergency Management. A draft HMP had begun in 2012 but was never completed. In 2019, the University drafted but did not complete a Hazard Identification, Risk Assessment (HIRA). This 2023 Hazard Mitigation Plan is the result of a dedicated group of individuals working for nine months identifying natural hazards and proposing ways to improve the University's resiliency.

URI Hazard Mitigation Committee

The URI Hazard Mitigation Committee was comprised of university faculty and staff. A representative from the South Kingstown Department of Public Works was invited to participate but did not respond to the invitation. The Rhode Island Emergency Management Agency (RIEMA) was also invited to join but had schedule conflicts. However, RIEMA has been helpful and provided guidance throughout the process. Although the student body was invited to provide feedback twice during the planning process and was represented by the various departments, there were no students on the Hazard Mitigation Committee. See Chapter 7 for recommendations on enhancing the breadth of HMC.

This HMP is a product of the URI Hazard Mitigation Committee (HMC). The 2022/2023 Committee members include:

- Sam Adams: Director, Emergency Management; Department of Public Safety
- Ryan Carrillo: Director, Planning and Real Estate Development
- Captain Michael Chalek: Administrative and Satellite Campuses Commander, University Police; Department of Public Safety
- Pam Hallagan: Risk Manager, Risk Management Office; Risk Control and Insurance
- Karlis Kaugar: Chief Information Officer; Information Technology

- Dave Lamb: Director of Facilities Operations
- Dave Lavalee: Assistant Director, External Relations and Communications
- Frankie Minor: Assistant Vice President for Student Affairs, Director of Housing and Residential Life
- Brittany Pierce: Campus Preparedness Planner, Emergency Management; Department of Public Safety
- David Palazzetti: Director, Narragansett Bay Campus Facilities and Operations; Graduate School of Oceanography
- Seth Pilotte, Manager, Construction Projects II, Narragansett Bay Campus Facilities and Operations; Graduate School of Oceanography
- Pam Rubinoff, Associate Coastal Manager, Coastal Resilience, Extension specialist, RI Sea Grant; Coastal Resources Center of the Graduate School of Oceanography
- Jeff Ulricksen, Assistant Director, Spatial Services; Planning and Real Estate Development

The Planning Process

This 2023 HMP is the result of a 7-step process that was initiated in January 2022 with the establishment of the HMC, considered to be the first step. Membership of the HMC consisted of university faculty and staff positions, by invitation from the Emergency Management Department. The university hired a consultant to assist with this planning effort.

Step two started the plan development process and included the first meeting of the HMC on January 20, 2022. The HMC met virtually over Zoom.

The University's previous draft plan was dated 2012, so the first meeting focused on re-ranking hazards and discussing the process for the plan. At this initial meeting, the group reviewed a set of questions to be included in an online public survey. The purpose of the survey was to capture the local faculty, staff, and students' perception of natural hazards.

The link to the survey was widely distributed on social media and on the University's website. Over 400 people responded to the survey. See **Appendix A** for survey results.

Step three began with the HMC meeting on February 17, 2022. After reviewing the hazards of concerns, the HMC began building a matrix which identified URI's critical infrastructure and community assets. Fifteen areas of vulnerability were identified: flood prone drainage systems/streets, or infrastructure; wastewater; water supply systems; electric utilities; steam utilities; other utilities; communication equipment; critical municipal hazard response facilities; transportation; populations; residential housing; dams; recreation facilities; natural resources; and historic resources.

During this early phase, the University's consultant (VHB) reviewed the previous campus master plans (new ones are under development), previously drafted vulnerability assessments; and gathered information on current departments and University operations.

Current University capabilities were discussed at the meeting on March 24, 2022. Many different departments, committees, and programs already engage in activities that help the university be more resilient to a variety of hazards. It is important to highlight these capabilities and show how they support the University's hazard mitigation efforts.

Step four was creating a list of mitigation actions to reduce the hazard impacts to the identified vulnerable areas. At the April 24, 2022 meeting, the HMC reviewed goals and mitigation items that were proposed in the draft 2012 plan. These 2012 actions were not formally adopted; this review was a discussion about if they were applicable rather than reporting on their status. A few of the previously drafted actions were rolled into the list of actions for this 2022 plan update. The HMC also began to brainstorm new mitigation actions at this meeting.

Step five was conducted during the May 26, 2022, meeting where the group continued proposing new actions, establishing action timelines, costs, and identifying responsible parties.

Step six focused on the prioritization of the mitigation actions. This occurred during the latter part of the June 10 meeting. After this meeting the consultant finished the draft of the Plan for committee review.

Step seven furthered the public input and review process, in late March 2023. The Plan was posted on the University's website, and *Rhody Today* (virtual newspaper) for public review. The Hazard Mitigation Plan was also emailed to Town Planners in Narraganset and South Kingstown for their review and comments. No comments were received.

Table 2 below provides a summary of the Committee's meeting dates and the activities that they conducted:

Table 2 Hazard Mitigation Committee (HMC) Meetings

Date	Meeting Summary
01/20/2022	› Kick off meeting with new contractor, VHB. HMC discussed the plan purpose and hazards of concern. Reviewed survey questions.
03/29/2022	› Natural Hazards survey posted online.
02/17/2022	› The HMC reviewed the hazards of concern and listed critical infrastructure and community assets.
03/24/2022	› Review of community assets and discussion of current capabilities.
04/21/2022 05/26/2022	› Review previously drafted mitigation actions. › Drafted mitigation actions.
06/10/2022	› Prioritization of mitigation actions.
08/15/2022	› Sent to EMA Director for review and additional information.
08/30/2022	› Distributed to HMC for review and edit.

03/24/2023	› Posted for public comment and distributed to neighboring communities.
06/16/2023	› Approved by the University President and Leadership Council
07/12/2023	› Delivered to Rhode Island Emergency Management Agency for Review.
10/31/2023	› Delivered to FEMA for Approval.
11/21/2023	› Approved by the University President and Leadership Council.
12/13/2023	› Approved by FEMA.

Public Input

This Plan incorporates distinct types of public input strategies used by the HMC during the drafting process and prior to its adoption by the University. Public input for the updated URI HMP was collected primarily through a public survey and an invitation to comment.

Early in the planning process, the HMC promoted and distributed a "Hazard Perceptions" survey online. The purpose of the anonymous survey was to hear from students, staff, and faculty about the hazards and neighborhoods they are most concerned about. Over 400 individuals participated in the survey. Most participants were concerned about winter storms, hurricanes, and high winds. The survey also provided the HMC with a list of problematic areas that are susceptible to flooding. The HMC used the input from the survey to focus their mitigation planning efforts.

The 2022/2023 HMC included URI staff and faculty from both the Kingston Campus and the Bay Campus. The HMC's roles focused on reviewing the content of the risk assessment matrix to ensure proper classification of problems and estimates of potential impacts; formulation of mitigation actions and sequencing of primary tasks; and identification of feasible implementation methods and schedules. Their comments were incorporated into the final 2023 Hazard Mitigation Plan.

Prior to public release of the 2023 HMP, the HMC drafted the Plan through a series of committee meetings. Unlike a jurisdictional plan which serves the public, the University's responsibilities extend to their students, staff, and faculty. Public and private entities not associated with the university are directed to review the latest South Kingstown Hazard Mitigation Plan and the Narragansett Hazard Mitigation Plan, both of which are up to date.

During the draft review portion of the Plan development, an electronic copy of the draft 2023 HMP was posted to the University's website. The URI community was informed of both the webpage posting and the public hearing. See **Appendix B**. They were encouraged to review the document, comment on the HMP and attend the virtual meeting. During the public review period, no comments were received. On June 16, 2023, the University President's Executive Council approved the Plan to be sent to the state for review.

Review and comments from FEMA and the RIEMA were also incorporated prior to adoption by the University.

Members of the HMC are involved in emergency management planning and campus-specific Master plan updates. Future updates will include elements of this hazard mitigation plan.

3

Natural Hazards

Hazards of Concern

The Rhode Island 2018 State of Rhode Island State Hazard Mitigation Plan Update Draft, 2019 Hazard Mitigation Plan Update Town of South Kingstown, and 2019 Strategy for Reducing Risks from Natural Hazards in Narragansett were used as a starting point for identifying hazards that pose the largest threat to the University. **Table 3** summarizes the hazards identified by the URI Hazard Mitigation Committee (HMC). These hazards generally align with FEMA's National Risk Index and do not include infectious disease, human caused hazards, or technological hazards.

Table 3 Hazards Identified by the URI Hazard Mitigation Committee

Natural Hazards Identified by the State	Identified by the Hazard Mitigation Committee	Notes
Severe Winter Weather		
Ice Storm	✓	
Snow	✓	
Flood		
Riverine (streams and rivers)	✓	White Horn Brook on Kingston Campus
Coastal	✓	Narragansett Bay Campus location only
Flash	✓	
Urban/Street	✓	
High Wind	✓	
Extreme Heat	✓	
Hurricane and Tropical Storms		
Nor'easter	✓	
Storm Surge	✓	Narragansett Bay Campus location only
Extreme Cold	✓	

Table 3 Hazards Identified by the URI Hazard Mitigation Committee

Natural Hazards Identified by the State	Identified by the Hazard Mitigation Committee	Notes
Thunderstorm	✓	
Hail	✓	
Lightning	✓	
Dam Failure	✓	
Fire		
Urban	–	Not covered by this natural hazard plan. Neither campus is located in an urban setting.
Wildfire/Brushfire	✓	
Sea Level Rise	✓	Narragansett Bay Campus location only
Infectious Disease	–	Not covered by this natural hazard plan. While still a threat to the URI community, disease is generally considered a biological event, not meteorological, environmental, or geological.
Drought	✓	
Earthquake	✓	
Tornado	✓	
Human-Caused Hazards		
Cyber Security	–	Not covered by this natural hazard plan.
Chemical Incident	–	Not covered by this natural hazard plan.
Terrorism	–	Not covered by this natural hazard plan.
Biological Incident	–	Not covered by this natural hazard plan.
Radiological Incident	–	Not covered by this natural hazard plan.
Civil Unrest	–	Not covered by this natural hazard plan.
Technological Hazards		
Infrastructure Failure	–	Not covered by this natural hazard plan.

Table 4 Recent Natural Disasters Declarations in Rhode Island

Date	ID	Description
January 2022	DR-4653-RI	Severe Winter Storm and Snowstorm
August 2021	3563-EM-RI	Hurricane Henri
January 2015	DR-4212	Severe Winter Storm and Snowstorm
February 2013	DR-4107	Severe Winter Storm and Snowstorm
October 2012	DR-4089	Hurricane Sandy

During the beginning phases of the planning process, the HMC participated in an exercise that captured the frequency of various hazards, the potential extent of damage, and their impacts (i.e., to populations, infrastructure, natural environment, etc.) The following scales were used during the analysis:

Probability of Future Occurrence	
Highly likely:	Near 100% probability within the next year
Likely:	Between 10% and 100% probability within the next year or at least one chance in next 10 years
Possible:	Between 1% and 10% probability within the next year or at least one chance in next 100 years
Unlikely:	Less than 1% probability in next 100 years
Damage Extent	
Low:	Some local property damage, not campus-wide, minor injuries/loss of life
Medium:	50% of property could be damaged and possible injuries/loss of life
High:	Major town-wide property damage, injuries and loss of life.
Level of Concern/Risk Rank	
Developed by the HMC to rank the various hazards based on frequency and damage potential.	
Low:	Not expected to occur with any frequency, damages will be limited
Medium:	Will occur within the next 10 years but the University has resources to reduce risks
High:	Expected to occur within the next 5 years and is a major concern for the University. University- wide impacts.

Based on a combination of probability of future occurrence, damage extent and impacts, the team assigned each hazard a Level of Concern/Risk Rank. **Table 5** summarizes the hazards of concern for the University, ranked from a high concern to low concern.

Table 5 Hazards Ranked

Hazard	Level of Concern/Risk Rank
Nor'easters	High
Hurricanes	High
Winter Storms and Ice	High
High Wind	High
Extreme Cold	High
Extreme Heat/Heat Wave	High
Flooding (Coastal/Storm Surge)	Medium-High (Bay campus)
Flooding (Street and Riverine)	Medium
Flooding (Heavy Rain/Runoff/Flash)	Medium
Lightning	Medium-Low
Hail	Low
Drought	Low
Earthquakes	Low
Tornadoes	Low
Brushfires	Low
Dam Failures	Low
Coastal Erosion	Low (Bay campus)
Tsunamis	Low
Landslides	Unlikely

In this Plan, climate change is treated as an ongoing amplifier to the identified natural hazards, not profiled as an independent hazard. "Extreme weather events have become more frequent during the past half-century, and this trend is projected to continue.[13] For instance, more frequent intense precipitation events may translate into more frequent flooding episodes. The National Climate Assessment and Development Committee has documented that the average temperature across the United States has increased 1.5°F since 1895, with the majority of the increase since 1980. Weather events have and will continue to become more intense and frequent and will result in health and livelihood related impacts such as water supply, agriculture, transportation, and energy. The impact of dynamic storm events includes, but is not limited to, more frequent and intense heat waves, increases in ocean and freshwater temperatures, frost-free-days, heavy downpours, floods, sea level rising, droughts, and wildfires."[14]

13 IPCC, 2012 - Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (Eds.) Available from Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 8RU ENGLAND, 582 pp.

14 National Climate Assessment and Development Advisory Committee (NCADAC) January 2013 Draft Climate Assessment Report. http://ncadac.globalchange.gov/

Potential climate change impacts will be mentioned for each hazard.

The following subsections are organized by the level of risk as identified in **Table 5** Hazards Ranked. Where applicable, the discussion of hazard history is expanded to include references to the Town of South Kingstown (URI Kingston Campus) and the Town of Narraganset (URI Narragansett Bay Campus) or the larger Washington County.

Nor'easters

Description

A strong low-pressure system along the Mid-Atlantic and New England can form over land or over coastal waters. The storm radius is often as large as 1,000 miles, and the horizontal storm speed is about 25 miles per hour, traveling up the eastern United States coast. Sustained wind speeds of 10-40 miles per hour (mph) are common during a Nor'easter, with short term wind speeds gusting up to 70 mph. Typically a winter weather event, Nor'easters are known to produce heavy snow, rain and heavy waves along the coast. Unlike hurricanes and tropical storms, Nor'easters can sit offshore, wreaking damage for days.

Also called East Coast Winter Storms, Nor'easters are characterized by:

- A closed circulation.
- Located within the quadrilateral bounded at 45N by 65W and 70W, and at 30N by 85W and 75W.
- Show a general movement from the south-southwest to the north-northeast.
- Counterclockwise rotation causes winds to blow in from the northeast.
- Contain winds greater than 23 mph.
- The above conditions must persist for at least a 12-hour period[15].

The magnitude or severity of a severe winter storm or Nor'easter depends on several factors including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, and time of occurrence during the day (e.g., weekday versus weekend), and season.

The extent of a severe winter storm (including Nor'easters that produce snow) can be classified by meteorological measurements and by evaluating its combined impacts. For measuring wind effects, the Beaufort Wind Scale is a system that relates wind speed to observed conditions at sea or on land (See **Table8**). The snow impact of a Nor'easter can be measured using National Oceanic and Atmospheric Administration's (NOAA's) Regional Snowfall Index (See the section *Winter Storms*).

Location

The University's close proximity to the Atlantic Ocean renders it particularly susceptible to Nor'easters and the resulting damages and loss of human life and property.

15 Hersher, et al. An East Coast Winter Storm Climatology. Northeast Regional Climate Center, Cornell University, Ithaca, NY, 2001.

Probability of Future Occurrence

Highly Likely.

Extent (Event Magnitude)

On average, the University experiences or is threatened by a Nor'easter every one to two years. In 2018, the University and the rest of Rhode Island experienced a rare outbreak of three Nor'easters within a matter of weeks. The two in early March produced rain, the later one produced snow in parts of Rhode Island.

Impact and Damage Extent

Medium-High. Most local damage experienced from Nor'easters is related to utilities, roads, stormwater infrastructure, buildings, trees, and snow loads on roofs. Expected damages are similar to those from a hurricane, including erosion of the coastal shoreline. The Blizzard of 1978 was the largest Nor'easter on record. Many people in Rhode Island were without heat and electricity for over a week.

Climate Change Impacts

Like hurricanes, changes in air and water temperatures may lead to stronger Nor'easters along the Atlantic Ocean. The University should expect stronger and more frequent severe storms. Higher sea levels will also result in higher storm surges over time.

History

Table 6 summarizes some of the Nor'easters that have impacted Washington County where both the Kingston and Bay campuses are located.

Table 6 Nor'easter History[16]

Date	Comments
02/10/1969	Up to 20 inches of snow in parts of Rhode Island.
02/07/1978	27 inches of snow in Providence. State of emergency declared in Rhode Island and in nearby Connecticut.
02/24/1998	The second powerful Nor'easter to affect the region in less than a week brought heavy rainfall and strong northeast winds to much of Rhode Island. An extremely intense low-pressure system moving to the northeast and passing just to the southeast of Nantucket had a central barometric pressure just under 29 inches of mercury. Rainfall totals for this storm exceeded 2 inches over the eastern and northern part of the state. Strong northeast winds gusted to 40 to 56 mph across the state. Nearby Charlestown experienced wind gusts of 52 mph.
03/21/1998	A strong very early spring Nor'easter brought a mixture of snow, sleet, and rain to Rhode Island. Peak wind gusts were 35-49 mph.
10/25/2005	A strong coastal storm (i.e., a Nor'easter) entrained with energy and moisture from the remnants of Wilma brought rainfall amounts between 2 and 2.5 inches and damaging winds to portions of Rhode Island. The high winds brought down limbs, trees, and wires, resulting in scattered power outages in nearby Exeter.
01/12/2011	A developing Nor'easter coastal storm dumped nearly two feet of snow across portions of Rhode Island in a 24-hour period. Ten to eleven inches of snow fell across Washington County.
03/02/2018	Nor'easter #1. Wind gusts >70 mph. Two to four inches of rain across the region. Coastal flooding. Widespread power outages and tree damage. This was a rain and wind event.[17]
03/07/2018	Nor'easter #2. Two to four inches of rain across Washington County. Wind gusts >60 mph.
03/13/2018	Nor'easter #3. Wind gusts about 50 mph in coastal Rhode Island. Thousands without power in Rhode Island. Blizzard conditions brought up to a foot of snow. This was a heavy snow and wind event.[18],[19]

16 NOAA Storm Event Database, Providence County. https://www.ncdc.noaa.gov/stormevents/

[17] WPRI. March 20, 2018 https://www.wpri.com/news/local-news/march-of-the-noreasters-each-storm-different-from-the-last/1082557076

[18] Newport Daily News. March 14, 2018 http://www.newportri.com/da9d9382-475d-5911-8cd2-1fc8cfbb3c1a.html

[19] NOAA Storm Event Database for flood events in Washington County. https://www.ncdc.noaa.gov/stormevents/

Hurricanes

Description

Hurricane Damage on Kingston Campus

Hurricanes are low pressure systems that usually form over the tropics. These storms are referred to as "cyclones" due to their rotation. Hurricanes 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 hurricanes move inland, they can cause severe flooding, downed trees and power lines, and structural damage (Rhode Island State Hazard Mitigation Plan 2014).

There are three categories of tropical cyclones:

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

Once a tropical cyclone no longer has tropical characteristics it is classified as an extratropical system (Rhode Island State Hazard Mitigation Plan 2014).

Most Atlantic hurricanes begin as atmospheric "easterly waves" that propagate off the coast of Africa and cross the tropical North Atlantic and Caribbean Sea. When a storm starts to move toward the north, it begins to leave the area where the easterly trade winds prevail and enters the temperate latitudes where the westerly winds dominate. This situation 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 (Rhode Island State Hazard Mitigation Plan 2014).

Hurricanes are categorized according to the Saffir/Simpson scale (**Table7**) with ratings determined by wind speed and central barometric pressure. Hurricane categories range from one through five, with Category 5 being the strongest (winds greater than 155 mph). A hurricane watch is issued when hurricane conditions could occur within the next 36 hours. A hurricane warning indicates that sustained winds of at least 74 mph are expected within 24 hours or sooner (Rhode Island State Hazard Mitigation Plan 2014).

The Saffir-Simpson scale below is based primarily on wind speeds and includes estimates of barometric pressure and storm surge associated with each of the five categories. It is used to

give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall.

Table 7 Saffir/Simpson Hurricane Wind Scale[20]

Wind Speed	Typical Effects
Category 1 – Weak 74-95 mph (64-82kt)	*Minimal Damage:* Damage is primarily to shrubbery, trees, foliage, and unanchored mobile homes. No real damage occurs in building structures. Some damage is done to poorly constructed signs.
Category 2 – Moderate 96-110 mph (83-95kt)	*Moderate Damage:* Considerable damage is done to shrubbery and tree foliage; some trees are blown down. Major structural damage occurs to exposed mobile homes. Extensive damage occurs to poorly constructed signs. Some damage is done to roofing materials, windows, and doors; no major damage occurs to the building integrity of structures.
Category 3– Strong 111-130 mph (96-113kt)	*Extensive Damage:* Foliage torn from trees and shrubbery; large trees blown down. Practically all poorly constructed signs are blown down. Some damage to roofing materials of buildings occurs, with some window and door damage. Some structural damage occurs to small buildings, residences and utility buildings. Mobile homes are destroyed. There is a minor amount of failure of curtain walls (in framed buildings).
Category 4 – Very Strong 131-155 mph (114-135kt)	*Extreme Damage:* Shrubs and trees are blown down; all signs are down. Extensive roofing material and window and door damage occurs. Complete failure of roofs on many small residences occurs, and there is complete destruction of mobile homes. Some curtain walls experience failure.
Category 5 – Devastating Greater than 155 mph (135kt)	*Catastrophic Damage:* Shrubs and trees are blown down; all signs are down. Considerable damage to roofs of buildings. Very severe and extensive window and door damage occurs. Complete failure of roof structures occurs on many residences and industrial buildings, and extensive shattering of glass in windows and doors occurs. Some complete buildings fail. Small buildings are overturned or blown away. Complete destruction of mobile homes occurs.

Location

The University's close proximity to the Atlantic Ocean renders it particularly susceptible to hurricanes and the resulting loss of human life and property.

Probability of Future Occurrence

Likely.

Extent (Event Magnitude)

Hurricanes that occur in Rhode Island are usually weak (Category 1) or downgraded tropical systems. The wind speeds may be lower, but the storms can still bring a lot of rain and storm surge which can cause widespread flooding.

20 National Weather Service, National Hurricane Center

Impact and Damage Extent

High-Medium. The Narragansett Bay Campus is located in a coastal community, but the Kingston Campus is only about 5 miles inland. Hurricane strength storms can cause coastal flooding, dangerous storm surge, and widespread inland flooding. The rain and storm surge alone could damage homes, roads, businesses, and infrastructure, and cripple the surrounding towns. The high winds could down power lines and trees, and damage mobile homes or older structures. During extremely dangerous conditions, the University may elect to relocate students to temporary housing. Damage extent is dependent upon the size and timing of the storm. A slow-moving storm may stall offshore and bring more rain to the area than a fast-moving storm.

Climate Change Impacts

Warming global air and water temperatures may increase the intensity of hurricanes that travel up along the Atlantic Coast.

History[21]

The unforeseen Great New England Hurricane of 1938 is the most catastrophic weather event in Rhode Island history. The event occurred slightly before high tide and brought with it winds upward of 120 mph.

In South Kingstown, houses were swept from their foundations, elm trees were uprooted in Kingston, and entire families were swept out to sea in a huge tidal wave. "South Kingstown recorded a storm surge high of 11.5 feet. The heavy surf of the storm hit the fishing village of Jerusalem, causing great damage to the fishing fleet as well as nearby homes. At the western boundary of the village, dunes as high as 25 feet were flattened. In nearby Matunuck the wind and water undermined many of the cottages. Upper Point Judith Pond also sustained serious damages. Boats from Hanson's yard were found 200 yards inland of the pond, scattered among the roofs of toppled houses. On the South Kingstown side of Narrow River flooding reached the bottom of Torrey Hill. In Green Hill, every structure was destroyed. Unfortunately, many people invested more money into these high-risk areas as they started rebuilding along the shore as fast as they could clear the wreckage."

A Category 1 hurricane struck Rhode Island in August 1954 (Carol). "Though the storm was almost equal in severity, improvements in the warning and evacuation systems greatly reduced loss of life. The storm surge was slightly higher than that of '38, reaching a maximum of 11.6 feet. In both Green Hill and Jerusalem, structures were washed off the barrier beaches. The Potter Pond Bridge on Succotash Road washed out early in the storm leaving more than 100 people stranded on the East Matunuck side. Many of the homes in Jerusalem were located on filled marshes, only two to three feet above mean high water. These low-lying houses sustained extensive damage; in fact, some were completely demolished by the storm. Only pilings were left of the docks in Snug Harbor. Abandoned by their owners, boats were ripped from their slips and moorings and strewn across the small fishing village."

21 NOAA Storm Event Database, and South Kingstown Local Hazard Mitigation Plan Update 2019

In October 1991, Hurricane Bob hit Rhode Island as a Category 2 storm. "The tidal surge was thought to have damaged the Potter Pond Bridge causing it to close for several days. Fourteen boats were grounded in South Kingstown waters, with area marinas reporting $100,000 worth of damage. Nine roads were closed for a period of several days following the storm because of debris and fallen trees."

In 2011, Hurricane Irene hit South Kingstown as a tropical storm. Despite the relatively low wind speeds, sustained winds over a 6 to 12-hour long duration resulted in widespread tree damage and resulted in power outages to roughly half a million customers throughout the state. Numerous trees, poles, and wires were downed throughout South Kingstown. Local roads were also flooded. Collective effects throughout Massachusetts and Rhode Island resulted in one fatality, no injuries, and $127.3 million in property damage.

In October 2012, Hurricane Sandy severely impacted coastal Rhode Island as it came ashore with Tropical Storm strength winds. South Kingstown was mainly impacted by waves and high winds. Tree damage was widespread.

Winter Storms and Ice

Description

The majority of Rhode Island lies outside the heavy snow and ice regions of the northeast. Due to its maritime climate, Rhode Island generally experiences cooler summers and warmer winters than inland areas. However, snow and ice do occur and can be more than an inconvenience and cause extensive damage. The two major threats from these hazards are loss of power due to ice on electrical lines and snow loading on rooftops. Additionally, loss of power could mean loss of heat for many residents.

Typical winter snowfall on the Kingston Campus.

Winter storms vary in size and strength and can be accompanied by strong winds that create blizzard conditions and dangerous wind chill. There are three categories of winter storms. A blizzard is the most dangerous of the winter storms. It consists of low temperatures, heavy snowfall, and winds of at least 35 miles per hour. A heavy snowstorm is one which drops four or more inches of snow in a twelve-hour period. An ice storm occurs when moisture falls and freezes immediately upon impact.

Location

Both campuses are susceptible to the impacts from winter storms.

Probability of Future Occurrence

Highly Likely.

Extent (Event Magnitude)

On average, the Town of South Kingstown receives 30 inches of snow throughout the year. The average winter temperature (December-February) in South Kingstown is 42.3 degrees Fahrenheit.[22]

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

The Sperry–Piltz Ice Accumulation (SPIA) Index is a scale for rating ice storm intensity, based on the expected storm size, ice accumulation, and damages on structures, especially exposed overhead utility systems. The SPIA Index uses forecast information to rate an upcoming ice storm's impact from 0 (little impact) to 5 (catastrophic damage to exposed utility systems).

The University expects at least a level 1- isolated or localized utility interruptions every year due to ice.

[22] Intellicast http://www.intellicast.com/Local/History.aspx?location=USRI9981

Figure 3 SPIA Index

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

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

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

Impact and Damage Extent

Varies. A severe winter storm could have a serious impact on the University community including physical infrastructure.

The combination of wind, ice, and snow can have a crippling effect on the University. Heavy and/or excessive snowfall amounts can stress roofs and hinder snow plowing efforts, as well as cause power outages. Fortunately, the university has experience and equipment to handle the extensive plowing effort needed to keep the roads and sidewalks passable.

Climate Change Impacts

The URI campuses may likely see less snowfall over the winter season but may see more intense blizzards when they do occur.

Warming temperatures may mean less snowfall but if there is enough moisture in the atmosphere, it may fall as freezing rain, coating everything in ice. The University should expect more ice events.

History

The Towns of South Kingstown and Narragansett has been subjected to annual snowstorms and Nor'easters. The Great Blizzard of 1978 blanketed the Towns of South Kingstown and Narragansett with 27 inches of snow and ice, and closed businesses for several days. In February 2013, Winter Storm Nemo temporarily crippled the area. Power lines were downed, and road crews had a challenging time keeping the roads passable.

Due to the unique weather in New England, ice storms are usually part of larger snow events. Winter storms have included ice warnings when there are rapidly warming and cooling temperatures. Rhode Island was spared the brunt of the 2008 ice storm which affected more than a million people across New Hampshire, Vermont, Massachusetts, Maine, Connecticut, and New York.

High Winds

Description

Wind Damage on the Kingston Campus.

Wind is the 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. National climatic events such as high gale winds, tropical storms, thunderstorms, nor'easters, hurricanes, and low-pressure systems produce wind events in Rhode Island. 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.

The Beaufort Wind Scale is a 12-level scale used to describe wind speed and observed wind conditions at sea and on land. A wind classification of 0 has wind speeds of less than 1 mile per hour are considered calm. On the other end, a classification of 10 with wind speeds reaching 63 miles an hour will blow down trees and cause considerable damage.

Table 8 Beaufort Scale

Beaufort Number	Description	Wind Speed (km/h)	Observations
0	Calm	<1	Smoke rises vertically
1	Light Air	1-5	Smoke drifts slowly
2	Light Breeze	6-11	Leaves rustle, wind vanes move
3	Gentle Breeze	12-19	Leaves and twigs on trees move
4	Moderate Breeze	20-29	Dust picked up from ground
5	Fresh Breeze	30-38	Small trees sway in wind
6	Strong Breeze	39-51	Large branches move
7	Near Gale	51-61	Trees move, hard to walk
8	Gale	62-74	Twigs break off trees
9	Strong Gale	75-86	Branches break off trees
10	Whole Gale	87-101	Trees uprooted
11	Storm	102-120	Buildings damaged
12	Hurricane	>120	Severe building and tree damage

Location

Wind events are expected throughout the year in the Towns of South Kingstown and Narragansett.

Probability of Future Occurrence

Highly Likely.

Extent (Event Magnitude)

At the Kingston Campus, the windier part of the year lasts for 6.1 months from October 14 to April 22, with average wind speeds of more than 7.8 miles per hour (6.8 kts).[23]

[23] Weather Spark https://weatherspark.com/y/26154/Average-Weather-in-Kingston-Rhode-Island-United-States-Year-Round#Sections-Wind

At the Bay campus, the windier part of the year lasts for 6.2 months, from October 13 to April 21, with average wind speeds of more than 8.5 miles per hour (7.4 kts).[24]

Impact and Damage Extent

Medium. Strong wind gusts of 40 miles an hour (Beaufort Scale of 8) can blow twigs and small branches from trees. Occasional gusts and sustained winds at this speed (and above) are of concern to the University. Damage from wind events range from power outages, property damage to vehicles and buildings, and fallen trees/limbs. Previous wind events at both campuses have resulted primarily in power outages and downed tree limbs with minimal property damage. It is important that the University maintain the tree trimming program to reduce the likelihood of fallen trees/limbs from disrupting transportation routes, taking down power lines, and/or creating damage to the tree canopy.

Climate Change Impacts

Changes in atmospheric circulation are predicted to occur. See "Hurricanes" and "Nor'easters."

History

Table 9 Recent History of High Winds in Washington County[25]

Date	Magnitude (kts)	Comments
10/29/2012	75 kts.	Hurricane Sandy. A Citizens Weather Observing Program observer in Westerly reported sustained winds of 64 mph and a wind gust of 86 mph. The Automated Surface Observing System at Westerly State Airport recorded wind gusts of 69 mph.
01/31/2013	50 kts.	Amateur radio operators in Westerly and South Kingstown reported wind gusts to 56 and 55 mph, respectively, on their home weather stations. In Richmond, a tree was downed near Richmond Elementary School on Kingstown Road.
11/27/2013	51 kts.	An amateur radio operator recorded a wind gust of 59 mph on their home weather station in South Kingstown. A utility pole was downed onto Route 102 in Exeter. A tree and wires were downed in Kingston, temporarily disrupting Amtrak train service. A large tree was downed onto a house in North Kingstown.
02/16/2016	50 kts.	Winds gusted as high as 58 mph at the Weatherflow mesonet stations at Ninigret Pond and at Point Judith. Trees and wires were blown down in South Kingstown.

[24] Weather Spark https://weatherspark.com/y/26157/Average-Weather-in-Narragansett-Pier-Rhode-Island-United-States-Year-Round#Sections-Wind

[25] NOAA Storm Event Database (2022). Wind types: high wind, thunderstorm wind.

Table 9 Recent History of High Winds in Washington County[25]

Date	Magnitude (kts)	Comments
10/29/2017	60 kts.	A tree and wires were brought down on Yawgoo Valley Road, Partridge Drive, and Mail Road in Exeter; trees and wires were brought down on Gardiner Road and multiple trees were brought down on Lewiston Avenue, both in Richmond; a tree and wires were down on Hundred Acre Road in the West Kingston section of South Kingstown; a tree and wires were down on Spring Street in the Hope Valley section of Hopkinton. An amateur radio operator in Westerly reported a sustained wind of 49 mph; another operator in Charlestown reported a wind gust to 69 mph.
03/02/2018	61 kts	An amateur radio operator at Charlestown reported a wind gust to 70 mph.

Extreme Temperatures

Description

Extreme cold may accompany winter storms, be left in their wake, or can occur without storm activity. Extreme cold can lead to hypothermia and frostbite, which are both serious medical conditions. The definition of an excessively cold temperature varies according to the normal climate of a region. In areas unaccustomed to winter weather, near freezing temperatures are considered "extreme cold." In Rhode Island, extreme cold usually involves temperatures below zero degrees Fahrenheit.[26]

The wind chill index attempts 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. A wind chill index of -5 indicates that the effects of wind and temperature on exposed flesh are the same as if the air temperature alone was five degrees below zero, even though the actual temperature could be much higher. The NWS issues the following a wind chill alerts:

- A wind chill warning is issued within 12 to 24 hours before the onset of extremely dangerous cold conditions. Issued when wind chill temperatures are expected to be hazardous to life within several minutes of exposure.
- A wind chill watch is issued when conditions are favorable for excessive cold in the next 24 to 72 hours.
- A wind chill advisory is issued within 12 hours of the onset of dangerous cold conditions.

NOAA's National Weather Service issues ***extreme (or excessive) heat*** warnings when the maximum expected heat index is expected to be 105° F or higher for at least 2 consecutive days and nighttime air temperatures are not expected to fall below 75°. In the northeast, these criteria are generally modified to a heat index of 92° for higher for 2 consecutive days.

[26] Rhode Island State Hazard Mitigation Plan 2014.

The following are the types of heat event warnings that are issued by NOAA's National Weather Service:

- An excessive heat warning is issued within 12 to 24 hours before the onset of extremely dangerous heat conditions.
- An excessive heat watch is issued when conditions are favorable for excessive heat in the next 24 to 72 hours.
- A heat advisory is issued within 12 hours of the onset of dangerous heat conditions.

Location

An extreme heat or cold event would be a regional issue affecting URI and significant portions of Southern New England.

Probability of Future Occurrence

Highly Likely. (Excessive Heat)

Highly Likely. (Extreme Cold)

Extent (Event Magnitude)

NOAA's National Weather Service has issued Wind Chill Advisories, Watches, and Warnings, as well as Excessive Heat Warnings, Excessive Heat Watches, and Heat Advisories for the Towns of South Kingstown and Narragansett.

Impact and Damage Extent

Medium. Extreme temperatures could have a serious impact on structures, as well as the general University population. During a heat wave, there is an increased stress to the power grid causing more outages.

Personal exposure to dangerous heat conditions may lead to heat cramps, heat exhaustion, and heat stroke. These are especially important to monitor in children, elderly, and vulnerable populations that are not able to move to cooler conditions.

Extreme cold conditions may occur during, after, or without any connection to a winter storm. Exposure to extreme cold can lead to hypothermia and frostbite. The university needs to be concerned about frozen water pipes and heating fuel.

Climate Change Impacts

Over the coming century, extremely hot days (over 90 degrees F) is projected to increase in New England.[27]

"Extreme cold in Rhode Island is projected to continue as extreme weather events experience an upswing due to climate change. The specific likelihood of extreme cold is unpredictable,

[27] Confronting Climate Change in the Northeast, by the Northeast Climate Impacts Assessment Group, July 2007

as days of frigid, arctic air and below freezing temperatures may be followed by days of mild temperatures in the 40s or 50s."[28]

History[29]

NOAA's Storm Events Database does not have any records specifically for South Kingstown, nor does the University keep records. The following were reported at nearby airports; consistent airport data was not recorded with NOAA.

Table 10 Extreme Temperatures (Excessive Heat, and Extreme Cold/Wind Chill) at Nearby Airports [30]

Date	Temperature (Fahrenheit)	Comments
07/06/2010	105-106	Heat index values at the Westerly State Airport (KWST) Automated Surface Observing System were 105 to 106 degrees.
02/16/2011	-26	The Automated Surface Observation Station at nearby Newport State Airport (KUUU) recorded wind chills as low as 26 below zero.
02/16/2015	-26	Wind chills as low as 26 below zero were reported at nearby TF Green Airport in Warwick.
02/14/2016	-32	Wind chills as low as 32 below zero were reported at nearby TF Green Airport in Warwick.

Flooding

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

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

FEMA maintains regulatory flood maps called Flood Insurance Rate Maps (FIRM). Insurance companies refer to these when providing coverage to homeowners. These maps are available for viewing at Town Hall and online at The FEMA Map Service Center https://msc.fema.gov. Please note that there is a process for the public to request a change in the flood zone designation for their property.

[28] RI Emergency Management Agency, State of Rhode Island Hazard Identification and Risk Assessment. November 2016

[29] NOAA Storm Event Database (2021).

[30] NOAA Storm Event Database (2022). Wind types: high wind, thunderstorm wind.

Table 11 Flood Zone Descriptions

Flood Zone	Description
VE	Coastal areas with 1% annual chance of flooding with additional hazards due to storm-induced velocity wave action. 26% chance of flooding over the life of a 30-year mortgage
A	1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. No recorded Base Flood Elevation
AE	1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Base Flood Elevation is provided.

For the purpose of this plan, three types of flooding will be discussed: coastal, street flooding, and stream/riverine flooding. Since these hazards are ranked in order of concern, the first is coastal flooding caused by heavy rain.

Coastal Flooding Description

Simply put, coastal flooding occurs when seawater inundates the land. This can be from high tides, storm surge, or wind-driven waves that erode the coastline. Because of development pressures and population increases on the coast, a greater number of structures are at risk to coastal flooding.

Coastal Flooding at URI Bay Campus Beach Parking Lot. Photo credit: MyCoast.

Location

Low-lying coastal areas on the Narragansett Bay Campus are the most vulnerable.

Probability of Future Occurrence

Coastal flooding is highly likely at the Bay campus.

Extent (Event Magnitude)

Localized and high tide coastal flooding can be expected to occur on an annual basis.

Impact and Damage Extent

Along the coast, hurricanes and other storms accompanied by heavy winds and rain make the Narragansett Bay Campus vulnerable to property and environmental damage caused by coastal flooding. Storm surge coupled with large fast-moving waves can scour the beach and building foundations. Coastal storms that occur during the summer have the likelihood of catching visitors and seasonal residents off guard without a plan to evacuate.

Saltwater intrusion into freshwater systems is another concern. Large storms will push the seawater up into the rivers and estuaries causing flooding. This can also impact the

freshwater drinking resources. The timing of these storms around high tide could impact the extent of the damages.

Vulnerable structures at the Narragansett Bay Campus include stormwater infrastructure, water supply lines, and roads.

NOTE: While developing this plan, the university's Rhode Island Coastal Hazards Modeling & Prediction (RI-CHAMP) system was used to simulate the effects of a major hurricane striking the Narragansett Bay Campus. The simulation found that none of the campus's critical infrastructure included in the model was adversely affected by inundation.

Street Flooding Description

Street flooding due to runoff occurs when water runs over the land's surface impervious surfaces (paved areas, building subdivisions, and highways). Two major environmental modifications are primarily responsible for drastically altering the rain fall-runoff relationship.

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

Location

During heavy or extensive rain events, flooding at the Kingston and Bay campuses is generally caused by undersized catch basins and poor natural drainage. These areas include but are not limited to:

- Butterfield Road (Kingston Campus)
- West Alumni Avenue (Kingston Campus)
- Complex Road (Kingston Campus)
- Pier Road (Bay campus)

Probability of Future Occurrence

Street flooding is highly likely.

Extent (Event Magnitude)

Localized street flooding can be expected to occur on an annual basis at both campuses.

Impact and Damage Extent

Low. Heavy rains, quick thaws with precipitation, and hurricanes accompanied by heavy winds and rain make the University vulnerable to property and environmental damage caused by flooding.

Vulnerable structures include stormwater infrastructure, residential housing, water supply lines, wastewater infrastructure, and roads. Natural environments that aren't accustomed to water can also be impacted by flooding. Long-term standing water can also be a public health and safety issue.

Climate Change Impacts

Changing weather patterns may lead to more severe rain events.

History

The university regularly experiences street flooding on the nuisance level. Most nuisance flooding occurs at Fraternity Circle. The heavy rainfall in the spring of 2010 resulted in riverine flooding as well as ground saturation flooding.

River/Stream Flooding Description

Riverine flooding occurs when heavy rainfall or snow melt causes the water in rivers and streams to flow over their banks. The severity of the flood depends on the saturation of the surrounding ground, the amount of precipitation, and duration of the event. Riverine flooding is most likely to occur in the late summer and early spring due to snow melt and spring rainfalls.

Location

Overtopped stream banks combined with heavy rain and a high-water table can easily flood parts of the Kingston Campus. Low-lying areas around White Horn Brook are the most vulnerable.

Probability of Future Occurrence

River and stream flooding is likely at the Kingston Campus.

Extent (Event Magnitude)

Localized flooding can be expected to occur on an annual basis.

Impact and Damage Extent

Low. Damages are localized to the natural floodplain along White Horn Brook which includes Ellery, Dorr, Fayerweather/Gorham, and Meade Stadium.

Climate Change Impacts

Changing climate conditions are likely to bring more rainfall events to the area and fewer snowstorms. More intense storms will stress the streams and natural floodplains designed to carry floodwaters.

History

Table 12 History of Riverine/Stream Flooding in South Kingstown since 2000.[31]

Date	Comments
03/28/2005	Low pressure system brought 3-4 inches of rain resulting in poor drainage flooding. In South Kingstown, flooding affected several roadways on the URI campus.
10/15/2005	Between 2.5 and 4.5 inches of rain in Rhode Island. Many roads were closed throughout the region.
03/14/2010	Between 3 and 6 inches of rain fell in the area resulting in flooded basements and yards. Neighboring Narragansett and Richmond had reports of structural damages and road closures.

Drought

Description

Drought in nearby Connecticut.
Photo credit: Bob Luckey Jr./ Hearst Connecticut Media

Drought is characterized as a continuous period of time in which rainfall is significantly below the norm for a particular area over a multi-year period. The American Meteorology Society defines drought as a period of abnormally dry weather sufficiently long enough to cause a serious hydrological imbalance. Drought differs from other natural hazards in that they occur suddenly. Rather, a drought evolves over months or even years and, while causing very little structural damage, can have profound economic, environmental, and social impacts.

There are four different ways that a drought can be defined:

[31] NOAA Storm Event Database for flood events in Washington County, specifically The Town of South Kingstown. Data for the Town of Narragansett was not used because the URI Bay campus Is not impacted by riverine floods. https://www.ncdc.noaa.gov/stormevents/

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

Characteristics and impacts of drought differ in many ways, so it is difficult to quantify drought. An existing index called the Palmer Drought Severity Index (PDSI) that used temperature and precipitation levels to determine dryness, measuring a departure from the normal rainfall in a given area. The advantage of the PDSI is that it is standardized to local climate, so it can be applied to any part of the country to demonstrate relative drought or rainfall conditions. A monthly PDSI value below -2.0 indicates moderate drought, and a value below -3.0 indicates severe drought.

The U.S. Drought Monitor tracks drought conditions in Rhode Island and in the rest of the nation. They create maps based on climate data, hydrologic and soil conditions, as well as reported impacts and observations from over 350 contributors nationwide.

Table 13 Drought Severity [32]

Severity	Category	PDSI Index Value	Drought Level	Possible Impacts
Exceptional Drought	D4	-5 or less	Emergency	Widespread crop/pasture losses, shortages of water creating water emergencies.
Extreme Drought	D3	-4 to -4.9	Warning	Major crop/pasture losses, widespread water shortages or restrictions.
Severe Drought	D2	-3 to -3.9	Watch	Crop or pasture losses likely, water shortages common, water restrictions imposed.
Moderate Drought	D1	-2 to -2.9	Advisory	Some damage to crops/pastures, developing water shortages, voluntary water-use restrictions requested.
Mild Drought/Abnormally Dry	D0	-1 to -1.9	Normal	Short term dryness slowing planting or crop growth.
Incipient Dry Spell		-0.9 or less	–	–

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

32 http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx

The RI Drought Steering Committee assigns drought levels for the seven designated drought regions in the state, based on hydrological indices such as precipitation, groundwater, stream flow, and the PDSI, as well as on local supply indices such as static groundwater levels and reservoir levels. The Normal, Advisory, and Watch levels are issued statewide. The Warning and Emergency levels are issued on a regional basis and consider local conditions, source of water supply, and water storage capacity issues.

Location

Although temporary drought conditions may occasionally exist in Rhode Island, affecting the Towns of South Kingstown and Narragansett, devastating long term drought conditions are not indicative of this temperate region.

Probability of Future Occurrence

Likely.

Extent (Event Magnitude)

According to The National Weather Service Rhode Island receives on average 39" to 54" of rain annually. Notwithstanding the same, the State experiences extended periods of dry weather. Some type of drought in Rhode Island occurs approximately once every 11 years.

Impact and Damage Extent

Low. The main impacts of meteorological drought are periods of very high fire danger, impacts to the University's agricultural research, and low drinking water supplies. The Kingston Campus draws water from the Chipuxet Aquifer. The Narragansett Bay Campus is tied into Narragansett's drinking water. Changes in water levels can impact not only the quantity of available water but also the quality.

Climate Change Impacts

Even though rain events may intensify due to climate change, the periods between them may be longer. Rhode Island expects longer periods of drought "Recent climate change studies[33] have indicated that although precipitation is projected to increase throughout this century, it will be in the form of short duration, intense, and less frequent events. In addition, it is projected by the Northeast Climate Impacts Assessment Group (NECIA) and the New York City Panel on Climate Change (NPCC) that most of this increased precipitation may occur during colder times of the year, such as winter, in the form of snow or ice. Furthermore, it is projected that the frequency and intensity of both long-term and short-term droughts throughout the Northeast will increase throughout the century with the impacts beginning to occur with a greater degree of frequency beginning in the mid-century (2050s)."[34]

[33] Information derived from two recent studies: Confronting Climate Change in the Northeast, by the Northeast Climate Impacts Assessment Group, July 2007, and Climate Risk Information, by the New York City Panel on Climate Change, 2/17/09.

[34] State of Rhode Island State Hazard Mitigation Plan Update 2019.

History

Historically, Rhode Island has ranged from near-normal moisture conditions to moderate and severe droughts throughout the past century. Since 2000, the longest duration of drought (D1–D4) in Rhode Island lasted 36 weeks beginning on May 19, 2015 and ending on January 19, 2016. The most intense period of drought occurred the week of September 29, 2020, where D3 level drought affected 99.21% of Rhode Island land.[35]

Table 14 History of Droughts[36]

Date	Area Affected	Category	Remarks
1930-31	Statewide	D1/D2	Stream flow of 70% normal.
1941-45	Statewide	D1	Stream flow of 70% normal in Blackstone and Pawtuxet Rivers.
1949-50	Statewide	D1/D2	Stream flow of 70% normal.
1963-67	Statewide	D1-D3	Water restrictions/well replacements common.
1980-81	Statewide	D1	Groundwater deficient in eastern part of state. Considerable crop damage.
1987-88	Southern part of the state	D0/D1	$25 million crop damage.
1998-99	Statewide	D1-D3	Spring through summer the State experienced 75% of normal flow.
2012	Statewide	D2	January–April 2012. Meteorological drought due to precipitation levels one half of normal.
2016	Statewide	D2	August to November. Severe Drought due to below normal precipitation.
2020	Statewide	D3	September to November. Extreme Drought

[35] NOAA National Integrated Drought Information System https://www.drought.gov/states/Rhode-Island Accessed July 2021.

[36] USGS; RI Water Resources Board http://www.wrb.ri.gov/work_programs_drought/Drought_Facts_110607.html; and NOAA National Centers for Environmental Information https://droughtmonitor.unl.edu/AboutUSDM/AbouttheData/DroughtClassification.aspx

Lightning/Thunderstorms

Description

Storm Clouds over the Kingston Campus.

Thunderstorms are formed when the right atmospheric conditions combine to provide moisture, lift, and warm unstable air that can rise rapidly. Thunderstorms occur any time of the day and in all months of the year but are most common during summer afternoons and evenings and in conjunction with frontal boundaries. The National Weather Service (NWS) classifies a thunderstorm as severe if it produces hail at least one inch in diameter, winds of 58 mph or greater, or a tornado. About 10 percent of the estimated 100,000 annual thunderstorms that occur nationwide are considered severe. Thunderstorms affect a smaller area compared with winter storms or hurricanes, but they can be dangerous and destructive for a number of reasons. Storms can form in less than 30 minutes, giving very little warning; they have the potential to produce lightning, hail, tornadoes, powerful straight-line winds, and heavy rains that produce localized flooding.

All thunderstorms contain lightning. Thunderstorms can occur singly, in clusters, or in lines. Therefore, it is possible for several thunderstorms to affect one location over the course of a few hours. Thunderstorms usually bring heavy rains (which can cause localized floods), strong winds, hail, lightning, and tornadoes. Lightning is caused by the attraction between positive and negative charges in the atmosphere, resulting in the buildup and discharge of electrical energy. Lightning is one of the most underrated severe weather hazards yet ranks as the second-leading weather killer in the United States. "Hundreds of people across the nation are injured annually by lightning, most commonly when they are moving to a safe place but have waited too long to seek shelter. Lightning strike victims often suffer long-term effects such as memory loss, sleep disorders, weakness and fatigue, chronic pain, depression, and muscle spasms. Lightning has the potential to start both house fires and wildfires. Lightning causes an average of 55-60 fatalities, 400 injuries, and over $1 billion in insured losses annually nationwide." Lightning often strikes as far as 10 miles away from any rainfall.

Location

Both campuses are susceptible to lightning/thunderstorms.

Probability of Future Occurrence

Highly Likely.

Extent (Event Magnitude)

There is no universally accepted standard for measuring the strength or magnitude of a lightning storm. Similar to modern tornado characterizations, lightning events are often measured by the damage they produce. Building construction, location, and nearby trees or other tall structures will have a large impact on how vulnerable an individual facility is to a lightning strike. A rough estimate of a structure's likelihood of being struck by lightning can be calculated using the structure's ground surface area, height, and striking distance between the downward-moving tip of the stepped leader (negatively charged channel jumping from cloud to earth) and the object. In general, buildings are more likely to be struck by lightning if they are located on high ground or if they have tall protrusions such as steeples or poles which the stepped leader can jump to.

Impact and Damage Extent

Low. The impacts from lightning are often localized but could cripple a university campus. Lightning can strike buildings and accessory structures, often causing structure fires. Electrical and communications utilities are also vulnerable to direct lightning strikes. Damage to these lines has the potential to cause power and communication outages for the University community, residences, and critical facilities.

Human vulnerability is largely determined by the availability and reception of early warnings for the approach of severe storms, and by the availability of nearby shelter. Swimming, boating, and fishing are particularly dangerous during periods of frequent lightning strikes, which can also cause power outages, topple trees, and spark fires. Individuals who immediately seek shelter in a sturdy building or metal-roofed vehicle are much safer than those who remain outdoors.

Climate Change Impacts

Changing weather patterns may lead to more severe thunder and lightning storms.

History

There has been no reported loss of human life at the University in the past 50 years due to lightning.

Table 15 Recent History of Lightning Strikes in Washington County

Date	Comments
06/25/2012	Lightning struck trees, houses, and transformers in South Kingstown.
09/01/2013	Barn fire in nearby Hopkinton caused by lightning.
07/23/2018	House in nearby Exeter struck by lightning.
09/26/2018	Lightning strike in Exeter took down powerlines.

Tornadoes

Description

A tornado is a violent windstorm with a twisting, funnel-shaped cloud. They are often spawned by thunderstorms or hurricanes. Tornadoes are produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. The damage from a tornado is a result of the high wind velocity and wind-blown debris. Tornado season is generally March through August, although tornadoes can occur at any time of year. Over 80 percent of all tornadoes strike between noon and midnight. During an average year, about 1,000 tornadoes are reported across the United States, resulting in 80 deaths and over 1,500 injuries. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of one-mile-wide and 50 miles long.

Tornadoes are categorized according to the damage they produce using the Fujita Scale (F-scale). Below is the Enhanced Fujita (EF) Scale and the Old Fujita (F) Scale. An F0 tornado causes the least amount of damage, while an F5 tornado causes the most amount of damage. Relatively speaking, the size of a tornado is not necessarily an indication of its intensity. On August 7th, 1986, a rare outbreak of seven tornadoes occurred in New England. One such tornado, rated F2 on the Fujita Scale, carved its way through Cranston, RI, and Providence, RI (north of the URI campuses), causing twenty injuries and $2,500,000 in damages. In 2021 a tornado briefly touched down in Westerly, and another was spotted in North Kingstown. Table 15 highlights more tornado events that have affected, Rhode Island.

Table 16 Fujita Scale

Fujita Scale			Enhanced Fujita Scale		
F Number	Fastest ¼ mile (MPH)	3 Second Gust (MPH)	EF Number	3 Second Gust (MPH)	Damage Scale
0	40-72	45-78	0	65-85	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
1	73-112	79-117	1	86-110	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
2	113-157	118-161	2	111-135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
3	158-207	162-209	3	136-165	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
4	208-260	210-261	4	166-200	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars are thrown, and large missiles generated.
5	261-318	262-317	5	Over 200	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yds); trees debarked; incredible phenomena will occur.

Probability of Future Occurrence

Possible.

Location

The URI Hazard Mitigation Committee recognizes that the risk of tornadoes is low for the State of Rhode Island and the University but with the recent changing weather patterns and touchdowns of tornadoes, it would be unwise not to consider them a possible hazard.

Extent (Event Magnitude)

In 2021 an EF-0 tornado touched down in nearby North Providence and caused scattered tree damage.[37] It is expected that future tornadoes will be 0 or 1 on the F-Scale of magnitude.

Impact and Damage Extent

Varies. Could cause widespread destruction. Tornadoes can cause significant damage to buildings, trees and above ground utility lines. Flying debris can be cause injuries to students, faculty, and staff.

Climate Change Impacts

It is uncertain how climate change will affect tornado outbreaks in the Towns of South Kingstown and Narragansett.

History

There is no history of tornadoes at either URI campus but there have been occurrences in Rhode Island.

Table 17 Recent Tornado Events in Rhode Island[38]

Date	EF-Scale	Injuries	Damage	Location
8/16/2000	0	0	$0	Providence County
8/7/2004	0	0	$0	Kent County
7/23/2008	1	0	$47,987	Bristol County
8/10/2012	0	0	$50,000	Washington County
10/24/2018	1	0	unknown	North Providence and Lincoln
10/02/2019	0	0	$5,000	Portsmouth, RI
11/13/2021	0/1	0	unknown	3 tornadoes in Foster, Westerly, and N. Kingstown[39]

37 NOAA Storm Event Database (2021).

38 Rhode Island Emergency Management Agency (RIEMA), Rhode Island 2014 Hazard Mitigation Plan Update; NOAA Storm Event Database www.ncdc.noaa.gov

39 https://www.wpri.com/weather/pinpoint-weather-alerts/nws-two-confirmed-tornadoes-in-rhode-island/

Tsunamis

Description

Although tsunamis were not discussed in the Rhode Island State Hazard Mitigation Plan, they are profiled in the Massachusetts and Connecticut Plans. The URI Hazard Mitigation Committee perceives a likelihood of tsunamis in the future and is thus including them as an identified hazard in this plan.

Tsunamis (also called seismic waves) are a series of giant ocean waves created by underwater geologic activity such as an earthquake, landslide, volcanic eruption, or impact from a meteorite. This series of waves can travel hundreds of miles per hour across the open ocean and develop waves of 100 feet or more.

The configuration of the ocean bottom and magnitude of the tsunami will influence the size of the wave(s) when it hits land. The Pacific coastlines of California, Oregon, Washington, Alaska, and Hawaii are the most popular places for tsunamis to occur.

Because earth movements associated with large earthquakes are thousands of square kilometers in area, any vertical movement of the seafloor immediately changes the sea-surface. Tsunamis are most commonly generated by earthquakes in marine and coastal regions. Major tsunamis are produced by large (greater than 7 on the Richer scale), shallow focus (< 30km depth in the earth) earthquakes associated with the movement of oceanic and continental plates. Underwater landslides associated with smaller earthquakes are also capable of generating destructive tsunamis.

Although the U.S. east coast is much less likely to be affected by a tsunami than the west coast, tsunami threats do exist. The closest tectonic boundary to the U.S. east coast is the spreading Mid-Atlantic Ridge, which contains numerous faults and earthquakes that take place. However, according to the Maine Geological Survey, tsunamis are more likely to occur at convergent margins. In the Caribbean Sea, there is a convergent plate boundary and a region with a higher probability of generating earthquakes that could produce tsunamis. Tsunamis could potentially travel to New England from the Caribbean, the Mid-Atlantic Ridge, or from the Canary Islands.

Traditionally the magnitude of tsunamis was measured by the wave height, speed, and associated earthquake magnitude. A Tsunami Intensity Scale, although not used that much has been proposed to quantify a large number of criteria. http://neamtic.ioc-unesco.org/images/Neamtic/PDF/intensity-scale.pdf

Location

The low-lying Narragansett Bay Campus is most at risk for tsunami damage.

Probability of Future Occurrence

Possible.

Extent (Event Magnitude)

Due to the low magnitude of seismic activity in the Atlantic Ocean, tsunamis that are formed off the coast of New England would be relatively small.

Impact and Damage Extent

Uncertain. The amount of energy carried by a tsunami can cause widespread devastation and loss of life for miles. In addition to the sheer weight and force of the wave, all the debris it creates can further damage the area. Trees and natural habitats are destroyed, and coastal zones are polluted by the dangerous chemicals carried out by receding waves. Flooding and contaminated drinking water can quickly spread diseases.

Climate Change Impacts

It is uncertain how warming temperatures and more extreme rainfall will impact the triggers that cause tsunamis. However, as sea levels rise, previously inland areas will be more susceptible to coastal wave action.

History

"Only a total of six tsunamis have been recorded anywhere in the Gulf and East Coast States. Three of these tsunamis were generated in the Caribbean, two were related to magnitude 7+ earthquakes along the Atlantic coastline, and one reported tsunami in the mid-Atlantic States may be related to an underwater explosion or landslide."[40]

The latest recorded tsunami anywhere close to Rhode Island was in November 1929 when an earthquake and submarine slump offshore caused a significant tsunami to come ashore in Newfoundland. Enormous waves hit the coast at 25 miles/hour. In addition to major damage along the coast, twenty-eight people died in Newfoundland.[41]

Hail

Description

Hail is formed in towering cumulonimbus clouds (thunderheads) when strong updrafts carry water droplets to a height at which they freeze. Eventually, these ice particles become too heavy for the updraft to hold up, and they fall to the ground at speeds of up to 120 mph. Hail falls along paths called swaths, which can vary from a few square acres to up to 10 miles wide and 100 miles long. Hail larger than 0.75 inch in diameter can do great damage to both property and crops, and some storms produce hail over two inches in diameter. Hail causes about $1 billion in damages annually in the U.S. (Rhode Island State Hazard Mitigation Plan 2014).

[40] Dunbar, Paula (2008), "U.S. States and Territories National Tsunami Hazard Assessment: Historical Record and Sources of Waves". National Tsunami Hazard Mitigation Program. https://nws.weather.gov/nthmp/documents/Tsunami_Assessment_Final.pdf

[41] Higgins, Jenny (2007), "The Tsunami of 1929". The Heritage Newfoundland & Labrador website http://www.heritage.nf.ca/articles/politics/tsunami-1929.php

Table 18 Hail Size

Hail Diameter	Size Description
1/4"	Pea Size
1/2"	Mothball Size
3/4"	Penny Size
7/8"	Nickel Size
1" (Severe Criteria)	Quarter Size
1 1/4"	Half Dollar Size
1 1/2"	Walnut or Ping Pong Ball
1 3/4"	Golf Ball Size
2"	Hen Egg Size
2 1/2"	Tennis Ball Size
2 3/4"	Baseball Size
3"	Teacup Size
4"	Grapefruit Size
4 1/2"	Softball Size

Location

Both the Kingston and Bay campuses are susceptible to hail.

Probability of Future Occurrence

Highly Likely.

Extent (Event Magnitude)

The hail in South Kingstown and Narragansett is usually 1 inch or smaller.

Impact and Damage Extent

Structure vulnerability to hail is determined mainly by construction and exposure. Metal siding and roofing is better able to stand up to the damages of a hailstorm than many other materials, although it may also be damaged by denting. Exposed windows and vehicles are also susceptible to damage. Crops are extremely susceptible to hailstorm damage, as even the smallest hail stones can rip apart unsheltered vegetation.

Human vulnerability is largely determined by the availability and reception of early warnings for the approach of severe storms, and by the availability of nearby shelter. Early warnings of severe storms are also vital for aircraft flying through the area.

Climate Change Impacts

There is uncertainty about the effects of climate change on hailstorms in the area. It is likely that the changes in weather patterns may bring more severe hail events.

History

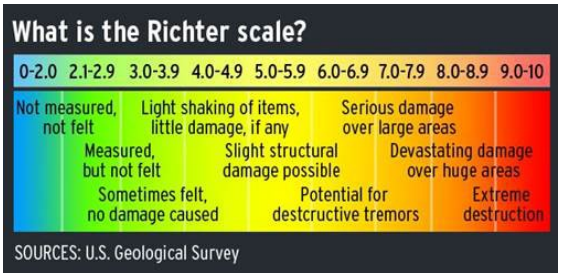
Table 19 Recent History of Hail in Washington County[42]

Date	Size	Comments
07/01/2009	0.75″ Hail	Penny size hail fell in the Wickford section of North Kingstown.
07/01/2012	0.75″ Hail	Large hail and gusty winds.
05/25/2014	1″ Hail	An upper level disturbance moved through Southern New England, igniting showers and thunderstorms across the area. Many of these storms produced small to large size hail thanks to very cold temperatures aloft.
07/24/2015	0.75″ Hail	Reports of large hail and isolated tree damage.
07/28/2015	½ to 1″ Hail	A strong upper level disturbance sparked showers and thunderstorms across much of southern New England. A few of these storms became severe, producing damaging winds. Others produced heavy rain that resulted in flooding. Half an inch to quarter size hail fell in Narragansett
07/14/2020	1.25″ Hail	Half dollar size hail was reported in South Kingstown.
08/27/2021	0.75″ Hail	Dime size hail reported in nearby Richmond.

[42] National Climate Data Center, 2018

Earthquake

An earthquake (also known as a quake, tremor, or temblor) is the result of a sudden release of energy in the Earth's crust that creates seismic waves. The seismicity or seismic activity of an area refers to the frequency, type and size of earthquakes experienced over a period of time. Earthquakes are measured with a seismometer. The size or magnitude is recorded on a device known as a seismograph. Earthquakes with a magnitude 3 or lower are mostly imperceptible (too low to recognize) and magnitude 7 earthquakes cause serious damage over large areas.



Although earthquakes are not considered to be a major problem in the Northeast United States, they are more prevalent than one might expect. Table 18 presents historical seismic activity for Rhode Island. It highlights the earthquake epicenter, the Richter magnitude at the epicenter, and the Mercalli Intensity Level. Richter magnitudes are technical quantitatively based calculations that measure the amplitude of the largest seismic wave recorded. Richter magnitudes are based on a logarithmic scale and are commonly scaled from 1 to 8. See the graphic below. The higher the magnitude on the Richter Scale, the more severe the earthquake. Mercalli intensity levels are based on qualitative criteria that use the observations of the people who have experienced the earthquake to estimate the intensity level. The Mercalli scale ranges from I to XII. The higher the intensity level on the scale, the closer the person is to the epicenter.

Table 20 Mercalli Scale

Modified Mercalli Intensity	Description of Intensity Level
I	Not felt except by a very few under especially favorable circumstances.
II	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III	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. Vibration similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all; many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in building 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. Noticed by persons driving motorcars.

Table 20 Mercalli Scale

Modified Mercalli Intensity	Description of Intensity Level
VIII	Damage slight in specially designed structures; considerable 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	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.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level distorted. Objects thrown into the air.

Despite the low probability of a high impact earthquake, physical characteristics in Rhode Island may increase earthquake vulnerability:

- **Hard Rock:** Due to the geological makeup of New England's base rock, seismic energy is conducted on a greater scale (four (4)-10 times that of an equivalent Richter magnitude earthquake in California).
- **Soft Soil:** Many coastal regions of New England are made up of soft soils. These soils can magnify an earthquake as much as two times.
- **Structures:** The New England region, being one (1) of the first settled areas of the United States, has an abundance of older, unreinforced masonry structures that are inherently brittle and very vulnerable to seismic forces.
- **Low Public Awareness of Vulnerability:** Little public recognition of earthquake threat, and no established system of educating or informing the public of the threat or how to prepare for or respond during an earthquake. Therefore, higher losses will occur here than in other regions of the country.

Location

Rhode Island is located in the North Atlantic tectonic plate and is in a region of historically low seismicity. Only three (3) or four (4) earthquakes of Modified Mercalli Intensity Scale (MMI) V or greater have been centered in Rhode Island, including the 1951 South Kingstown earthquake of magnitude 4.6 on the Richter scale.

Probability of Future Occurrence

Likely.

Extent (Event Magnitude)

Damaging earthquakes do not normally occur in this region. Rhode Island is located in an area of "moderate" seismicity and "high" risk. Seismic risk applies to the seismic hazard, location demographics, and regional economics to the vulnerabilities of the structure or lifeline on the site. Seismologists have estimated that there is about a 50% probability of a

very damaging magnitude 5.0 earthquake occurring anywhere in New England, in a 50-year period.[43]

Impact and Damage Extent

Low. The committee recognizes that the potential for an earthquake to strike the University is relatively low but the hazard could afflict campus-wide damage, causing power outages, building collapses, water main breaks, gas leaks, fires and injuries or deaths. Buildings that are most at risk from earthquakes are the historic structures.

Climate Change Impacts

It is uncertain how climate change will affect earthquake magnitude in and around Kingston and Narragansett.

History

No major earthquakes have happened at either campus, but they have occurred in the region.

43 RI Emergency Management Agency, State of Rhode Island Hazard Identification and Risk Assessment. November 2016

Table 21 Historic Seismic Activity in/near Rhode Island[44]

Date	Epicenter	Epicenter Magnitude	Mercalli Intensity Level
10/16/1963	Coastal MA	4.5	Caused some cracked plaster (MMI V) at Chepachet, Rhode Island.
6/14/1973	Western Maine	unknown	The intensities in Rhode Island were IV at Charlestown and I-III at Bristol, East Providence, Harmony, and Providence.
03/11/1976	Near Newport, RI	3.5	Intensity level VI shock effects felt throughout Southern New England. This earthquake has the distinction of being the largest earthquake to originate in Rhode Island.
04/20/2002	Plattsburgh, NY	5.2	Intensity level II to III shock effects felt throughout Rhode Island.
03/11/2008	Central Connecticut	2.9	No data reported for Rhode Island.
06/23/2010	Ontario-Quebec	5.0	Felt throughout Rhode Island.
2011	Rhode Island	0.9	Felt locally in RI.
2012	Rhode Island	1	Felt locally in RI.
2013	Kingston, RI	Unknown	Felt locally in RI.
04/04/2013	Hope Valley, RI	1.8	Felt locally in RI.
01/12/2015	Wauregan, CT	3.3	Felt locally in RI.
07/22/2015	East Providence, RI	2.3	Felt locally in RI.
12/01/2019	Newport, RI	2.0	Felt locally in RI.
11/08/2020	Buzzards Bay	3.6	Felt locally in RI.
11/22/2020	Buzzards Bay	2.0	Felt locally in RI.

Brushfire

Description

Brushfires are fueled by natural cover, including native and non-native species of trees, brush and grasses, and crops along with weather conditions and topography. While available fuel, topography, and weather provide the conditions that allow wildfires to spread, most wildfires are caused by people through criminal or accidental misuse of fire.

Brushfires can pose serious threats to human safety and property in rural and suburban areas. They can destroy crops, timber resources, recreation areas, and habitat for wildlife. Wildfires are commonly perceived as hazards in the western part of the country; however, smaller brushfires are a growing problem in the wildland/urban interface of the eastern United States, including Rhode Island.

Brushfires are dependent upon the quantity and quality of available fuels. Fuel quantity is the mass per unit area. Fuel quality is determined by a number of factors, including fuel density, chemistry, and arrangement. Arrangement influences the availability of oxygen. Another

44 United States Geologic Survey http//neic.usgs.gov/neis/states/rhode_island/rhode_island_history.html and Earthquake Hazards Program "*Did You Feel It*" Archives.

important aspect of fuel quality is the total surface exposed to heat and air. Fuels with large area-to-volume ratios, such as grasses, leaves, bark, and twigs, are easily ignited when dry.

Climatic and meteorological conditions that influence wildfires include solar insulation, atmospheric humidity, and precipitation, all of which determine the moisture content of wood and leaf litter. Dry spells, heat, low humidity, and wind increase the susceptibility of vegetation to fire. In Rhode Island, common factors leading to large fires include short-term drought, humidity below 20%, and fuel type.

Various natural and human agents can be responsible for igniting brushfires. Natural agents include lightning, sparks generated by rocks rolling down a slope, friction produced by branches rubbing together in the wind, and spontaneous combustion.

Human-caused brushfires are typically worse than those caused by natural agents. Arson and accidental fires usually start along roads, trails, streams, or at dwellings that are generally on lower slopes or bottoms of hills and valleys. Nurtured by updrafts, these fires can spread quickly uphill. Arson fires are often set deliberately at times when factors such as wind, temperature, and dryness contribute to the fires' spread.

The temperate climate in Kingston and Narragansett is not set up to endure long periods of drought that lead to widespread vegetation loss. Lightning fires in remote locations are rare but there is always a risk of fires from arson or careless fire use.

Location

The open fields, forested areas, and grassy areas on both campuses are most at risk.

Probability of Future Occurrence

Highly Likely.

Extent (Event Magnitude)

The Kingston and Bay campuses are largely developed but do maintain pockets of open space. The Kingston Campus has a lot more vegetated land that can provide fuel for brushfires. While the threat of wildfires may be slim, fires could still occur under the right conditions. Brushfires are rare on either campus. The general extent has decreased over the years due to better response equipment, faster response time, and the widespread use of cell phones used to report fires. However, the wildland-urban interface is growing, potentially putting more infrastructure and lives at risk.

Impact and Damage Extent

Low. Individual buildings may be more or less vulnerable to damage from brushfires based on factors such as the clear distance around the structure and the structure's construction materials. Brushfires primarily impacts timber and forest ecosystems, although the threat to nearby buildings is always present.

The likelihood of brushfires occurring and having widespread impacts has decreased over the years as fields and wooded areas are taken over by development.

Climate Change Impacts

Longer dry periods and droughts may increase the probability and frequency of brushfires. Severe droughts like what Rhode Island has experienced in 2022 can create a deep layer of dry material on the surface, allowing the fires to burn into the soil.[45]

In general, the magnitude and extent of brushfires has diminished over the years due to advances in detecting and firefighting technologies.

History

There have been no significant brushfires in the past 25 years at either campus.

Coastal Erosion

Description

Erosion is the gradual wearing away of the land. Although this can happen along rivers and streams, for the purpose of this Hazard Mitigation Plan, erosion will focus on coastal erosion as a hazard.

Coastal zones are dynamic areas that are constantly undergoing change in response to a multitude of factors, including sea level rise (SLR), wave and current patterns, hurricanes, coastal flooding and human influences. High winds and associated marine flooding from storm events such as hurricanes, nor'easters, flooding, and sea level rise, increase the risk exposure along developed coastal lands.

Location

Coastal erosion is only a concern for the Bay campus. Most of the developed part of campus is relatively protected from this hazard through elevation; however, the buildings along Pier Road east of Aquarium Road, including the pier are more vulnerable.

Probability of Future Occurrence

Possible.

Extent (Event Magnitude)

Shoreline change at the Narragansett Bay Campus has been mapped and is variable. Historically, the beach north of the pier has experienced up to 1.1 feet of accretion per year from 1939 to 2014. South of the pier, areas have experienced up to 0.4 feet of shoreline retreat per year.[46]

Impact and Damage Extent

[45] Cronin, Colleen. ecoRI News 2022. "Frequency of Brush Fires This Summer Could Offer Glimpse into Rhode Island's Future" August 29, 2022 https://ecori.org/frequency-of-brush-fires-this-summer-could-offer-a-glimpse-into-rhode-islands-future/

[46] CRMC Shoreline Change Map 1939-2014, Narragansett Bay, Rhode Island, South Ferry, Narragansett. http://www.crmc.ri.gov/maps/shorechange/Narragansett_South_Ferry.pdf

Minor. Most properties on the Bay are set back enough to be protected from mild coastal erosion. The Mosby's Center, the pier, and the parking lot on the north side of the pier are situated closer to the coastal bluff and beach and thusly more vulnerable.

Climate Change Impacts

The URI HMC expects erosion to be a growing concern as storms become more intense and sea levels rise.

History

See Extent.

Dam Failure

Description

Dams are classified as high hazard, significant hazard or low hazard. The classification is not based on whether a dam is deemed safe or unsafe. As of 2021, there are 95 high hazard dams, 81 significant hazard dams and 494 low hazard dams in the state.[47] Each dam's hazard classification determines the frequency of inspection. The higher the classification, the more frequently the inspection is conducted.

- A *High Hazard* dam is one whose failure or misoperation will result in a probable loss of human life.
- A *Significant Hazard* dam is one whose failure or misoperation results in no probable loss of human life but may cause major economic loss, disruption of lifeline facilities or impact other concerns detrimental to the public's health, safety or welfare.
- A *Low Hazard* dam is one whose failure or misoperation results in no probable loss of human life and low economic losses.

As part of each Rhode Island Department of Environmental Management (RIDEM) inspection, the major components of the dam are subjectively rated as good, fair or poor. The major components are the embankment, the spillway and the low-level outlet. Good means the dam meets the minimum Army Corps of Engineers (ACOE) guidelines. Fair means the dam has one or more components that require maintenance. Poor means a component of a dam has deteriorated beyond maintenance and is in need of repair.

Location

Neither the Kingston Campus nor the Narragansett Bay Campus have dams on their property. However, the University does own a low hazard dam at the W. Alton Jones campus which is located in West Greenwich, RI, 13 miles northwest of the Kingston Campus. This research site is a 2,300-acre forested laboratory.

47 2021 Annual Report to the Governor on the Activities of the Dam Safety Program. http://www.dem.ri.gov/programs/benviron/compinsp/pdf/damrpt21.pdf

Probability of Future Occurrence

Possible.

Extent (Event Magnitude)

The extent of a failure would vary. The URI Hazard Mitigation Committee has identified failure as a break in the dam, sending water downstream.

Impact and Damage Extent

Low. The URI Hazard Mitigation Committee recognizes that a dam failure is not a natural hazard in itself but several of the hazards listed in the hazard list could lead to dam failure. Severe winter storms, flooding, and a hurricane could all bring enough rain and or snowfall to cause a dam failure. A failure would impact the hiking trails at Arcadia State Park as well as URI research sites.

Climate Change Impacts

Related to flooding, more intense rain events may stress the structural integrity of dams which would lead to failure.

History

There is no history of this dam at W. Alton Brown campus failing.

Climate Change

Changing climate patterns globally and in Rhode Island will worsen the effects of natural hazards and affect future planning and mitigation efforts. Changes are already being observed and documented. Long-term climate change is likely to cause the following impacts at the URI Kingston and Bay campuses:

- Heavier, more frequent precipitation events, which may cause more street flooding, stream flooding, and flash flooding events.
- Longer periods of drought which may affect water availability and increase the threat for wildfires.
- More frequent high heat days and heat waves which stress the populations and the electric grid.

How rapidly these changes will be felt is debatable but there is certainty within the state that municipalities need to be prepared. The University aims to become more adaptable/resilient to the changing conditions.

Through the exercise of creating this plan, the University of Rhode Island is exploring ways to reduce their long and short-term risks to a variety of hazards. Any storm that comes up the eastern seaboard will likely impact the town. As climate conditions intensify, the HMC is prepared to update this Plan accordingly.

4

Risk Assessment and Fiscal Analysis

Asset Inventory

The first step in the assessment process was to create the inventory of facilities and resources of special concern to the University. The HMC identified the following as community assets:

- Flood prone drainage systems, streets, or infrastructure
- Wastewater facilities
- Water supply systems
- Electric utilities
- Steam utilities
- Other utilities
- Communication equipment
- Critical municipal hazard response facilities
- Transportation
- Residential housing
- Dams
- Recreation facilities
- Natural resources
- Historic resources

During the review of these assets, the HMC came to the conclusion that not all of these are so vulnerable they require a new mitigation action within the next 5 years. For some, assets, the university will continue with ongoing actions. As infrastructure ages, and climate conditions change, the HMC will update this Plan accordingly.

These most vulnerable assets are identified in the Community Assets Matrix located at the end of this section.

Hazard Mitigation Mapping

GIS data for the Towns of South Kingstown and Narragansett were utilized to analyze the potential risk from natural hazards. The use of the mapping data allowed the HMC to estimate potential fiscal and population impacts for each campus.

The final output of this exercise is the University of Rhode Island Community Assets Map in Appendix C. The focus of the maps is not to duplicate all of the spatial information generated through the inventorying process but rather to present the location of the identified risks as they relate to the University's response facilities.

The university has also begun inventorying its critical infrastructure in the Rhode Island Coastal Hazards Modeling & Prediction (RI-CHAMP) system, which can simulate the effects of winds and inundation from major storms. RI-CHAMP was used to simulate the effects of a major hurricane on coastal infrastructure at the Narragansett Bay Campus without significant impacts.

Flood Risk

Although wind and heavy snow can certainly produce substantial damages, nuisance flooding is one of the hazards that most frequently affects the University population. The university's building footprint data and FEMA's 1% annual chance floodplain data were utilized to generate estimates of potential fiscal impacts from flooding. The analysis showed the only build structures within the VE Zone are the pier and Aquarium Pump House. Further inland, the Blount Aquaculture Research Lab, the Marine Ecosystem Research Lab, and the Aquarium are all located in a 0.2% annual chance flood hazard area. There are no structures located in the regulatory floodplain on the Kingston Campus.

The beach parking lot at the Narragansett Bay Campus frequently experiences nuisance flooding but flooding on either campus has not impacted University operations. As sea levels rise and climate conditions change, this may prove to be different in the future.

Estimating Losses

Estimating the losses from flooding or any other natural hazard effecting the University is challenging. For the purpose of this Plan, campus assets have been put into one of the following categories:

- Built environment
- Social and academic assets
- Essential services and facilities
- Population
- Natural environment

Built Environment

This plan does not specifically address NFIP insured structures within URI Kingston or Bay campuses because it is not a requirement of FEMA grant funding. The University is a state-owned facility and thus is self-insured. However, URI acknowledges the Town of South Kingstown and the Town of Narragansett's participation in the NFIP and complies with their regulations.

The asset inventory is based on a building footprint data file which was provided by URI and 246 built structures across the two campuses.[48]

If any or all of these structures were to be damaged during a natural disaster, the university would have to provide an estimate of how much it would cost to replace the buildings. Using guidance from the Facilities Performance Indicators 2.0 (FPI), the APPA (formally the Association of Physical Plant Owners) estimates $950/ gross square foot building replacement value (BRV) to estimate the cost to build a comparable structure. This does not include contents or loss of business. A more accurate assessed value from can be used if available. For baseline planning purposes only, the BRV for the two campuses is over $5 billion.

Table 22 Built Environment

Campus	Number of Built Assets	Total Area (Square Feet)	Comments	Minimum BRV
Kingston: Main	205	5,195,687	Includes residences, academic and service buildings, utilities, athletics, out buildings, and others.	$5 billion
Narragansett Bay	41	326,207	No residences	$310 million

Source: URI Building Footprint GIS shapefile, supplied by URI Facilities Group July 2022.

Campus Buildings

Kingston Campus

The University of Rhode Island Kingston Campus has approximately 205 buildings, mostly with brick, stone, or granite façades.

[48] This does not include buildings which are located within the campus but are not university owned.

Overall, the University has 24 residence halls, 11 student apartment buildings, the President's house, and 5 buildings with available living space (Gate House, 22 Upper College Road, Texas Instruments House, John Grandin International Engineering Program House, and the Kingston Fire Station), for a total of 40 residential buildings on campus.[49]

The FEMA Flood Insurance Rate Map (Community Panel Number 44009C0185J) dated 04/03/2020 indicates a Zone A on University property. The Zone A floodplain is located east of the athletic complexes along White Horn Brook and vegetated buffer area. There are no built structures in the regulatory floodplain at the Kingston Campus.

Bay Campus

The buildings at the Narragansett Bay Campus were constructed between the 1932 and 2017, and total approximately 321,000 gross square feet of space. There are approximately 41 buildings on the Bay campus; their structural systems include wood, masonry, steel and concrete, as well as combinations.[50] The buildings contain a mix of offices, research laboratories, classrooms, and meeting spaces.

There are no residence halls on the Bay campus.

"The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Mapping and Flood Study for the Town of Narragansett (Community Panel Number 44009C0206J, dated October 16, 2013 and Flood Study 44009CV001B, dated October 16, 2013) indicates a Zone X along most of the eastern edge of the Campus. This zone is identified as areas of 0.2 percent annual chance flood; areas of one percent annual chance flood with an average depth of less than one foot or with drainage areas less than one square mile. Transect lines in the Flood Insurance Study identify the elevation of the one percent annual chance flood to be 10.6 feet North American Vertical Datum of 1988 (NAVD88). There is also a Zone VE, coastal flood zone with velocity hazard, at elevation 16 (NAVD 88)."[51] The only build structures within the VE Zone are the pier and Aquarium Pump House. Further inland, the Blount Aquaculture Research Lab, the Marine Ecosystem Research Lab, and the Aquarium are all located in a 0.2% chance flood hazard area.

The Narragansett Bay Campus is at risk from sea level rise and will become more vulnerable in the future. This is a result of exposed, low-lying land and increased sea level elevation. Over time, campus facilities could be exposed to or inundated with saltwater. Roadways throughout campus could also become unstable and jeopardize vehicle movement. The university's RI-CHAMP system can be used to simulate the effects of future storms on this infrastructure.

Electrical and Telecommunication Systems

The Kingston Campus Distribution System is comprised of a 4,160V distribution system network of eighteen primary feeders connected to five substations.

[49] 2000 Kingston Master Plan

[50] URI Narragansett Bay Campus Master Plan

[51] Ibid

Electrical and telecommunications services on the Narragansett Bay Campus are provided by RI Energy and Verizon respectively. Electrical service is three-phase. Both services are overhead on South Ferry Road and on the west side of the western section of Pier Road. Overhead electric service continues through the southernmost portion of campus in a haphazard manor adjacent to Aquarium Road. There is a significant network of underground telecommunications services throughout the campus connecting most campus buildings. Portions of the electrical distribution system is underground in the campus core and for many individual building services. [52]

Redundancy has improved the resilience of these systems vulnerability to lightning strikes, ice storms, and other hazardous events.

Estimating potential losses is challenging. The value of the equipment alone for both campuses is estimated to be at least $100 million.

Stormwater Management, Sewer System, Water System, Steam, and Natural Gas

Kingston Campus

The Kingston Campus is served by an array of open and closed drainage facilities, including over 900 catch basins, 300 drainage manholes, several structural stormwater best management practices (such as rain gardens and vegetated buffers), and 89 system outfalls. These facilities comprise the University's MS4, which is operated and maintained in accordance with URI's SWMPP and the RIPDES Small MS4 General Permit. Runoff collected and conveyed by campus drainage systems is ultimately received by the natural watercourses with watersheds intersecting the developed campus, i.e., White Horn Brook and the Chipuxet River.[53]

The University of Rhode Island sewer system primarily serves University-owned properties. University sewage is gravity fed through a university-owned conveyance system to the South Kingstown-owned Kingston pump station. From there it is sent to the South Kingstown wastewater treatment plans in Narragansett. Manholes pipes and cleanouts are all maintained by staff and third-party contracts.[54]

The University owns and operates three wells that pump from the local aquifer into the water distribution system. The University operate a million-gallon storage tank that provides pressure and volume for domestic use and fire protection. Additional assets include control, monitoring and treatment equipment. All the distribution pipe, valves and hydrants are maintained by URI staff and third-party contracts.[55]

[52] URI Narragansett Bay Campus Master Plan for Renewal

[53] URI Stormwater Master Plan 2018

[54] Utility Information Matrix, 2017

[55] Utility Information Availability Matrix, 2017

URI operates a dual fuel (natural gas an oil) steam plan including associated distribution, treatment, and monitoring equipment.

URI owns and operates three natural gas master meter stations and associated systems on the Kingston Campus. Buildings served are generally sub-metered but not all. URI currently has approximately 20 submeters.

The value of the equipment alone for the Kingston campus is estimated to be at least $100 million.

Bay Campus

The stormwater management system on the Narragansett Bay Campus is largely made up of catch basins and outfalls which generally flow from west to east, toward the shoreline south of the pier.

The Narragansett Bay Campus has a gravity fed sanitary sewer system which collects sanitary and lab waste services from campus buildings. The gravity system generally runs from the higher elevations along the west and northern sides of campus down gradient to the pumping station located just south of the Aquarium Ark Building. The system eventually connects to the Town of Narragansett sanitary sewer main.

Water service is provided to the Narragansett Bay Campus by United Water Rhode Island (SUEZ) from a 300,000-gallon water storage tank located immediately north of the campus at the end of Tarzwell Drive. The water storage tank is located on property owned by the Board of Trustees of State Colleges. There are two water mains in South Ferry Road feeding the campus, including a 12-inch main that appears to be for fire service only. This water main feeds the campus and the hydrants along South Ferry Road. There is another six-inch main in Tarzwell Drive that provides water to the campus from the water storage tank.[56]

Gas service to the campus is provided by RI Energy. There are mains located in South Ferry Road, adjacent to the western section of Pier Road, in a portion of the southern section of Pier Road, and in the northern section of Aquarium Road, as well as spurs off these primary distribution mains for individual services.[57]

The value of the equipment alone for the Narragansett Bay campus is estimated to be at least $50 million.

Future Land Use

Future land use for both campuses will be incorporated into Campus Master Plan updates. As economic stressors such as decreased funding and tuition increases, the University is preparing for the future by selectively reconfiguring existing facilities and developing new facilities to face these challenges. New academic and administrative spaces should build upon the vision of creating a "green" campus.

[56] URI Narragansett Bay Campus Master Plan for Renewal

[57] URI Narragansett Bay Campus Master Plan for Renewal

URI's vulnerability to natural hazards is not expected to change dramatically over the next five years due to increased development. Enforcement of current building codes and smarter building will ensure that development will be stronger and more resilient than some of the older, historic structures at the University.

Social and Academic Assets

Campus Research

The University of Rhode Island is a state-of-the-art research facility, home to 22 active Research Centers and six active Research Institutes. URI maintains several special collections, including rare books, Rhode Island State books and political papers, oral histories, Episcopal Church records, manuscripts and personal papers, and archives for commercial patterns. In addition, the university is home to an extensive special collection of textiles and costumes, consisting of almost 20,000 objects and artifacts.

Many if not all of the objects and items found in these special collections are irreplaceable. The value of these objects is based almost entirely on what a willing buyer and a willing seller would agree to paying for such an item; this market value will fluctuate. As such, defining a value for individual pieces or for the collections as a whole is impractical with the data currently available.

Additionally, a similar problem exists in assigning of a value for research specimens, including animals. The specimens and animals used in the plethora of research programs at URI are not replaceable in their current manifestation or generation. It may be possible to replace earlier generations of both specimens and animals, but it is not possible to replace the generation that currently exists.

Due to the difficulty of placing a value of these items, these specimens, animals, objects, and collections will not be considered further in this Plan. Future updates to this Plan may reconsider the treatment of these collections and may opt to include them in future risk assessments.

Historic Buildings

The National Register of Historic Places has recognized the University's quadrangle on the Kingston Campus as great historic architecture worthy of preservation. The entire URI Historic district is approximately 29 acres and includes the Quad. These historic structures are particularly vulnerable to high winds and lightning strikes, as they are primarily wood-frame construction and are close together than modern residences.

The replacement value of the buildings alone could be estimated at $950/square foot but that does not consider the loss of the historic artifacts should a building be destroyed in a storm.

University Athletics

URI is a Division I school with the following athletic facilities on the Kingston Campus used for college sports, club teams, and intramural competition:

- Bill Beck Field
- Boss Ice Arena
- Keaney Gymnasium
- Mackal Field House
- Meade Stadium
- Ryan Center
- Tootell Aquatics Center
- RI Soccer Complex
- URI Softball Complex
- URI Tennis Complex

The replacement value of the athletic buildings alone could be estimated at $950/square foot but that does not consider lost business associated with the athletic facilities.

Essential Services and Facilities

In extreme circumstances, essential services can be relocated if their headquarters or office buildings are impacted by a severe storm. Similar to other buildings, a baseline Building Replacement Value of $950/square feet can be used for loss estimation.

Emergency Operations Center

The University Emergency Operations Center (EOC) is located at 44 Lower College Road on the Kingston Campus. The EOC is staffed only during an emergency or campus-wide event. The EOC is in a building that is not hardened in terms of security or storm resistance.

In the event of an emergency that affects the URI community, a pre-recorded information line is activated and can be called from any working phone. Users can also get emergency information on the university's website as well as through the University's Facebook page and Twitter feed. Email notifications are also sent to all registered users. The University also employs the URI Emergency Notification System (ENS) which dispatches messages simultaneously via voicemail, text-messaging, and email to the entire student, faculty, and staff population within minutes.

Health Services

URI Health Services, located in the Potter Building, provides students with a wide range of medical and mental health services, as well as wellness education programs. Health Services has approximately four doctors and 11 nurses on staff.

Fire Station

The Kingston Fire Company is an all-volunteer department servicing the University and village of Kingston. There are approximately 31 volunteers. The department maintains 1 ladder truck, 1 heavy rescue, 2 engines, and a pick-up truck.

The Narragansett Bay Campus is served by the Narragansett Fire Station 3.

Police Station

The URI Police Department operates within the Department of Public Safety. Officers maintain around the clock armed patrols at the Kingston Campus and answer calls for service at the Bay campus. The main location for the department is at 85 Briar Lane on the Kingston Campus.

The Narragansett Bay Campus is served by URI Police.

Future Services and Facilities

The existing critical hazard response facilities should be equipped to maintain operations during power outages and severe weather. This would require additional generators at select locations. See *Mitigation Actions*.

In a growing digital age, the campus community relies heavily on the electric utilities. The reliability of the system at the Kingston Campus can be improved to become more resilient during extreme weather and increased stress loads. *See Mitigation Actions*.

Population Impact Analysis

Of primary concern during a hazard event is protecting the health and safety of URI students, faculty, and staff. In addition to knowing the total and seasonal population, it's also important to estimate how many people would be impacted by loss of service or need to evacuate.

In addition to nuisance flooding, snow-covered roads and walkways have historically proved to be a safety concern on both campuses. Even a light dusting of snow that is not cleared can freeze into a thin sheet of ice. The University Lands and Grounds staff work to keep walkways and roads clear for pedestrians and motorists.

Kingston Campus

The residence halls are clustered in the middle of campus between the athletic area and the academic zones. During the academic school year, there can be upwards of 5,600 undergraduate

students living on the Kingston Campus. These students are largely housed among 24 residence halls in the center of campus between the athletic facilities and the quadrangle. During the summer months, this number is decreased. Throughout the year, faculty and staff are working on campus.

A significant hazard can significantly cripple the university. In addition to direct damage to infrastructure, impacts can include the disruption of vital services, the loss of utilities, and the emotional strain from the disruption. This is especially jarring when students are forced to evacuate their dorms. The most common challenge in the winter is keeping the walkways safe for pedestrian traffic. The URI HMC has identified multiple ways to better educate the URI population about storm safety and how to receive emergency notifications. See Section 6.

Narragansett Bay Campus

There are no student housing facilities at the Narragansett Bay Campus but there are students, staff, faculty on campus throughout the year. The proposed all hazards education mitigation action in Section 6 is intended for populations at both campuses.

Future Population Changes

The University does not anticipate large shifts in the campus community population but as climate conditions change, there will continue to be vulnerabilities. Students and staff unfamiliar with the area or emergency procedures may be more at risk. See *Mitigation Actions*.

Natural Environment

Kingston Campus

The natural resources at the Kingston Campus serve critical functions for the environment as well as to provide a sense of place and institutional image. The diversity of native vegetation, reflective of topography, soils, and hydrology distinguish areas of floodplain forests, wet meadows, and upland forests that encompass the developed campus, and recall the historic qualities of the original Oliver Watson Farm. Scatterings of stone walls and rock outcroppings, characteristic of the rural New England landscape, contribute a sense of place and identity, unique to the University's geographic location. Campus expansion, lack of capital investment, and deferred maintenance have eroded some of the open space areas. [58]

Prominent natural features in the Kingston Campus include White Horn Brook, open fields, botanical gardens, and a campus-wide arboretum

The biggest threats to the natural environment at the Kingston Campus are development pressures, and non-point source pollution.

[58] URI Kingston Campus Master Plan 2000.

Narragansett Bay Campus

The URI Narragansett Bay Campus is less developed than the Kingston Campus; bounded by Narragansett Bay to the east and undeveloped woodlands to the west and south. Key natural elements on the Narragansett Bay Campus include:

- Coastal Bank and Cobble Beach
- Coastal Buffer Zones (a natural area adjacent to a shoreline feature that must be retained in or restored to a "natural" vegetative condition)
- Freshwater wetland

Rhode Island has experienced a significant increase in both flood frequency and flood severity over the past 80 years. Climate change is expected to result in more frequent heavy rains, affecting stream flow.[59]

Severe weather events can impact the natural environment and include loss of habitat, erosion, damage to trees, threats to ecosystems/ species, and contamination of potable water supply.

Future Vulnerability

As climate conditions change, increased storm intensity or frequency coupled with rising sea level may put considerable stress on the infrastructure and population at the Narragansett Bay campus. Drainage infrastructure on both campuses may be overwhelmed more often during more intense rain events.

Longer periods of elevated heat during the summer will cause increase stress on the University community and energy infrastructure.

Community Assets Matrix

The matrix (Table 23): Critical Infrastructure/Community Assets represents the culmination of the risk assessment process and is the final product. Its purpose is to gather all the pertinent results in one place for ease of presentation and to serve as a starting point for discussion of specific mitigation actions. It not only lists the specific areas of concern, but provides detailed location information, summarizes the applicable hazard, problem, and mitigation benefits.

59 Rhode Island's Environmental Climate Change Coordinating Council (EC4) Science and Technical Advisory Board, *Current State of Climate Science in Rhode Island,* May 1, 2016 Microsoft Word - STAB_Ann_Rpt_Final.docx (ri.gov)

Table 23 URI Critical Infrastructure/Community Assets at the Kingston and Narragansett Bay Campuses

Vulnerabilities	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
Flood Prone Drainage Systems, Streets, or Infrastructure	Kingston Campus: -Butterfield Rd. -West Alumni Ave. -Complex Road (behind Fascitelli Fitness and Wellness) -Meade Stadium (White Horn Brook) -East side of Keaney Parking Lot Bay Campus: -Pier Road (lower area) Stormwater system	Heavy rain Flooding (Street)	Retention areas at the bottom of the hill on Kingston Campus (lower campus). Project on Pier Road will elevate the road. Raising pier by 5ft. Catch basin cleaning. Health and Wellness Center will incorporate stormwater management. Butterfield Rd./White Horn Brook stormwater improvements.	1. Improve flood resilience of university assets. a. Prioritize flood vulnerabilities based on criteria such as age of the facility, value of operations, etc. b. Take action on identified areas.
Wastewater/Sewer	Conveyance system that transports sewage by gravity to South Kingstown pump station. Sewer lift station at Bay Campus.	Nor'easter Hurricane Flooding When White Horn Brook floods, it infiltrates the wastewater system and increases volume to the system. Coastal flooding could infiltrate system	Routine inspections and deployment of infiltration mitigation items.	2. Improve sewer line along White Horn Brook. a. Condition assessment. Inspect the line b. Line or replace pipe and manholes as needed.

Vulnerabilities	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
Water Supply Systems	3 wells that pump from local aquifer (Chipuxet Aquifer) Storage tank Distribution pipe and equipment	Drought Extreme Heat Power outages related to all hazards.	Drought monitoring and water use restrictions. Tank Maintenance Generator maintenance Continue voluntary and mandatory water use restrictions.	None at this time.
Electric Utilities	Overhead distribution lines and equipment 5 electric substations Campus Distribution System	Hurricanes Nor'easters Extreme Temperatures Lightning Power outages related to all hazards.	Maintain tree trimming and generators. Conservation efforts. Feeder switching provides redundancy. Run generators during brown outs. RI Energy owns Narragansett Bay Campus infrastructure. Plans to move main powerlines on Narragansett Bay Campus to make room for new parking lot. Continue hardening the system, making it reliable. Continuous evaluation.	3. Improve the system reliability at the Kingston Campus. a. Assess the need to add switching options. b. Replace medium voltage cable.

Vulnerabilities	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
			Continue to document locations and update the Enterprise GIS system.	
Steam Utilities	Dual fuel steam plant (natural gas/# fuel oil) and associated distribution system and mechanical rooms on Kingston Campus.	All hazards that lead to: Fuel supply interruption Steam line failures Condensate line failures Mechanical equipment failures Power outages	Maintain Fuel supply Contracts and maintain Infrastructure Maintenance and repair of plant, distribution system and mechanical rooms. Maintain generator and fuel oil delivery services. Maintain backup fuel oil. Life Cycle Replacement (track the age and condition of aging pipe before it fails).	None at this time.
Other	Research nuclear reactor located at the Narragansett Bay Campus (not owned by URI).	Earthquakes (However, large earthquakes are not often experienced in the area.)	Emergency Action Plan on file with the State. New site license application underway. Emergency response equipment cabinet located at the Narragansett Bay Campus.	None at this time.
Communication Equipment	URI Emergency/ALERT Emergency Phone network ("blue light phones')	Heavy rain. Lightning	Redundant Kingston system. New as of Feb 2020 – dual campus entry points,	4. Assess all-campus alert and blue light infrastructure for

Vulnerabilities	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
		Power outages related to natural hazards.	generator and UPS protected. Monthly Generator testing, system vendor maintained and tested.	reliability and compatibility.
Critical Municipal Hazard Response Facilities	Department of Public Safety, 44 Lower College Rd. URI Emergency Medical Services, 565 Plains Rd. EOC located at 44 Lower College Road. Police Department at 85 Briar Lane Kingston Fire Department at 35 Bills Road Alumni Facility: dispatch community services. Good for press conferences. Equipment garage: Auto facility for repairs, and storage facility Maintenance/equipment garage on Bay Campus. Security office Shelters: Memorial Union and Keaney Gymnasium Mobile Communication Unit Shelter Trailer	All hazards.		5. Install a generator at Plains Rd. (Environmental Health & Safety Building) 6. Install a generator at the URI Alumni Center on Kingston Campus.

Vulnerabilities	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
	RIEMA Trailer on Main Campus OSEC building for press conferences			
Transportation	Campus shuttles Parking lots Parking Lot at URI Narragansett Bay Campus Beach (URI-owned beach) Emergency access for boat launches/beach access	Winter storms and ice Heavy rain and associated flooding. Coastal erosion	Pervious parking on Kingston Road.	None at this time.
Populations	Students and employees located at Kingston Campus Students and employees at Bay Campus. No housing at Bay Campus. Visitors (especially for sporting and entertainment events) The expectation is the population of students living down the line and in Narragansett bay will be taken care of by URI, not the local police/emergency management should sheltering/evac be necessary	All hazards.	Emergency ALERT	7. All-hazards education program for students. a. Design and implement an employee hazard training using a web-based platform. b. Design and implement a student hazard training using a web-based platform. c. National Incident Commander Training for Senior Leadership. d. Add Emergency Management intro to onboarding video.

Vulnerabilities	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
Residential Housing	40 residence buildings at Kingston Campus › 24 residence halls › 11 student apartment buildings › The President's House › 5 other buildings with housing.	Power outages related to natural hazards.	Generator Project for RW Complex. Fire Watch policy Maintaining quarantine plans. Temporary relocation during power outages.	8. Conduct an inventory shelter in place supplies at residence halls. Build out capacity as needed.
Dams	Old Mill #3 in West Greenwich at Alton Jones Campus (low hazard dam)	Flooding	Maintain spillway	9. Old Mill #3 dam (Louitt Pond) a. Monitor and notify RIDEM if necessary. b. Assign a person for valve operation and release.
Recreation Facilities	Ryan Center Tootell Aquatic Center Mackal Field House Bradford R. Boss Ice Arena Fascitelli Fitness/Wellness Outdoor Recreation Fields URI Sailing Center (Robert P. Arrington Sailing Pavilion)- located in nearby South Kingstown. Campanella Rowing Center in nearby North Kingstown Narrow River/Middle Bridge-women rowing area.	All hazards.	Ongoing maintenance. Campus-wide Emergency Operations Plan. Every building has their own Building Emergency Action Plan (BEOP)	None at this time.

Vulnerabilities	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
	Bike Path Northwoods Challenge Course			
Natural Resources	White Horn Brook Wetlands Coastal bluff Beach Farmland (Agronomy, Peckham, East Farms) Alton Jones- woods? North Woods	Nor'easters Hurricanes High winds Drought Lightning Tornadoes Brushfire	Paton/Student-led management at North Woods. Outdoor lab for sciences. Stormwater management areas have become vibrant habitats. Maintenance on WHB to prevent flooding. Manage sediment.	None at this time.
Historic Resources	Kingston Village Historic District Henry Eldred Farm Fayerweather Blacksmith Site (Moorsefield Rd.) Lambda Chi Site (Kingstown Rd.) URI Quadrangle Oliver Watson Farmhouse (c. 1796) Taft Hall (1889) College Hall/ Davis Hall (1890/1895) "Old Ben Butler" Civil War Cannon (186, brought to campus in 1892) Lippitt Hall (1897) East Hall (1909) Ranger Hall (1914) Washburn Hall (1921) Bliss Hall (1928) Edwards Hall (1928)	All hazards.	Repairs as needed.	10. Restore bunkers to original condition.

Vulnerabilities	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
	Rodman Hall (1928) World War 1 Memorial Gateway (1922 and 1928) President's House (1931) Green Hall (1937) Quinn Hall (1937) Eleanor Roosevelt Hall (1937) Robert L. Carothers Library and Learning Commons (1964, 1975, 1992, 1993) Five Bunkers at GSO (WWII)			

5

Programmatic Capabilities

Purpose

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

Primary Plans, Regulations, and Departments

Plans

Business Continuity of Operations Plan (COOP): University operations should be performed efficiently with minimal disruption, especially during an emergency. The plan provides an overview of continuity of operations efforts. Departments have further specific plans outlining procedures necessary to maintain essential services on a day-to-day basis. Although the COOP and department plans are regularly reviewed, their visibility throughout departments can be improved upon.

Capital Improvement Plan (CIP): Updated annually, the current CIP for the period 2024-2028 is under consideration by the Governor's Office and Legislature. The CIP prioritizes public infrastructure projects over five years. Capital expenses include new or expanded physical facilities that are large, expensive, and permanent. Examples include renovation of the Narragansett Bay Campus, fire safety improvements, stormwater utility upgrades, a new

residence hall, and energy saving improvements to campus buildings. Such projects are expensive and cannot normally be financed on a "pay-as-you-go" basis. Actions identified in this tool are reviewed when updating the natural hazard mitigation plan.

Emergency Operations Plan: This plan addresses the response to extraordinary emergency situations associated with natural, man-made, and technological disasters. The URI Emergency Operations Plan further addresses pre- and post-disaster strategies to effectively deal with the hazards addressed in this plan such as hurricane and flooding evacuation, public warning and sheltering during natural disasters. URI's plan combines mitigation, preparedness, response, and recovery. Future revisions of the EOP by the URI Emergency Management department will continue to incorporate mitigation activities; including those listed in the Plan. This plan is reviewed and updated every few years to include changes in policy, new information, or changes in hazard threats.

Emergency Public Information and Warning Plan: Emergency Notification System ("Rave"), URI Website, email notification, campus voicemail, hotlines, media outlets, Emergency "All-Campus Alert" blue-light phone network.

Kingston Campus Master Plan: The previous URI Campus Master Plan (2000) provides design guidelines and policies for current and future development of the University's buildings, grounds, and infrastructure. The new plan is under development to help guide future land uses.

"The Master Plan proposes four broad elements of a vision for the future of the University of Rhode Island.

1. First, the University should seek opportunities in every project and initiative to cultivate a sense of community among its faculty, students, and staff.
2. Second, the University should recognize the value of its varied resources–from physical resources like land and buildings to human resources like a world-class faculty and an energetic, diverse and vibrant student body–to ensure that those resources are employed most effectively.
3. Third, there should be a demonstrable match between programs and facilities across all departments and divisions of the University, to ensure that core programs are housed in adequate facilities regardless of trends in funding for particular disciplines and programs.
4. Finally, the University of Rhode Island should build on its national reputation as a center for excellence in environmental education by seeking every opportunity to create a "green" campus, to put into practice in the physical environment the ideals developed in the classroom, in the laboratory, and in the field."

As a note, the Kingston Campus Master Plan is not current and is scheduled to be updated.

Land Use and Zoning Regulations: As a public institution, the University does not have any zoning regulations for land use, set back requirements, or required planning board review for development. Any subdivision of land is managed through the Planning Department.

Landscape Master Plan: The scope of the Landscape Master Plan (2017) encompasses open space, pedestrian circulation, balancing the needs of pedestrians and vehicles, bicycling, stormwater management, historic preservation, sustainability, identity, tree management,

and landscape maintenance. The plan identifies priority improvement projects for Hammerschlag Mall, the historic Quadrangle, the Elephant Walk, and the Chafee Green; all of which have the potential to be transformative for campus socialization, use for education, and environmental benefits.

Narragansett Bay Campus Master Plan: This is a strategic plan (2016) for renewal of the entire Bay Campus. The plan incorporates recommendations for new and renovated buildings, site and landscape improvements, and sustainable and energy-saving building operation systems. The plan makes recommendations for eliminating poor-quality buildings and consolidating functions to create more collaborative, flexible and energy efficient environments, separating pedestrian and vehicular circulation, improving service access, and creating a pedestrian campus core; for enhancing the overall campus landscape quality and coastal resiliency, and improving drainage and other utilities. An updated plan would help guide future land use considerations at this coastal campus.

Stormwater Master Plan: The Drainage Master Plan for the Kingston Campus (2018) was developed to guide planning, policy, and management as they relate to stormwater management and natural resource protection/restoration.

Strategic Plan: The 2023-2033 Strategic Plan provides strategic direction, a set of four broadly defined goals critical to the evolution of the University. Goals include broadening our impact through a reinvigorated commitment to our land- and sea-grant missions and the state of Rhode Island; enhance student achievement by cultivating an engaged and inclusive learning environment; foster an inclusive, people-centered culture; and implement leadings-edge administrative and financial systems and practices to power the university of the future.[60]

Strategic Plan for Campus Sustainability and Climate Action: This Strategic Plan (2017) organizes the University's sustainability actions that focus on academics and research, engagement and outreach, and greenhouse gas emissions. The plan is reassessed annually and updated as needed to ensure that the goals, strategies, and tactics described continue to be relevant and realistic.

Transportation and Parking Master Plan: The 2018 URI Transportation and Parking Master Plan (TPMP) establishes an implementation strategy that allows the University to grow while enhancing mobility, campus character, and aesthetics through environmentally sustainable and low impact smart growth strategies. The parking vision established in the plan is dependent on a bold approach to providing a seamless transit system for efficient movement of the university population and visitors within the campus proper, but equally important, to regional points of interest and connections. Implementation is an ongoing effort. Once implemented, the campus transportation system will be efficient, regionally connected, and sustainable.

URI Climate Action Plan: This Climate Action Plan (2010) aims to support the university's carbon neutrality efforts. The plan presents a series of mitigation actions and prioritizes

[60] *A Strategic Vision for the University of Rhode Island. Strategic Plan 2023-2033*. https://web.uri.edu/president/wp-content/uploads/sites/2061/StratPlan2023_Brochure_FINAL.pdf

those which may result in significant greenhouse gas emissions reductions. This plan should be updated as the University's greenhouse gas inventory is updated.

Departments/Divisions

Although not an exhaustive list, the following university departments and divisions play a role in either financing hazard mitigation actions, implementing mitigation actions, or supporting efforts to make the campus community more resilient to the impacts of natural hazards.

The University works as its own self-governing system independent of municipal ordinances but within the jurisdiction of the State. In order for mitigation to be successful, participating departments should meet annually to discuss potential hazard risks and the status of the identified actions. The challenge across all departments will be prioritizing hazard mitigation during "blue sky days" and when there are other competing demands for people's time. As a whole these departments and divisions could always need more funding and staff but keeping hazard mitigation relevant may prove to be more difficult in some departments than others. In order for these actions to be funded, it will be important for them to be included in the Office of Capital (OCP) and Office of Small Projects (OSP) budgets.

Administration (President): The university's President will ultimately be approving and adopting this Hazard Mitigation Plan.

External Relations and Communications: Upholds the URI brand and ensures that messaging being distributed internally and globally is clear, concise, and consistent.

Facilities Group: Within the Administration and Finance Division, this group encompasses a dynamic array of departments that work as a team to deliver a spectrum of critical facility services to the University enterprise on all campuses.

> **Planning and Real Estate Development**: Planning and Real Estate Development consists of three groups – Planning and Real Estate Development, Campus Design, and the Office of Space Allocation and Analysis. It is the goal of this office to create an environment that promotes teaching, learning, and a sustainable and integrated community at the University of Rhode Island while advancing the strategic initiatives of the University.
>
> **Office of Capital Projects (OCP):** Manages the many stages of all major capital construction on campus, including some planning and design of major engineering projects. This is a potential funding source for mitigation projects.
>
> **Office of Small Projects (OSP):** Manages minor renovation and construction projects across all URI campuses. This is a potential funding source for mitigation projects.
>
> **Facilities Operations**: Manages university resources to perform day to day maintenance and up-keep of the Kingston campus to ensure an environment and infrastructure that support the teaching, research, and outreach mission of the University.

Department of Housing and Residential Life: This department oversees about 5,500 students in 34 undergraduate residence halls, three undergraduate apartment complexes,

and one graduate apartment complex. The department works closely with the Department of Public Safety to ensure the safety of all residents. Fire drills are held twice each semester.

Department of Public Safety: The division is responsible for the safety and security of the students, faculty, staff, and visitors work together to protect them against injury, fire, and other threats and to ensure that the University continues its mission in a safe environment.

University Police and Security: Provide community policing, patrol the Kingston Campus 24/7 and answer service calls at the Narragansett Bay Campus and W. Alton Jones campus. The URI Police Department works closely with the other divisions of the Department of Public Safety as well as other academic departments and the Dean of Student's Office, Student Affairs, and Housing and Residential Life.

Parking and Transportation Services: The university-owned Rhody Shuttle Service is available around campus Monday through Friday from 7:30am to 8:00pm to visitors, students, faculty, and staff. The availability of this service is helpful to keep pedestrians out of inclement weather and extreme heat.

Environmental Health and Safety: The Environmental Health and Safety (EHS) Office is responsible for the development and implementation of programs aimed at protecting the safety and well-being of the university community as well as maintaining compliance with federal, state, and local occupational safety and health and environmental regulations. The EHS office manages the chemical safety, occupational safety, biosafety, industrial hygiene, hazardous waste, asbestos, radon, and indoor air quality programs.

Fire and Life Safety: The Fire & Life Safety office is responsible for the day-to-day fire safety and code compliance on all four campuses. This area covers all fire safety inspections for dormitories and Greek housing plus the administrative, academic and service buildings on all campuses.

Emergency Management: Provides planning and services for preparedness, response, recovery, prevention, and mitigation and serves as the liaison with other local, state, and federal emergency providers and responders.

Communications and Technology: Dispatchers who monitor a wide array of telecommunications, radio, video, and alarm systems under the direction of the Deputy Chief of Police. The

Administration: Consists of the Director, Assistant Director, Public Safety Administrative Coordinator, and a Fiscal Clerk.

Community Outreach and Education: Coordinates internships and campus-wide training for emergency preparedness. Through this planning exercise, the Hazard Mitigation Committee has realized that more outreach and education for students, faculty, and staff is needed.

Division of Research and Economic Development: The mission of this division is to "enable, support and to safeguard the University of Rhode Island's mission as the state's land- and sea-grant research institution; to accelerate research that will lead to improved

understanding and response to critically important human and environmental health concerns; to catalyze novel research, scholarly and creative pursuits across the university and across all domains of intellectual curiosity, and to support innovative strategic partnerships on a global scale."

Risk Control and Insurance Office: The Risk Management Office is an integral part of the University of Rhode Island. By promoting a culture of compliance and shared responsibility, the mission of the RCI is to manage and protect the university community; its human, physical, natural, and financial assets, and to minimize losses and legal liabilities.

Division of Student Affairs: This division is comprised of the following departments: Campus Recreation, Campus Stores, Counseling Center, Dean of Students, Dining Services, Housing and Residential Life, Health Services, Memorial Student Union, and Talent Development. This division is committed it creating inclusivity and anchoring students in a diverse and welcoming campus that supports a wide range of ideas.

University of Rhode Island Foundation & Alumni Engagement (URIFAE): Secures and manages contributions from alumni, parents, corporations, foundations, and friends on behalf of the University of Rhode Island, engages alumni through programming and communication, and establishes collaborative relationships with companies to encourage access to University resources.

University of Rhode Island Fund 100: Unrestricted state funds such as tuition and fees, state appropriations, unrestricted allocations to departments.

State Programs

Rhode Island Coastal Resources Management Council (CRMC): New development along coastal areas in Narragansett is regulated by Rhode Island Coastal Resources Management Council (CRMC) and the Town of Narragansett.

Rhode Island Capital Plan (RICAP): The Governor recommends $70.6 million in FY 2022 – FY 2027 from the RI Capital Plan Fund to finance asset protection projects. The University uses Rhode Island Capital Plan Fund monies as the principal means of financing building and utility infrastructure repair, replacements, and general renovations. URI is responsible for maintaining 326 buildings constructed over more than 130 years, encompassing 5.8M square feet, as well as the supporting utility infrastructure including University-maintained high voltage electrical, water, steam, sewer, drainage, pavement, hydrant, fire alarm, and security alarm systems.

Rhode Island Department of Environmental Management (DEM) Division of Law Enforcement: The Rhode Island DEM Division of Law Enforcement serves to protect the natural resources and ensure compliance with all environmental conservation laws through law enforcement and education.

Rhode Island DEM Wetland Regulations: The Rhode Island Department of Environmental Management (DEM) is responsible for regulating alterations of the freshwater wetlands throughout the State. Since many floodplains are also wetlands, appropriately managing these resources help maintain proper floodplain function. These regulations ensure that

actions in this plan which alter the physical landscape will not do so at the expense of wetlands.

Rhode Island Department of Health: The Rhode Island Department of Health (DOH), not only strives to prevent disease and increase health and safety, but they also promote the Special Needs Emergency Registry. By voluntarily enrolling in this list, local police, fire, and other local first responders can better prepare for and respond to an individual's needs during a disaster.

Rhode Island Executive Climate Change Coordinating Council: The Rhode Island Executive Climate Change Coordinating Council (EC4) is a 12-member council which assesses, integrates, and coordinates climate change efforts throughout state agencies to reduce emissions, strengthen the resilience of communities, and prepare for the effects of climate change.

Rhode Island Emergency Management Agency: The Rhode Island Emergency Management Agency (RIEMA) is the State agency assigned 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. RIEMA is also the pass-through agency for FEMA mitigation funding.

Rhode Island Enhanced 9-1-1 Telephone System: Both the Towns of South Kingstown and Narragansett, along with the university's own Public Safety Dispatch Center, utilize the state's E-911 system which provides 24-hour public safety communication services from one answering point in North Scituate. Each call is routed to the appropriate response team. The system processes both landline and wireless 9-1-1 calls.

Rhode Island Health and Educational Building Corporation: A quasi-public agency that assists the state's healthcare and private and public educational institutions in gaining access to low-cost financing for facilities construction and renovation.

Rhode Island State Building Code: All municipalities within the State of Rhode Island share a single building code (RIGL 23-27.3-100 et. al.). The Code itself (which incorporates the International Building Code) was last amended in 2012 and provides comprehensive construction requirements designed to mitigate the impacts from natural hazards, such as high wind events. The Code is enforced by the Fire & Life Safety office and provides an additional layer of regulatory control to those discussed above. These codes are applicable for all University properties.

Rhode Island State Fire Code Regulations: URI has adopted the Rhode Island Fire Safety Codes to safeguard life and property from the hazards of fire and explosives in accordance with safe practice. The Code is enforced by the university Fire & Life Safety office as well as the Rhode Island Office of the State Fire Marshal and provides reasonable minimum requirements for fire prevention and protection.

Other

United Way 2-1-1: United Way 2-1-1 in Rhode Island is a free, confidential service that provides information, referrals, and is available in multiple languages. This service connects residents with community services they may need such as childcare, housing, health insurance, and tax preparation.

Federal Programs

Federal Emergency Management Agency: The Federal Emergency Management Agency (FEMA), an agency of the U.S. Department of Homeland Security, coordinates disaster response when local and state resources are maxed out. The agency also provides grant funding for pre-and post-disaster mitigation projects.

The university may look to the following FEMA grants for funding mitigation projects: Hazard Mitigation Assistance Program (HMAP), and Building Resilient Infrastructure and Communities (BRIC).

6

Mitigation Actions

Mission Statement

It is the mission of the university and the HMC to protect and enhance the quality of life, property, and resources by identifying areas at risk from natural hazards and implementing hazard mitigation actions to protect the university community; infrastructure; economy and its historical, natural and cultural resources.

Mitigation Goals

Goals are general guidelines that explain what URI wants to achieve. Goals are expressed as broad policy statements representing desired long-term results. URI's mitigation planning goals include:

- **Goal 1**: Improve capabilities, coordination, and opportunities to plan and implement hazard mitigation projects, programs, and activities to protect public health and safety.
- **Goal 2**: Maintain continuity of operations during and after natural hazard events, including transition to an on-line, electronic, or other type of virtual environment when facilities are inaccessible.
- **Goal 3**: Improve education and outreach efforts regarding potential impacts of hazards and the identification of specific measures that can be taken to reduce their impact.
- **Goal 4**: Pursue opportunities to protect new and existing campus facilities, assets, and infrastructure from identified hazards.
- .

Proposed 2023 Mitigation Actions

The URI Hazard Mitigation Plan Committee (HMC) decided to propose actions that addressed certain vulnerabilities that were identified earlier in the planning process. See Chapter 4.

The worksheets below summarize the specific mitigation actions, who will lead each effort, the timing of each action, and potential funding sources.

After all of the action details were completed, the HMC discussed the priority level of each action. The HMC went through each action and decided if it was a high, medium or low priority for the university community. This helps to generally prioritize needs when funding becomes available or budgeted. Actions that received a high priority ranking would provide more benefits than low priority items. Understanding that priorities can and will change, it was helpful to document what is important at that moment in time. Having this discussion as a group helped the HMC consider maximum benefits to the entire university community, not just individual departments.

The HMC was encouraged to propose a range of mitigation actions regardless of project costs. Some of the less expensive action items may be completed in less time but can still provide a lot of benefit to the university community. Similarly, an overhaul of the All-Campus Alert system can greatly reduce the risk to students and staff in the event of an emergency, yet it will require substantial funds. It is still a high priority for the university to pursue funding and support to get this accomplished. If costs have already been set aside for a particular mitigation action, the HMC prioritized that action to ensure that it was completed and funds were spent in a timely manner.

Funding and staff time will be the determining factors on when various actions are completed. The Committee understands that implementation of many of these proposed actions requires the university to secure external funding.

This HMP includes actions which prevent or reduce the consequences of disaster (mitigation), planning and education (preparedness), improved response in the immediate aftermath of an event (response), and improved restoration efforts (recovery). Those which are true mitigation actions are noted as such. There are necessary planning elements that need to be completed before additional mitigation actions can be considered. The Committee has identified a range of actions below, some of which are planning activities. However, there is a mitigation action identified for each vulnerable area where applicable.

Priority Level

- ***High:*** Reduces the greatest risks, is important to accomplish first. Funding is already available/earmarked.
- ***Medium:*** May need other actions to be completed first. System is currently operational but should be improved before it fails.
- ***Low:*** Less of an impact on safety and property. Other mitigation actions provide more benefits.

Time Frame (from date of plan adoption)

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

VULNERABLE AREA: Flood Prone Drainage Systems, Streets, or Infrastructure

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
1. Improve flood resilience of university assets. a. Prioritize flood vulnerabilities based on criteria such as age of the facility, value of operations, etc. b. Take action on identified areas.	☐Local Plans and Regulations ☒Structure and Infrastructure ☒Natural Systems Protection ☐Education and Awareness	☒1 ☐2 ☐3 ☒4	☒High ☐Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?

University Village Apartments (Grad Village) has experienced flooding during heavy rain events. Improvements to the stormwater infrastructure have reduced the severity of the impacts but the topography still lends itself to flooding. Campus wide, it's important for buildings and campuses to remain accessible and safe for students, faculty, and staff.

- Butterfield Rd. stream crossing.
- White Horn Brook- basement flooding
- During severe rain/ storm events, some facilities downstream (near Brookside apartments and Butterfield Road, have been impacted in the past due to flooding. During some severe events, Whitehorn Brook becomes overwhelmed and unable to adequately drain the campus in a timely fashion.

BENEFITS	OBSTACLES	
Improved resilience to changing climate conditions.		
LEAD/CHAMPION	**SUPPORT**	
Facilities Group	RIDEM, RIDOT	
POTENTIAL FUNDING SOURCES	**ESTIMATED COST**	**TIMELINE**
RI Capital Plan Fund (RICAP)	Assessment: $50,000 Implementation TBD	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

Planned development for Health and Counseling building may offer mitigation opportunities.

No longer have transformers standing in water at the Roger Williams housing complex near Ellery Pond. Not exceeding 100-year flood.

VULNERABLE AREA: Wastewater/Sewer

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
2. Improve sewer line along White Horn Brook. a. Condition assessment. Inspect the line. b. Line or replace pipe and manholes as needed.	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☒2 ☐3 ☒4	☐High ☒Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?
Age, infiltration during rain events (water entering pipes).

BENEFITS	OBSTACLES	
LEAD/CHAMPION	**SUPPORT**	
Facilities Group	HMC	
POTENTIAL FUNDING SOURCES	**ESTIMATED COST**	**TIMELINE**
RI Capital Asset Protection (RICAP) and RI Health and Education Building Corporation (RIHEBC) Bond funds	Inspection: $20,000 Repairs: TBD	☐Short Term (0-3 years) ☒Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

Needs to be done but not critical at this time.

Flooding impacts how much water is in the wastewater stream (not stormwater)

VULNERABLE AREA: Electric Utilities

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
3. Improve the system reliability at the Kingston Campus. a. Assess the need to add switching options. b. Replace medium voltage cable.	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☒2 ☐3 ☐4	☐High ☐Medium ☒Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?

The electrical system is under increasing stress loads. Improvements need to be made to reduce the power outages so that campus operations can continue uninterrupted.

BENEFITS	OBSTACLES	
Improved system resiliency during a power outage or other event compromising the electrical system.	Funding should repairs need to be made.	
LEAD/CHAMPION	**SUPPORT**	
Facilities Group		
POTENTIAL FUNDING SOURCES	**ESTIMATED COST**	**TIMELINE**
RI Capital Asset Protection (RICAP) and RI Health and Education Building Corporation (RIHEBC) Bond funds	Assessment: $100,000 Repair/Replace: TBD	☐Short Term (0-3 years) ☒Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

VULNERABLE AREA: Communication Equipment

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
4. Assess all-campus alert and blue light infrastructure for reliability and compatibility.	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☒Education and Awareness	☐1 ☐2 ☒3 ☐4	☒High ☐Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?

The full system is outdated and not as fully capable as newer models.

BENEFITS	OBSTACLES	
Redundancy and improved messaging campus-wide.	The Emergency alert system is in place and considered effective. Less urgency to update the system.	
LEAD/CHAMPION	**SUPPORT**	
Office of Emergency Management	Information Technology Services (ITS), Facilities Group, Communications	
POTENTIAL FUNDING SOURCES	**ESTIMATED COST**	**TIMELINE**
Fund 100's University carryforward funding	$400,000	☐Short Term (0-3 years) ☒Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

All campus alert is essentially not usable. Cannot record a real time message, all you can do is sound the sirens or used a canned message and system can only be activated by someone physically in the server room where it is located. You can only alert a limited number of blue lights at a time.

VULNERABLE AREA: Critical Hazard Response Facilities

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
5. Install a generator at 177 Plains Rd. (Fire & Life Safety, Alarm Services, Environmental Health & Safety)	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☐1 ☒2 ☐3 ☒4	☐High ☐Medium ☒Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?
Fire alarming and fire safety equipment are in the building at 177 Plains Road; houses functions critical to post-storm recovery. Building is fed by the local power grid—not the campus power grid—and typically waits longer for power to be restored following an outage.

BENEFITS	OBSTACLES	
Redundancy	Existing poor electrical service to the building.	
LEAD/CHAMPION	**SUPPORT**	
Facilities Group		
POTENTIAL FUNDING SOURCES	**ESTIMATED COST**	**TIMELINE**
RI Capital Plan (RICAP)	$100,000	☐Short Term (0-3 years) ☐Medium Term (3-5 years) ☒Long Term (more than 5 years)

OTHER NOTES
Small building, office and storage. May become more critical if that department is needed. Limited ability to operate elsewhere due to paper records and spare parts inventory maintained at this location.

VULNERABLE AREA: Critical Hazard Response Facilities

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
6. Install a generator at Alumni Center at Kingston Campus.	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☐1 ☒2 ☐3 ☒4	☐High ☐Medium ☒Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?

Office space for Communications & Marketing, which serves a critical function before, during, and after any type of campus emergency. Able to hold a press conference (not student space).

BENEFITS	OBSTACLES	
Redundancy		
LEAD/CHAMPION	**SUPPORT**	
Facilities Group		
POTENTIAL FUNDING SOURCES	**ESTIMATED COST**	**TIMELINE**
URI Foundation & Alumni Engagement	Generator: $250,000 Plan: $25,000	☐Short Term (0-3 years) ☒Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

COOP for Alumni Center/Communications in place.
Consider relocating to Memorial Union.

Public Safety Building and Police Building does not have adequate space.

VULNERABLE AREA: Populations

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
7. All hazards education a. Design and implement an employee hazard training using a web-based platform. b. Design and implement a student hazard training using a web-based platform. c. National Incident Commander Training for Senior Leadership. d. Add Emergency Management intro to onboarding video.	☐Local Plans and Regulations ☐Structure and Infrastructure ☐Natural Systems Protection ☒Education and Awareness	☐1 ☐2 ☒3 ☐4	☒High ☐Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?

BENEFITS	OBSTACLES	
Education of students, staff, and faculty so they know either what to do or where to go for information during extreme weather events.		
LEAD/CHAMPION	**SUPPORT**	
Office of Emergency Management		
POTENTIAL FUNDING SOURCES	**ESTIMATED COST**	**TIMELINE**
University's unrestricted Fund 100 budget	$100,000	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

National Incident Management System https://training.fema.gov/nims/

- Identify a Point of Contact for each department.

Add Emergency Management to new student onboarding video.

VULNERABLE AREA: Residential Housing

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
8. Conduct an inventory of shelter in place supplies at residence halls. Build out capacity as needed.	☐Local Plans and Regulations ☐Structure and Infrastructure ☐Natural Systems Protection ☒Education and Awareness	☐1 ☐2 ☐3 ☒4	☒High ☐Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?
Having the necessary supplies available allows occupants to shelter in place and reduces the need to relocate or evacuate campus residents.

BENEFITS	OBSTACLES	
Storage space is limited; additional locations may need to be identified if additional inventory is required.		
LEAD/CHAMPION	**SUPPORT**	
Housing and Residential Life	Office of Emergency Management	
POTENTIAL FUNDING SOURCES	**ESTIMATED COST**	**TIMELINE**
Student Affairs Budget	$50,000	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

VULNERABLE AREA: Dams

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
9. Old Mill #3 dam (Louitt Pond) a. Monitor and notify RIDEM if necessary. b. Assign a person for valve operation and release.	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☐1 ☒2 ☐3 ☐4	☐High ☒Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?
There is currently no one at URI responsible for the dam maintenance or operation.

BENEFITS	OBSTACLES	
Managed water release behind the dam when necessary.	Staff turnover	
LEAD/CHAMPION	**SUPPORT**	
Facilities Group		
POTENTIAL FUNDING SOURCES	**ESTIMATED COST**	**TIMELINE**
Staff time	none	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

Valve has been installed to release water. Assign a person for value operation and release.

Dam is in good shape. There are active outdoor research properties between the dam and Arcadia Management Area that could be impacted as a result of a dam failure.

VULNERABLE AREA: Historic Resources

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
10. Restore bunkers to original condition.	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☐1 ☐2 ☐3 ☒4	☒High ☐Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?

Some of the pre-World War I coastal bunkers are unusable and present safety concerns.

BENEFITS	OBSTACLES	
Historic preservation. Safety hazard. Public safety. Increase visibility of bunkers.		
LEAD/CHAMPION	**SUPPORT**	
Narragansett Bay Campus Facilities	Local historical groups	
POTENTIAL FUNDING SOURCES	**ESTIMATED COST**	**TIMELINE**
RI Capital Plan (RICAP) (funding has been earmarked) Office of Small Projects (executing the project)	Unknown	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

Heavy earth

See: https://www.gso.uri.edu/maritimes/Back_Issues/00Spring/Text(htm)/bunkers.htm

7

Implementation and Adoption

Implementing the Plan

The University of Rhode Island and the URI Hazard Mitigation Committee realize that successful hazard mitigation is an ongoing process that requires implementation, evaluation, and updates to this plan. The university also understands the importance of integrating appropriate sections of the plan into the university's Capital Projects list and emergency management plans. When updated, the university's Emergency Operations Plan and Campus Master Plans will reflect the work done in this Natural Hazards Mitigation Plan.

Adoption of this mitigation plan increases university's eligibility for federal hazard mitigation grants. These grants originate from FEMA's Building Resilient Infrastructure and Communities (BRIC), and post-disaster Hazard Mitigation Grant (HMGP) Programs.

Monitoring and Evaluation

The HMC, under the leadership of the university's Office of Emergency Management, will meet annually (or more frequently if necessary), to monitor and evaluate the actions contained in the plan. During the annual evaluation process, the mitigation strategy will be promoted online for community review. Comments and suggestions will be sent directly to the Emergency Management Director or brought up at the advertised annual meeting.

At each annual meeting, the committee members will discuss the actions assigned to them to ensure continual progress with mitigation efforts. The planning process and status of each mitigation action will be documented in a spreadsheet, and minutes recorded for the record. The HMC will base its evaluation on whether the actions have met the following criteria: increased public awareness/education, reduction in hazard damage potential, actions being implemented in the designated time frames, and actions staying within the cost estimate. The HMC will document its findings and provide an annual summary report to the University President and Senior Leadership Council.

The HMC will also continue to re-evaluate membership on the committee to ensure effective engagement of the appropriate parties. New members may be invited to serve on the HMC as priorities shift.

Revisions

Recognizing that this is a living document, the HMC will make changes to the Plan after a disaster or as conditions warrant. Otherwise, it is expected that a revised plan will be adopted every five years. These revisions will reflect changes to hazards, existing conditions, priorities, and funding strategies.

Eighteen months before the plan is expected to expire, the university will begin to secure funding for a plan update.

A year before the current plan is expected to expire, the university will either secure a third-party contractor to lead the update effort or identify a lead in-house. A full revision of the plan will commence a year in advance of the current plan expiration date to ensure the University always has an up-to-date plan. The University should plan on spending nine months updating the plan before it is submitted to RIEMA and FEMA for review.

During the next plan revision, the university will enhance the breadth of the HMC to be more inclusive. The university will invite the Rhode Island Building Code Commission and the Building Officials for the Towns of Narragansett and South Kingstown to participate in the planning process. Two representatives from the student body will also be invited to participate in the entire planning process. Prior to finalizing the HMC, the university will also consider key campus organizations that may provide valuable insight to the plan update. If invitees can commit to being on the HMC, they may be designated as a stakeholder and brought into the conversation as needed.

All future meetings will again be open to the campus community, and it is the hope of the HMC that once the public education and outreach actions begin, public involvement in the Plan will increase and will be reflected in future revisions.

The university will involve the campus community in the plan update process by holding an advertised campus community meeting to present recommended revisions and solicit input. The HMC may decide that an online forum will encourage more participation. This effort will be advertised in the campus newspaper as well as on the campus website.

Revised plans will be sent to the neighboring communities for comment.

The revised plan/update will incorporate a formalized process for prioritizing actions and weighing the cost/benefit of such actions. See FEMA's *Local Mitigation Planning Policy Guide*, Effective April 19, 2023 https://www.fema.gov/sites/default/files/documents/fema_local-mitigation-planning-policy-guide_042022.pdf. All updates or revisions to the plan will be submitted to RIEMA and FEMA.

Adoption

After each revision cycle (every 5 years or sooner as warranted), the URI Hazard Mitigation Plan will be presented to and adopted by the University President and Senior Leadership Council. The associated documentation will be kept as part of this plan.

URI Natural Hazards Survey

502	17:25	Closed
Responses	Average time to complete	Status

1. What is your primary connection to URI?

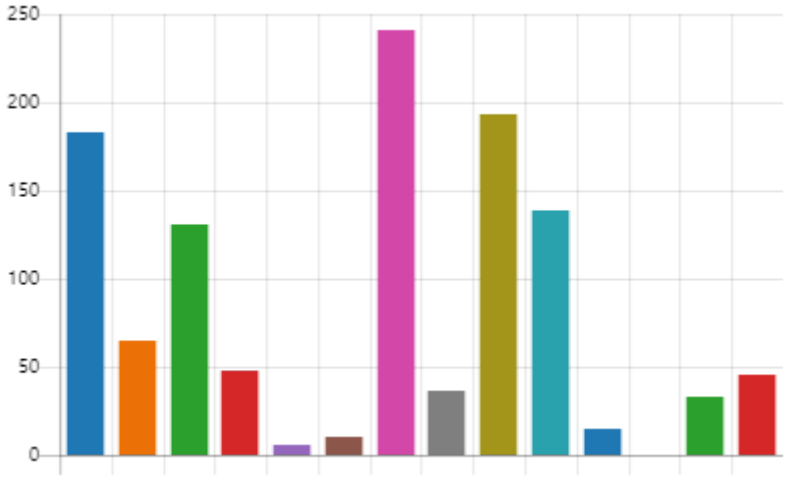
Student	217
Faculty	88
Staff	186
Other	8

2. Have you ever experienced or been impacted by a natural disaster while at the University?

Yes	271
No	230

3. If yes, what types of natural events/natural disasters? Check all that apply.

High Winds	183
Lightning	65
Extreme Cold	131
Extreme Heat	48
Drought	6
Earthquake	10
Winter storm (snow and ice)	241
Hail	36
Hurricane/Tropical Storm/Nor'...	193
Street Flooding from heavy rain	139
Riverine Flooding	15
Brushfire	0
Coastal Flooding from high ti...	33
Stream flooding	45

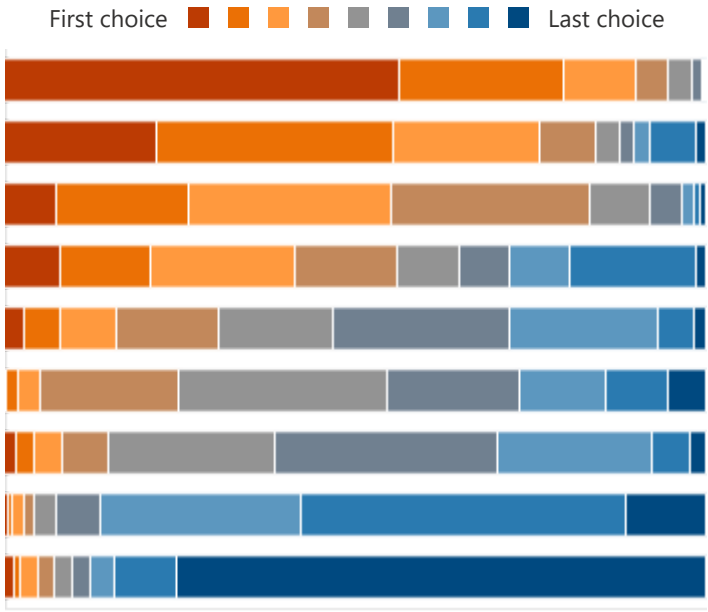


4. How prepared do you feel that you are for the probable impacts of natural hazards?

Not Prepared- no need	3
Not Prepared- never thought ...	96
Somewhat prepared for some ...	295
Prepared for most events	105

5. Please re-order the list of hazards so that the 3 you are most concerned about are at the top.

Rank	Options
1	Hurricane/Tropical Storm/Nor'...
2	Winter Storm (snow and ice)
3	High Winds
4	Flooding (all types)
5	Extreme Cold
6	Lightning
7	Extreme Heat
8	Drought
9	Brushfire



6. Please tell us of a location on campus that has experienced flooding.

322

Responses

Latest Responses

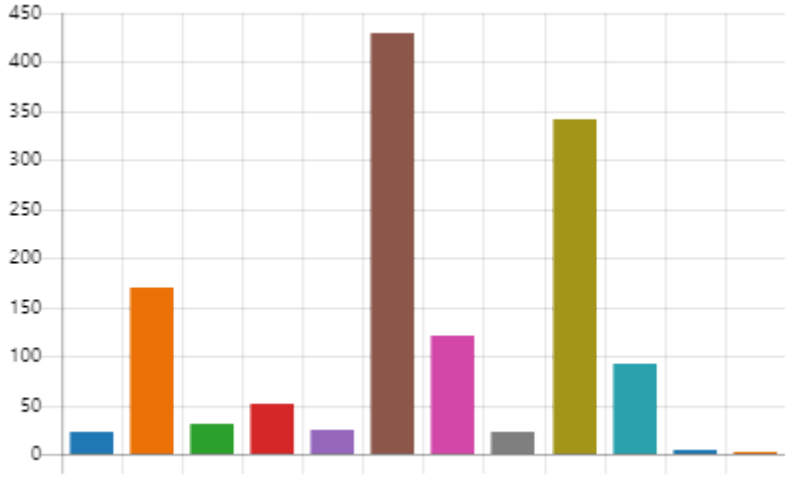
"*Tootell Athletic Center*"

"*bay campus beach king tide during superstorm Sandy*"

48 respondents (**16**%) answered **Hall** for this question.

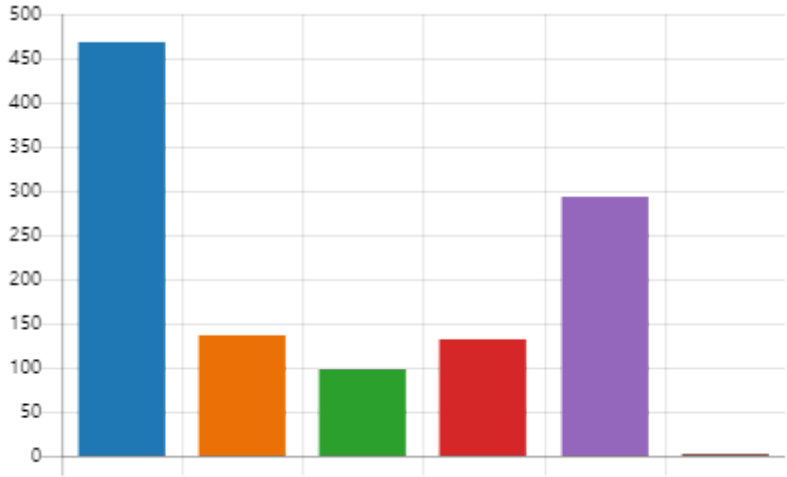
7. How do you prefer to receive pre-storm educational material?
Check all that apply. (Don't worry, we aren't adding you to a list.)

Student newspaper	23
URI Website	170
Residence hall floor meetings	30
Training and exercises	51
URI Community meetings	25
Email	430
Social media (Facebook, Twitt...	120
Information at the library or M...	22
Text message from URI Emerg...	342
Phone call from URI Emergenc...	93
Not interested	4
Other	2



8. How do you prefer to receive EMERGENCY storm information and updates?
Check all that apply. (Don't worry, we aren't adding you to a list.)

Text message from URI Emerg...	469
Phone call from URI Emergenc...	137
Social media (Facebook, Twitt...	97
URI Website	131
Email	293
Other	2



9. What Emergency Management topics would be helpful for training?

207
Responses

Latest Responses
"*Evacuation routes*"

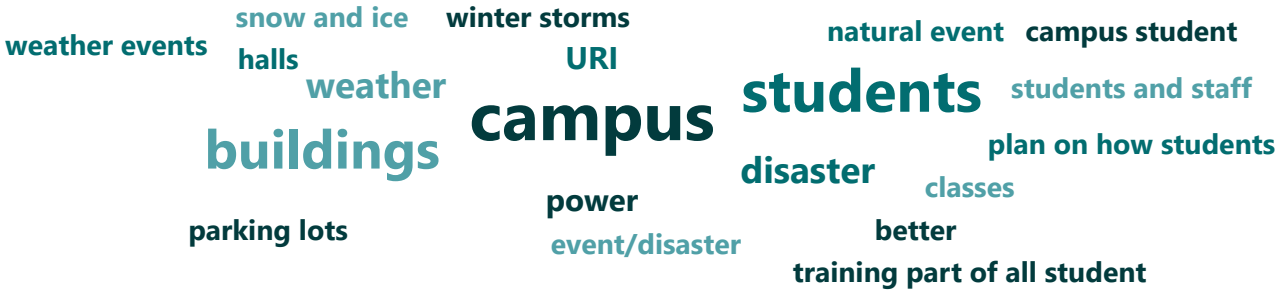
72 respondents (**37**%) answered **list** for this question.

10. Additional thoughts on how URI can better prepare for the next natural event/disaster.

174
Responses

Latest Responses
"*At GSO work with the Town of Narragansett to get South Ferry Road ...*
"*Ensuring tree limbs near power lines are preventatively managed to p...*

29 respondents (**18**%) answered **campus** for this question.



Q6: Please tell us of a location on campus that has experienced flooding

1	anonymous	the ponds in 2017/2018
2	anonymous	Unsure
3	anonymous	Butterfield road
4	anonymous	Brookside
5	anonymous	Memorial Union area
6	anonymous	the slums
7	anonymous	campus-wide
8	anonymous	laundry rooms
9	anonymous	The dorms in complex area- was a student when the entire area flooded due to short term heavy rains
10	anonymous	None
11	anonymous	Plains Rd lot
12	anonymous	Not aware
13	anonymous	unsure - there seems to be a lot of ponding on impervious surfaces - special problem when it freezes
14	anonymous	The roads
15	anonymous	Walkway to mackal
16	anonymous	None known
17	anonymous	the bottom of campus
18	anonymous	Washburn
19	anonymous	Dorr Hall, Barlow Hall, Coddington Hall
20	anonymous	Don't know.
21	anonymous	Unknown
22	anonymous	Carlotti
23	anonymous	My buildings basement
24	anonymous	Plains Road
25	anonymous	Lower college road.
26	anonymous	NA

27	anonymous	outside Wiley/behind Heathman
28	anonymous	Tyler Basement - Sewage backup because sewer pipes freeze.
29	anonymous	Independence Square II
30	anonymous	Street
31	anonymous	Outside of Hope Dining Hall during a heavy rain in September
32	anonymous	The campus housing by Butterfield.
33	anonymous	n/a
34	anonymous	I do not know any.
35	anonymous	I do not know.
36	anonymous	I am not aware any locations where flooding occurred before on campus
37	anonymous	Rode to campus
38	anonymous	Sophmore Slums always flood
39	anonymous	outside hope
40	anonymous	outside hope
41	anonymous	I know of people in Brookside Hall who have experienced flooding
42	anonymous	Plains and fine arts lots, the slums
43	anonymous	Washburn Hall
44	anonymous	Near the gym near hope dinning
45	anonymous	I do not know
46	anonymous	Unknown
47	anonymous	GSO lower parking area
48	anonymous	Foundation building?
49	anonymous	Beaupre basement
50	anonymous	Carlotti Administration Building basement
51	anonymous	Lippitt Hall
52	anonymous	Health Services entrance
53	anonymous	SSRC, Avedisian
54	anonymous	handicap entrance to Tyler Hall, water pools up as the parking lot is slopped and makes the access impassible.

55	anonymous	No idea
56	anonymous	Fine arts parking lot
57	anonymous	Pharmacy building (rooms located near the loading dock)
58	anonymous	The intersection by brookside hall
59	anonymous	I am unaware of flooding on campus
60	anonymous	bottom of campus, Plains Road, exiting campus to RT 138
61	anonymous	Tyler Hall, Kelley Hall
62	anonymous	Basement of my building
63	anonymous	Green Hall parking lot
64	anonymous	N/A
65	anonymous	2010 Flood- Everything was flooding
66	anonymous	Dorr Hall
67	anonymous	Gardiner Crops Research Center
68	anonymous	Briar Lot #1 at the Welcome Center seems to pool water
69	anonymous	paths between butterfield and memorial union
70	anonymous	Lower campus, 210 Flagg Rd.
71	anonymous	Roosevelt Hall
72	anonymous	not sure!
73	anonymous	Memorial Union - so much mold and water damage on our ceilings (3rd floor)
74	anonymous	unsure
75	anonymous	Lower level of campus near athletic buildings
76	anonymous	Green Hall lower level
77	anonymous	A number of years ago there was an extreme flooding event where I believe some of the dorms experienced flooding. I have also seen flooding in the area between Keaney and the rest of campus.
78	anonymous	SSRC building
79	anonymous	Butterfield Road
80	anonymous	Greenhouse parking lot, but now it has a basin
81	anonymous	Coastal

82	anonymous	Idk on campus but the pottery studio I go to
83	anonymous	River area between Merrow hall and Mainfare dining area leading onto Butterfield road (across street from Fascitelli Gym) ; Street flooding down West Alumni Ave, pooling up at intersection of complex road(on sidewalk and street), and flowing into river between complex road and Meade stadium student entrance
84	anonymous	Unknown
85	anonymous	The street
86	anonymous	I don't know
87	anonymous	CBLS (building has had indoor flooding on several occasions), Plains Road
88	anonymous	buildings, green hall, carlotti, woodward
89	anonymous	Butterfield Road
90	anonymous	?
91	anonymous	By Postal Services / Facilities Services
92	anonymous	Horn Building on NBAY campus, Coastal Institute on NBAY Campus
93	anonymous	It was on Route 138 where 2 places were flooded and a stream overflowed on Slocum Road
94	anonymous	Woodward basement but has been corrected.
95	anonymous	I don't know
96	anonymous	The bottom of campus leading up the hill. Specifically around Eddy Hall and Ellery Pond
97	anonymous	Bliss hall
98	anonymous	sometimes the walk paths near the library that connect to Memorial union get flooded, though i have only experienced this once
99	anonymous	Lower campus (slums)
100	anonymous	Fogarty Hall, lower level, east corridor
101	anonymous	NA
102	anonymous	Hillside b tower bottom
103	anonymous	none that I know of.
104	anonymous	the quad, the parking lot
105	anonymous	I have experienced streets being closed because of flooding trying to get home.
106	anonymous	unaware

107	anonymous	Not sure
108	anonymous	none that I can recall
109	anonymous	No
110	anonymous	Sherman building area parking lot and surrounding areas
111	anonymous	Kingston
112	anonymous	N/A
113	anonymous	Everywhere puddles
114	anonymous	near coddington and the other slum dorms
115	anonymous	Lippitt hall
116	anonymous	the area behind eddy
117	anonymous	Tootell Physical Education Center
118	anonymous	Building interiors from burst pipes or equipment malfunction
119	anonymous	CBLS, Avedisian, any bldg with a door to a mechanical space that says "do not open when flooded"
120	anonymous	Merrow Hall 1st floor
121	anonymous	Dorms, Large puddles form in lower levels of campus making it difficult to walk
122	anonymous	I don't know of any. We have had water damage inside the Chafee building but I believe that was an infrastructure issue and not caused directly by a storm.
123	anonymous	Bay Campus - Marine Science Research Facility
124	anonymous	Lower College Road
125	anonymous	None to my knowledge.
126	anonymous	Quinn basement Roosevelt basement
127	anonymous	Horn Bldg, Bay Campus
128	anonymous	Football field
129	anonymous	Dorms
130	anonymous	Not sure
131	anonymous	Quinn Hall
132	anonymous	internal flooding in the CI on Bay campus. Flooding of parking lot at bay campus beach
133	anonymous	unknown

134	anonymous	I have not experienced any
135	anonymous	Parking logs, Briar Lane & Alumni/Foundation
136	anonymous	I don't know
137	anonymous	Meade Stadium
138	anonymous	Haven't experience it
139	anonymous	Roads; intersection of flagg & lower college
140	anonymous	housing buildings at the bottom of campus
141	anonymous	Don't know.
142	anonymous	Plains lot
143	anonymous	dorms
144	anonymous	Fine Arts Center
145	anonymous	back of chafee
146	anonymous	Quinn Hall, Bressler Hall
147	anonymous	the slums
148	anonymous	The elephant walk
149	anonymous	East Farm, GSO
150	anonymous	Kind of everywhere can get pretty flooded in heavy rain
151	anonymous	Some parking lots on main campus
152	anonymous	Unsure
153	anonymous	The spot by the courtyard near CBLS is either a muddy wet puddle or ice after any rain/snow. It needs drainage or grading.
154	anonymous	Dorr Hall
155	anonymous	pathways/sidewalks
156	anonymous	Butterfield, White Horn Brook, West Alumni
157	anonymous	
158	anonymous	Near the bottom of campus since there are hills at the top.
159	anonymous	The brick path, pretty much every heavy rain
160	anonymous	corner of Bills Road and Upper College/ parking lot in Fine Arts - becomes uncrossable without rubber boots

161 anonymous Campus grounds were completely flooded out (especially near Athletic Fields) on an Open House day.

162 anonymous Outside of the facitelli fitness center

163 anonymous I personally have not been living on campus or have been there long enough as a student to see any flood damage

164 anonymous none

165 anonymous Frat Circle

166 anonymous pathways

167 anonymous Route 138 couldn't leave campus east or west during historic floods

168 anonymous None at the Kingston campus, as far as I am aware.

169 anonymous none

170 anonymous The walking path near Eddy Hall.

171 anonymous The path from the fine arts parking lot

172 anonymous lower college rd

173 anonymous Carlotti

174 anonymous Not known

175 anonymous Mackal Fieldhouse

176 anonymous roads

177 anonymous Our own building! The FAC is flooded on an average rainy day, not even a hurricane, with water dripping down interior walls. It astounds me that this has been happening for years and nothing has changed. Mold. Electrocution risks.

178 anonymous N/A

179 anonymous Do not know

180 anonymous none

181 anonymous Lippitt Hall (flood of 2009), Chafee Hall (after pipes burst during winter)

182 anonymous Parking lot behind Administrative Services building

183 anonymous I don't know

184 anonymous Street between Quinn and Memorial union

185 anonymous Bay Campus

186 anonymous Freshman dorms - near the Fasatelli Gym

187 anonymous Butterfield Road

188 anonymous Near Ellery Hall,

189 anonymous Roosevelt Hall

190 anonymous Fine Arts Center, dorms…

191 anonymous Brookside's walking path outside

192 anonymous The steps all over campus have puddles that get really deep

193 anonymous CACS building bay campu

194 anonymous Ballentine Hall has had some leadkage, but not sure if flooding (more extreme)

195 anonymous Fayerweather dorms

196 anonymous N/A; Haven't seen

197 anonymous In the Kingston campus, the dip in the walkway between the business school and the library.

301 anonymous Morrill Hall

302 anonymous Health Services

303 anonymous Bottom of hill behind Eddy Hall

304 anonymous The basement of Ranger

305 anonymous Roads around campus

306 anonymous butterfield road

307 anonymous Plains Rd Parking Lot, and some of the footpaths behind the memorial union

308 anonymous Memorial Union entrance near the campus store

309 anonymous Butterfield road

310 anonymous Butterfield Rd

311 anonymous There haven't been any flood since I have been here, to the best of my knowledge.

312 anonymous The Slums

313 anonymous Backside of Dining Services Distribution Center

314 anonymous Lippitt Hall

315 anonymous Quite a few buildings as well as the creek/road that passes by Hope dining

316 anonymous With major snowbanks plowed in the commuter lots blocking storm drains there were major streams of water that later re-froze

317 anonymous 70 Lower College

318 anonymous ?

319 anonymous Flagg road

320 anonymous Brookside Hall first floor

321 anonymous I don't know

322 anonymous NA

323 anonymous Right outside the entrance to Hope Commons closest to the dining hall entrance

324 anonymous Ellery Pond

325 anonymous The brook/land near Brookside

326 anonymous the roads

327 anonymous kingston

328 anonymous Missing from your list is water damage entering through worn out roofs. Quinn Hall - 3rd floor has had water damage that damaged some artifacts in the Historic Textile and Costume Collection. Watson House has experienced water damage prior to new roof being installed.

329 anonymous Butterfield and West alumni

330 anonymous Kingston

331 anonymous White horn brook, lower parking lots, Hope dinning stream

332 anonymous Upper College Rd. Street and building lower level flooding

333 anonymous West Alumni Ave.

334 anonymous Fine Arts Center

335 anonymous n/a

336 anonymous Whitehorn brook area

337 anonymous Carlotti Basement

338 anonymous The road behind (North of) the library. The parking lot of Sherman building. Carlotti building.

339 anonymous First floor of the Memorial Union

340 anonymous HR Building

341 anonymous West Alumni Rd.

342 anonymous not that I have seen

343 anonymous street in front of Hope

344 anonymous Lippitt Hall. Every time we get more than about 5 inches of rainfall in a 48-hour period, the entire East wing of the first floor floods with up to 6 inches of water.

345 anonymous streets

346 anonymous Behind Ballentine Hall

347 anonymous Roosevelt Hall years ago in basement

348 anonymous I have never seen flooding on campus.

349 anonymous Chafee, Memorial Union, Goddard Library, Totell Aquatic Center,

350 anonymous "Lake Independence" as it used to be called (outside the Independence Square Building) was generally fixed when the addition to the building was put on

351 anonymous Woodward Lab (man-made flood hazards)

352 anonymous Butterfield Road, Some of the Halls

353 anonymous Bliss Hall

354 anonymous Pastore

355 anonymous Heathman Hall

356 anonymous Dorms next to the pond behind Mackal and the Ryan center.

357 anonymous some residence halls

358 anonymous Dorms

359 anonymous not sure

360 anonymous HR Building

361 anonymous Brookside Apartments

362 anonymous Swan Hall

363 anonymous Don't know of any

364 anonymous Back entrance to Quinn hall

365 anonymous Lippitt

366 anonymous By the slums

367 anonymous W Alumni Ave

368 anonymous Bike path near football stadium, road outside Eddy leading to Keaney Lots

369 anonymous Some buildings at the Bay Campus

370 anonymous Upper college road (prior to latest resurfacing)

371 anonymous the loading area of butterfield dining hall

372 anonymous potter front entry

373 anonymous Potter Building - Front entrance

374 anonymous Next to Welcome Center

375 anonymous No particular place/building but there are definitely places that contain large puddles.

376 anonymous Surge

377 anonymous Unknown

378 anonymous idk

379 anonymous Peckham Farm

380 anonymous Streams and street run off water

381 anonymous Not sure

382 anonymous Fine Arts Center (lower level AND upper levels via leaking roofs

383 anonymous Rodman hall, CBLS, Bressler

384 anonymous N/A

385 anonymous Unsure

386 anonymous Not sure on campus; off-campus flooding/bridge & road closings made traveling to campus impossible (Super Storm Sandy)

387 anonymous walkways

388 anonymous I'm not sure but I heard the whole campus flooded a few years back. Chafee regularly takes on water esp. in the stairwells

389 anonymous West side, lower campus

390 anonymous Parking lots

391 anonymous Avedesian Hall

392 anonymous Residence Halls, and the intersection turning into Keaney Lot from 138

393 anonymous I don't know of any.

394 anonymous Tyler hall

395 anonymous Walkway from Carothers Library to Memorial Union becomes a river during heavy rainfall.

396 anonymous Flagg Road - hazardous waste storage shed - concrete pad slopes inward and creates a pond

397 anonymous Shore area at Bay Campus

398 anonymous The street that Hope Commons is on, the sewer/stream thing has overflowed in the semester of Fall2021 and spilled over the cement dividers.

399 anonymous Independence Square

400 anonymous I'm not sure but I feel like there's a lot of water on the roads when I'm driving

401 anonymous 70 Lower College Rd, Research Integrity - every heavy rain.

402 anonymous Sidewalk across from Heathman Hall

403 anonymous I don't know

404 anonymous Kingston Campus

405 anonymous Tootell Aquatic Center

406 anonymous CIB

407 anonymous Washburn

408 anonymous N/A at NBC

409 anonymous unknown

410 anonymous N/A

411 anonymous Some grassy areas

412 anonymous Chafee building

413 anonymous Engineering Quad (it is better now, but still hard to walk through all the water)

414 anonymous Butterfield Rd

415 anonymous Walkway in front of Chaffee, pedestrian cross-walks on upper college rd, parking lots at the bottom of the hill

416 anonymous I don't know of any

417 anonymous Butterfield Road

418 anonymous none

419 anonymous Beaupre

420 anonymous Gorham Hall basement with heavy rain

421 anonymous Garrahy

422 anonymous I don't know of any

423	anonymous	not sure
424	anonymous	bay campus beach king tide during superstorm Sandy
425	anonymous	Tootell Athletic Center
426	anonymous	?

Q9: What Emergency Management topics would be helpful for training?

2	anonymous	General awareness
3	anonymous	ice
5	anonymous	how to prepare so you minimize damage from an upcoming event
7	anonymous	evacuation procedures/maps
8	anonymous	What to do in power outage, large storms, loss of power, resources for these issues, etc.
11	anonymous	Flooding and storms

I think Storms, Flooding, High Winds

13	anonymous	Snow and ice navigation, flooding events, power outtages
14	anonymous	GENERATOR BACKUP
18	anonymous	Active shooter/bombing drill
19	anonymous	How to dress properly for these events and how you can prepare before the said event comes
20	anonymous	Evacuating students during class
21	anonymous	Flood training
22	anonymous	Flood shelter.
23	anonymous	Preparation, emergency management, First Aid training,
24	anonymous	Hurricane and flooding
25	anonymous	Preparing for a storm / power outages
26	anonymous	where to go, who to speak to for help, what to do
27	anonymous	How to deal with power outages in terms of keeping important samples preserved
28	anonymous	where to go, and who to speak to
29	anonymous	Manmade disasters like terrorism and school shootings
31	anonymous	Hurricane
32	anonymous	evacuation procedures and sheltering procedures would be helpful to know.
34	anonymous	Evacuation
36	anonymous	Dealing with snow/ice, on campus shelter areas
37	anonymous	Shelter resources and preparedness, team building

38 anonymous active shooter

41 anonymous each building should have evacuation plans & drills. I have been at URI for 16 years and our building has never had a drill.

42 anonymous Wind, snow, flood, fire

43 anonymous To know if there is an option to work remotely on day(s) disaster impacts the area.

46 anonymous Proper Evacuation routes from campus based on direction of travel to minimize traffic on campus in an emergency

47 anonymous Recommended personal gear for walking in inclimmate weather

48 anonymous Dig-Safe practices must be followed, and licensed contractors should be used, rather then state workers, since state workers are not trained as well, if at all.

49 anonymous I think the way to reach the most people is through text or email.

52 anonymous TI would be interested in knowing more about how the University makes the determination about whether or not to cancel classes, but this is not really training.

53 anonymous flooding and high winds

55 anonymous High winds, winter storms, flooding

57 anonymous how to handle ones self, and how to prepare (i.e. don't panic, always have XYZ on hand)

58 anonymous Flood safety

59 anonymous Exiting the campus when there is a snowstorm

62 anonymous Preparing for severe cold and ice, also severe winter and rain storms

63 anonymous Earthquake

65 anonymous Fire, hurricanes

66 anonymous Winter and summer storm procedures, including power outages.

68 anonymous Power outage, flood, blizzard, hurricane

69 anonymous hurricane and winter storm training

70 anonymous What to do in case of emergency evacuation procedures / where to go

71 anonymous If I had to come up with some, they'd be heat/cold affects like treating dehydration, hypothermia, and heat exhaustion

72 anonymous winter storm leading to black outs

73 anonymous where to go and what to do in extreme weather on campus.

75 anonymous Power Outage and Winter storm

77 anonymous Storm

78 anonymous Flood

80 anonymous Extreme Cold/Winter Weather Preparedness

85 anonymous What to do in emergency situations, who to call, how to prepare (especially living in dorms where main source of food is leaving dorm building)

88 anonymous Winter Storm preparedness. Building your own disaster To-Go bag.

90 anonymous Prep for electronic equipment/electronic equipment. Prep for high winds.

91 anonymous Things to include for a survival kit

94 anonymous How to keep house warm, how to prepare for a winterstorm (food, cloths), what to do when a huracane comes (protect windows, how to protect old trees from falling)

95 anonymous Storm/Hurrican Preparedness, Flooding/Evacuation

97 anonymous Shelter's

98 anonymous I would say flood and hurricane topics

99 anonymous Shelter info, power info

100 anonymous where to go for tornado warning

102 anonymous How to deal with black ice

103 anonymous evacuation

104 anonymous What to do if you are caught in an emergency situation such as a winter storm or hurricane, what to do before the storm, who can you call if you need assistance, etc.

105 anonymous Active shooter, flash flooding, earth quakes, EMPs,

106 anonymous Preparation

109 anonymous Where do we go if there is an incoming nuke? Also safe locations on campus in case of a Tornado Warning.

110 anonymous any

112 anonymous anything about hurricane preparedness

113 anonymous Hurricane, flooding

115 anonymous How/when to drive during a winter storm / where you go to escape flooding / what to do if building is damaged by high winds, heavy snow or lightning

117 anonymous flood

118 anonymous CPR/AED Training

119 anonymous How can we help others in a case of emergency?

Practicing the plan vs just talking about it, what to do before, during, and after natural disasters

122 anonymous Severe tropical storm, ice/snow storms; URI is usually well prepared (university closes for off-campus people); Training for dorm residents seems most important.

123 anonymous using the list of natural events that was referenced above in this survey I think that flooding/hurricane and snow events are the best for training because those are the events that most frequently impact the URI area.

302 anonymous Loss of power and what to do if if the systems are not on back-up generators. What to do if the generators break down. Flooding

303 anonymous maybe even what to do in power outage or in case of snow/ice/hurricane.

304 anonymous Hurricane

305 anonymous Lab preparations

306 anonymous Not sure if this qualifies, but active shooter

308 anonymous Places of safety to shelter in during disasters at URI

312 anonymous High winds and storms

315 anonymous hurricane, tornado

316 anonymous No list available

317 anonymous How to prepare for power outages, how to prepare for multiple days without power, etc

319 anonymous No list below?

320 anonymous frozen pipes, which seem to cause a lot of trouble around campus

321 anonymous Extreme heat, flooding

323 anonymous What's the logistic need to prepare and other necessities towards each natural event/disaster

324 anonymous training on being prepared for extreme storms; things to have on hand; where to find last minute information as needed.

328 anonymous What to do on campus when an emergency situation arises? Some scenario based training exercises. Also, learning what buildings have higher risk equipment and chemicals that are impacted by hazards. What measures are being taken to ensure everyone's safety if the equipment malfunctions or chemical leaks.

329 anonymous Available Campus Resources

331 anonymous evacuation procedure

334 anonymous all topics

335 anonymous Unable to view referenced list options.

337 anonymous Flood, ice/snow storm, wind

338 anonymous Campus evacuation

339 anonymous Hurricane, Tornado

341 anonymous Power outage preparedness

343 anonymous Active Shooter Training / Prepare for any type of storm / being an open campus it might be helpful to address how to handle aggression toward certain communities, i.e. LGBTQ/Muslim/Hilell/Black-Latino-Asian communities.

346 anonymous The ALERT system works great. Providing direction (and reassurance) through that is helpful. No particular topics.

347 anonymous Flood response and mitigation

348 anonymous Knowing where emergency shelters would be ahead of time would be helpful. Rules around pets in emergency shelters. Clear, simple, emergency checklist tailored to particular types of hazards

349 anonymous Driving through flooded areas, how to handle downed trees blocking road access

350 anonymous flooding

351 anonymous I would like any type of emergency training. I have no idea what to do if there's a large fire or tornado.

352 anonymous what to do in a flood/power outage

353 anonymous There is no list below to choose from.

354 anonymous Emergency supplies

357 anonymous parking pre- snowstorms to clear workers parking lots completely / better clearing of walk-ways

358 anonymous Preparedness, knowing places of refuge, and knowing safe routes in special cases of tree fall risk.

359 anonymous what to have on hand in your dorms in case your stuck in there because of a hurricane

361 anonymous Hurricanes/tropical storms

363 anonymous Evacuation routes

364 anonymous Evacuation, Continuity of Operations, Personal Planning

365 anonymous what to do in heavy snow, what to do in floods. where are dangerous places to go or where should be avoided.

366 anonymous Business Continutiy

367 anonymous Anything having to do with power loss because I don't have access to a generator at my off-campus house

368 anonymous Evacuating campus in adverse weather events; how/where to shelter in place if you're an employee who has missed the opportunity to evacuate

369 anonymous Maps of areas prone to flooding, power outages, buildings with backup generators, etc

371 anonymous Staff and faculty expectations on how to help students

372 anonymous What to do during a hurricane or power outage

373 anonymous Hurricane....long loss of power

374 anonymous What to do in case of flooding

375 anonymous Definitely Winter Storm procedures and preparation

376 anonymous What to do in the case of a lock down.

377 anonymous power outages on campus and preparation for storms on campus and home prep

378 anonymous Hurricane/snowstorm preparedness

379 anonymous Something to do with power outages

380 anonymous What to do in the case of a hazard striking while in the classroom with students

381 anonymous For faculty, what are reasonable expectations for coursework and teaching, how to be aware of students' situations

382 anonymous Evacuation routes

383 anonymous What we would need to prepare for an emergency

Q10: Additional thoughts on how URI can better prepare for the next natural event/disaster?

2 anonymous Actually salt the side walks or cancel class when there is too much ice! I fell at least four times.

3 anonymous Send out people the night before the storm with salt so that the walkways to class aren't icy. The walkways have been extremely slippery. Also send people to plow the parking lots better.

4 anonymous Discuss more with students about procedures and resources for different "disasters" we may experience while living at URI

5 anonymous This year when the flooding happened in some of the dorm halls it really felt like there was no support from officials to check in with residents who were affected - for example, I'm an RA in dorr hall and my room was flooded in august, then later that day URI still let residents move into their room! Which like...I was still in the process of making sure my items were dry, while still having to help people navigate the building. Also during power outtages, there are some buildings that frankly aren't safe to reside in...so are they safe in general? Probably not.

6 anonymous When we lose power, some research buildings DO NOT HAVE GENERATOR BACKUP!

7 anonymous More communication

8 anonymous Training should be mandatory for all staff/faculty

9 anonymous Educating people about our climate crisis and how we can adapt/make a change to prevent disasters

10 anonymous I think that URI should have a written plan on how students should handle natural events and also should create a way that keeps students, especially commuters, from coming to campus when the weather is dangerous.

11 anonymous Preparation, training, practice exercises,

12 anonymous be better prepared for power outage, which occurs more often than other emergencies

13 anonymous alerts

14 anonymous alerts

15 anonymous Better communication on parking/driving situations better salted and plowed sidewalks. I'm sure there was a worker shortage this year, but I can't imagine being a handicapped student here and having to deal with the atrocious state of some of our sidewalks

16 anonymous Install real drainage systems on the campus, way too many building still flood frequently

17 anonymous During any storm WHY do you have us walk to get food in the dinning halls. Close the dinning hall give us enough food until it's over . It's crazy walking in this weather

18 anonymous Clear and concise instructions

19 anonymous More backup generators, regular testing and maintenance of backup generators, regular maintenance of environmental control systems in buildings

20 anonymous Evacuation routes - we have a bottleneck on campus everyday at peak times. Also, with predictable weather, allowing for remote work can reduce unsafe travel... I have appreciated recent proactive announcements in advance to use that option rather than waiting until we have already arrived to campus.

21 anonymous Do regular tests on generators and emergency power lines/breakers in all buildings. Make sure enough emergency power lines are offered in laboratories. Have emergency dry ice/-80 storage capabilities in the event that emergency power does not work in certain buildings so that researchers can move precious samples. Have a chain of command setup so that people know who to contact in the different Colleges/Departments to help save precious research samples. Evaluate and fix areas/buildings that have previously flooded.

22 anonymous In winter be sure each building entrance has some sort of ice melt so occupants can apply and not wait for facilities

23 anonymous Team building to foster communication and cooperation.

24 anonymous Maybe cancel class when something is forecasted with a high level of certainty (like some of the snow storms in the past)

25 anonymous allow those of us who can to work remotely during adverse weather events like snow/heavy winds/flooding/hurricane forecasts. Otherwise we feel pressured to report to work (or discharge personal time, which isn't an option for some workers)

26 anonymous Ensure that URI members (esp. staff) are always informed whether or not they should come to URI early in the morning of potential snow days. (874-SNOW frequently offers no useful information)

27 anonymous Planning, prevention, education, awareness

28 anonymous Highlight escape routes to get off campus and alternative means of egress

29 anonymous Allow those that can work remotely to do so and make a university wide call indicating which departments can do so as otherwise no one knows if THEIR department has that option.

30 anonymous Make emergency management training part of all student, faculty and staff on-boarding and annual/semi-annual update. Establish who is/is not to be listened to during natural event/disaster (limit spread of misinformation). Provide access to maps of where to go during natural event/disaster. Create "disaster kit" list to be shared with community each August/January; have disaster kit prep events.

31 anonymous We need functional backup generators on ALL research buildings, including the greenhouse complex. We need to identify the buildings which flood every time there is a nor'easter and then we need to take action to prevent the flooding.

32 anonymous Traffic mitigation/direction so that back up is minimal while trying to escape from campus onto main roads

33 anonymous 24/7 access to drinking water in residence halls, as well as take-home food available at dining halls and farther away residence halls.

34 anonymous Natural disasters are one thing. Man made disasters are another, more frequent, and sufficient thought should be put into their potential, and measures to mitigate them.

35 anonymous Any that the group thinks we are most at risk for experiencing. I'm game!

36 anonymous Anticipating downed trees and limbs with work crew readiness. Warning students and staff when high winds are expected. Trimming and maintaining trees on a constant basis.

37 anonymous Periodic monitoring of the campus to remove potential problems, such as trimming trees with limbs that have the potential to cause power outages - but I would expect that this is something that the University already does.

38 anonymous Leave shovels in the dorm buildings so students can shovel the walkways out considering we had no path to leave when there are 20 inches in front of door. If there was a shovel 5 people can clear the way in 20 minutes.

39 anonymous Please keep in mind that there are international students who might not be familiar with New England weather and common procedures and resources. They are also often here on campus during break periods. Also, with climate change, we are likely to see more extreme heat issues and so air conditioning is more critical, especially for those staff that are here in the summer working in old buildings.

40 anonymous Better preparation for winter storms(shoveling/plowing and putting down ice melt) ; natural or man made structures to lower wind on campus ; better system/road design for flood management

41 anonymous Be prepared with salt/sand to properly sand walkways and roads.

42 anonymous by allowing people to telework /allowing remote classes so as not to risk peoples lives attempting to get to campus

43 anonymous Cencel classes earlier before the weather turns worse and getting off campus is an issue

44 anonymous Please keep a careful eye on the power

45 anonymous Making sure walkways are cleared and easy to navigate

46 anonymous Keep storm drains clear. Signage of evacuation routes and shelter locations. Backup power.

47 anonymous Access to food is probably the biggest thing. Making sure the dining halls are open and able to serve, as well as making it safe for students to be able to walk to the dining halls in the event of a disaster

48 anonymous More exterior generators or solar powered devices.

49 anonymous Possibly holding events that detail what to do in exceedingly dangerous weather

50 anonymous Allow work from home when available but do not charge employees by discharging sick or vacation time when internet is not available. Provide instructions for how to secure office spaces ahead of time when emergencies are predicted/expected.

51 anonymous A sh*t ton of salt. In the mornings after snow, blizzards, or even normal ice formation, I never see sand or salt on the ground. I only see the green salt later in the day. The initial shock of the disaster seems like the center of attention but I also want to see focus on the aftershock and ice left by winter storms.

52 anonymous List of essential personnel and their roles.

53 anonymous Monitor potential weather issues, prepare in advance by communicating campus closing

54 anonymous Thanks for asking these questions.

55 anonymous Give some advice on what we need to prepare for Emergency. Thank you!

56 anonymous There are many old trees around the campus. Some particularly caused damage to the residents' properties living on campus. Personally, my vehicle's windshield got damaged during the storm by a fallen branch of a tree parked at the parking lot in Graduate Village. After such storms, these trees get even more unsteady and make us concerned about our children's safety when they are playing on warm days outside. Although we filed a property damage report with the Risk Management Office, we did not hear back from Ms. Cynthia Stanton, which made us even more concerned regarding the URI's responsibility and reaction toward their student's physical well-being and the protection of their personal property.

57 anonymous Making working from home a permanent option.

58 anonymous ensuring backup power for critical research equipment.

59 anonymous stop putting flat roofs on buildings, don't put huge diesel tanks & generators on roofs, use heating and cooling systems that will not generate condensation, which then results in mold

60 anonymous I think URI does a great job with preparation. We must stay ready to be ready.

61 anonymous Not aware of anything

62 anonymous More communication and trainings.

63 anonymous Keep buildings up to date before disaster occurs

64 anonymous Timely info/prompts on email and social media

65 anonymous Pre-planning. Cancelling classes during extreme heat and cold.

66 anonymous Back up power provided to the Independence Square building.

67 anonymous Better building maintenance

68 anonymous Parking lots and sidewalks tend to get very icy and dangerous. I slipped on black ice a few years back and cut up my ankle. I know there is a lot of campus to cover, but it gets very dicey with the black ice...

69 anonymous Have an eye on forecasts to keep students up to date

70 anonymous Make it clear where I am supposed to get information when I need it.

71 anonymous public maps re. safety sheltering

72 anonymous I feel that dining isn't always prepared for events, as an on campus student it can be stressful thinking about feeding myself. also being given microwaveable meals for the day expected for a power outage is discouraging. also not all students have microwaves.

73 anonymous The Institution does a relatively good job of doing so now.

75 anonymous Make sure that all the walkways are clear and free of ice.

76 anonymous listen to qualified professionals before taking action

77 anonymous If possible, give more notice.

78 anonymous Think more about how essential workers are treated or endangered. Early closing decisions; with early openings, people are already leaving for work by 5:30am, so decisions should be made before that time. Also, for studnets, staff, and faculty who commute via bus, whether the buses will stop running is a serious concern.

79 anonymous Require the entire campus to go through some kind of a training exercise (in person or virtual) to at least be aware of what to do in different situations.

80 anonymous Table tops

81 anonymous Better communication

82 anonymous Roads on campus are very dangerous during snow and ice storms. Salting occurs many hours after plowing, and it is especially noticeable on weekends. It creates a very dangerous situation for people who have to come to work.

83 anonymous salt sidewalks better for ice, better backup electrical systems for some dormitories.

84 anonymous Oftentimes I notice the ramps, especially ramps to residence halls, are not cleared after snow/ice storms. This seriously limits accessibility to disabled students. In Peck Hall, the wheelchair ramp to get into the building was covered with snow for days after the last storm in February. There is a wheelchair bound person in the building and this is just not safe if there happens to be a fire or something in the building. Accessibility should be top priority. All students deserve to feel safe during natural disasters.

85 anonymous engage public audiences

86 anonymous It would be nice if the parking lots could be clear of snow and ice seeing as we pay $230 a year to park there on top of the $13,000 yearly tuition.

88 anonymous Scheduled, repeated, training and a comprehensive checklist for major occurrences.

89 anonymous Prioritize fixing our building.

91 anonymous Develop plans for the events most likely to occur.

92 anonymous Be sure to debrief after each one and learn what could be done to prevent problems the next time.

93 anonymous Put together data base / emergency contacts that people can access as needed

96 anonymous More communication pertaining to food services. The significant snow storms that took place this winter often had an air of uncertainty because there wasn't clear communication about the availability of food and dining services, which is something important for on campus students.

97 anonymous Newer and stronger buildings

98 anonymous Give warnings ahead of time. Allow students to take food from the dining halls to the room. Depending on the natural event, giving out or sell scarfs, gloves, hats, etc in each hall.

99 anonymous Better routes for excess water drainage. Predict events and don't hold classes on those days.

100 anonymous I think to share information through email newsletters would be good

101 anonymous Tsunamis need to be added to your hazards list. It might take a large one to reach URI, but they are still possible.

102 anonymous As long as the University is prepared for events with a plan to keep students safe on and off campus I think the school is doing a good job. There were a lot of winter weather events that resulted in classes being cancelled which I thought was a good idea so that students did not have to worry about driving to class in unsafe conditions. I think that moving cars to specific parking lots didn't work as well as intended because it resulted in cars just getting plowed in wherever they were parked, even if they were moved to plow other parking lots.

103 anonymous If the school decides to call students regarding natural events/disasters, students should be made aware what that number is. When the school calls students, does it pop up as a 401 number or would it say "URI NATURAL EVENT/DISASTER LINE"?

301 anonymous Reinforce basements and water pipes to avoid building flooding

302 anonymous Ensuring updated contact information for all students, faculty and staff which would require them to be prompted to update minimally once per year.

303 anonymous Warning and updates :)

304 anonymous take into account commuter students

305 anonymous For the above question number 9, I did not see a list to choose from? They are not listed. So I added Hurricane

306 anonymous Improve infrastructure of the seawater system at the URI Bay Campus and invest in natural disaster preparedness on the Bay Campus

308 anonymous Don't plow in cars. Prevent ice on the sidewalks.

309 anonymous Be prepared and proactive by informing URI Community what steps have already been taken for such events and what we can do to really be prepared.

310 anonymous A generator for the lands and grounds shop, since we need to respond to all these events.

311 anonymous Please salt the commuter lots, specifically the fine arts lots. I fell incredibly hard and cut up my hands and I'm not the only student. I am a disabled veteran with a previous head injury and this makes me really nervous to try to walk on unsalted areas. Excellent job salting around the lecture halls though!

312 anonymous Improve known vulnerabilities in campus buildings.

313 anonymous alerts on how to active safely during natural events/disasters

314 anonymous I got in a car accident due to having a final on the same day as a winter storm and totaled my car. Would be great if I wasn't forced to come to school under threat of getting a zero on my final. I was going 20 mph and left an hour earlier than I usually did on my route to school and still slid on ice/snow and ruined my car. I know cancelling classes is a pain but I doubt it's worth letting students get into car accidents.

315 anonymous The only thing I would say is I know when we experienced the extreme amounts of snow it was hard for plowing purposes and to navigate but it alos became difficult to get cars in the residental lot in and out of the spots which I feel caused a lot of commotion in the parking lot.

316 anonymous Salt more of the sidewalks/steps to prevent ice

317 anonymous allot the appropriate time needed. Consult with environmental faculty members on their opinion.

318 anonymous Divest from fossil fuels

319 anonymous prioritize the safety of the students and move classes virtual or cancel.

320 anonymous Faculty and staff should be encouraged to watch out for their buildings by shutting windows, leaving faucets dripping, etc. if severe weather is expected.

321 anonymous Have a dedicated center open for major storms

322 anonymous Provide shelters for loss of heat and loss of electricity electricity events in winter.

323 anonymous Update electrical infrastructure on all aspects, overhead power lines and poles as well. If possible relocate underground.

324 anonymous Training of as many community members as possible.

325 anonymous Clearly marked buildings and areas that should be used in case of an emergency.

326 anonymous Its important to have a plan in place for various disaster situations with clearly defined roles and responsibilities. Simulation exercises should be performed as needed to ensure everyone responsible for responding and taking safety steps knows what to do. Also, general awareness for the community that these exercises are happening and improvements to the response plans continue to be made.

327 anonymous Listen more to employees and less to "educated" a**holes

328 anonymous Community outreach, education, and training for students and community members

329 anonymous Improve the drainage on campus. If needed add pumps to ensure water moves out as fast as possible to prevent flooding. Especially since campus is built on an old swamp, flooding needs to be taken more seriously.

330 anonymous In general, I think URI does a good job regarding emergency preparedness for natural disasters. As a building manager, however, I find it frustratingly difficult to have evidenced issues regarding flooding get taken seriously enough for a mitigation plan to be implemented. I have brought up the issue with facilities each time a flood occurs (so they know it's happening), but no solution is ever presented (or even considered, as far as I can tell). The amount of damage caused with each flood is immeasurable, since much of the damage is likely behind the walls and under the floor. I would definitely sleep better at night if I could have a flood prevention plan in place for Lippitt Hall.

331 anonymous Flood mitigation improvements across campus (grading ground surfaces to direct water away from buildings / pooling, temporary erosion control barriers along inclines to slow flood waters, possibly permanent barriers as well)

333 anonymous I work on Upper College Road and our building had no power for several days after a couple of different severe weather events. I also advise a sorority on campus and Fraternity Circle has also lost power on occasion. I know the electrical grid is complicated, but it would be great to somehow mitigate the impact on certain areas of campus that seem to consistently go offline for longer periods of time due to weather (its perplexing when Dunkin Donuts behind our building has power when we don't)

334 anonymous Better prevention of power outages on campus.

335 anonymous Community Awareness

336 anonymous Having the Right equipment

337 anonymous more back up generators

338 anonymous Continue to monitor weather and other pre-cursors to disaster and communicate them ASAP to URI Community.

339 anonymous Make a video on what to do for different storm events

340 anonymous keep students safety in mind when a disaster/natural event strikes and have that reflected in decision making

342 anonymous Equal preparation/clean-up for winter storms. In my 5 years at URI, University seems to over-prepare for typical/mild winter snow/ice storms but under-prepare for major storms/blizzards. For example, this past winter classes were not canceled the Monday following a blizzard and the conditions on campus were not conducive to all students being on campus. Then a few weeks later we had a mild storm and classes before noon were cancelled to allow for clean up. I was on campus for my research project at 7am, and the campus was beautifully cleaned and ready for students already, but classes were cancelled. Seems backwards.

343 anonymous better enforcement of regulations / clear parking under large / old trees that might come down - barriers upstream to raging water from massive storms running down the hill - more in-place backup / reliable -

344 anonymous Back up generator for Chafee Broadcast Center

345 anonymous Definitely sending out message alerts to students/staff, securing buildings that may be at risk of flooding or damage, and evaluating drainage systems so they are clear.

346 anonymous I think the Facilities Group does a great job with limited time to do it in.

347 anonymous upgrade your generators considering that last semester, the power across the whole campus went out do to a light drizil

348 anonymous Making sure to notify of cancellations or office closures well before the start of the event.

349 anonymous Address buildings needing repair to keep out adverse weather (ie Fine Arts Center needs repair to stop flooding and leaks,, particularly the Theatre wing)

350 anonymous More information on a centralized resource

351 anonymous Employees who can do so should be prepared to work from home.

352 anonymous More generators

353 anonymous Flyers in dorms, educational emails/trainings, mention it in dorm/floor meetings

354 anonymous URI should coordinate for the event that RIPTA stops service and riders from Providence and elsewhere are stranded on campus.

355 anonymous Campus empties out during serious weather, seems like the ideal situation to me.

356 anonymous In terms of recovery, the first winter storm during the Spring2022 semester I think was handled kind of poorly, more specifically with the residential parking lots. We received emails saying that at a certain time that night we would receive emails to move our cars out of the residential lots and into commuter lots but according to my roommates (I chose to be snowed in at my parents that weekend) no one received that email so everyone was snowed in the residential parking lots. When I returned, the parking lots were poorly done, I saw one poor girl digging herself out with a bucket, and my car slid and got stuck in a snowbank. Maybe distribute those emails when they're supposed to would be nice, or have someone actively patrolling those lots to make sure no one gets stuck or help them if

they do (I got stuck at night and it took a couple hours to find someone to help me, thankfully a group of other students pushed me out).

357 anonymous Please make the roads and sidewalks less slippery when we have winter weather.

358 anonymous As a new employee I don't know any disaster protocols.

359 anonymous I find it unconscionable that when weather conditions warrant classes cancelled that staff and faculty must still come to campus or take a vacation or personal leave day.

360 anonymous 1. Keep our facilities in good working order 2. Keep our grounds clean and cleared of debris 3. Modernize our systems

361 anonymous Make sure URI has the proper equipment prepared in time.

362 anonymous Allow for classes to be on zoom with prior knowledge of a winter storm or extremely cold weather for the duration of the storm and provide refuge for students who lose power during these times. (I.e. offering food and water in the Ryan Center or Rams Den of Memorial Union)

363 anonymous Let us know where on campus we should go if we are caught here during an event.

364 anonymous More buildings on full generator

365 anonymous I don’t know why losing power is so common so I would say preventative measures for power outages

366 anonymous Make sure there is emergency backup power in all buildings, particularly those housing animals. Trim trees near power lines and pressure National Grid to prioritize power to campus

367 anonymous Continued efforts on landscaping to support heavy rains but also drought-resistant. Thinking about what students who live off campus should be doing.

369 anonymous Ensuring tree limbs near power lines are preventatively managed to prevent power outages.

370 anonymous At GSO work with the Town of Narragansett to get South Ferry Road plowed in a timely fashion following snow storms. Heading east from the main campus, roads up to the light at 1A South Ferry can be in very good condition after a snow storm. But as soon as you cross onto South Ferry the road is often unplowed and dangerously slippery. This is not a one time occurrence. It happens with every snow storm.

371 anonymous They have been pretty good about keeping us informed

Appendix B: Public Outreach

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URI Office of Emergency Management seeks community feedback on hazard mitigation plan

April 4, 2023

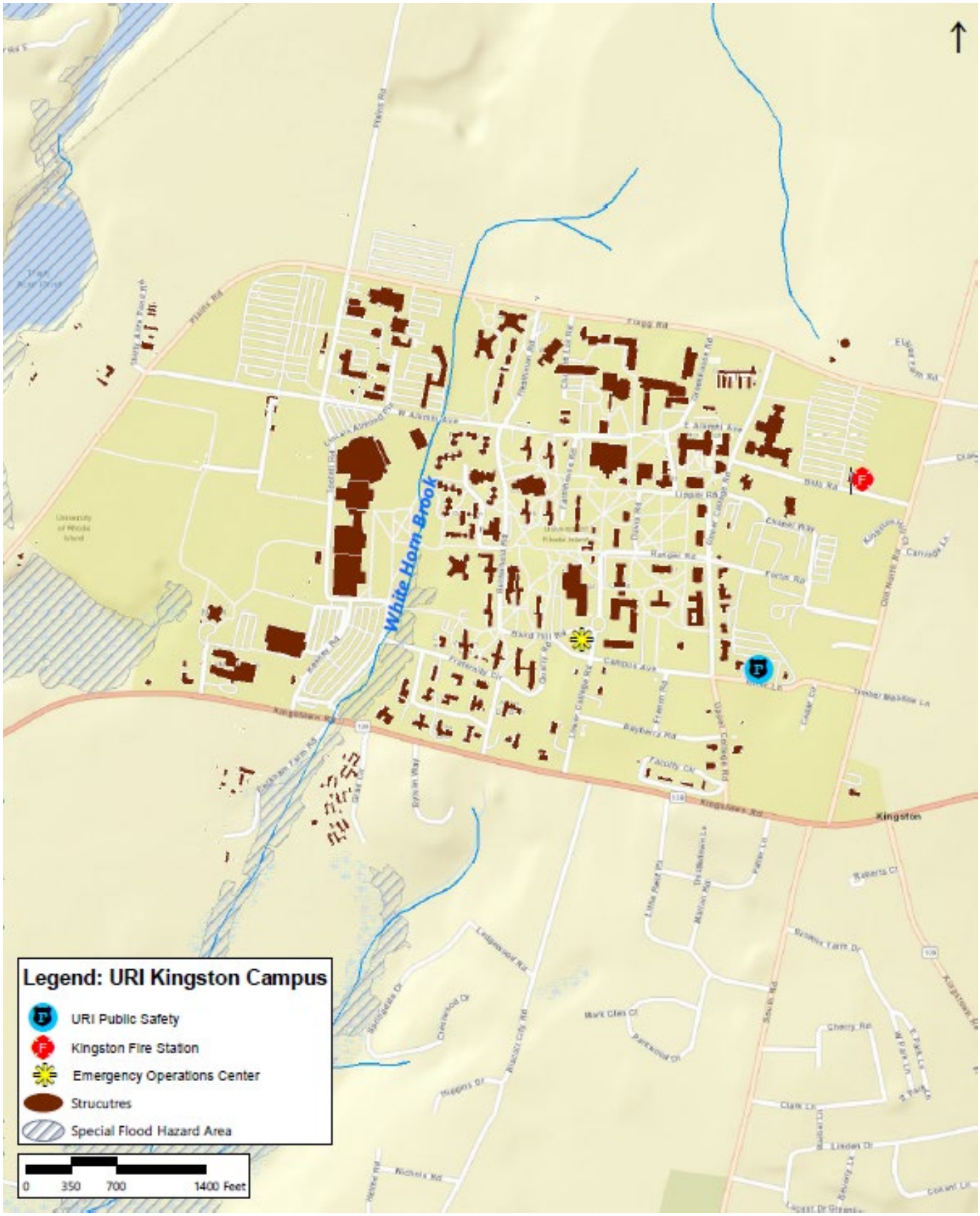
The University of Rhode Island Office of Emergency Management has drafted a natural hazard mitigation plan—the first of its kind for a college or university in the state of Rhode Island.

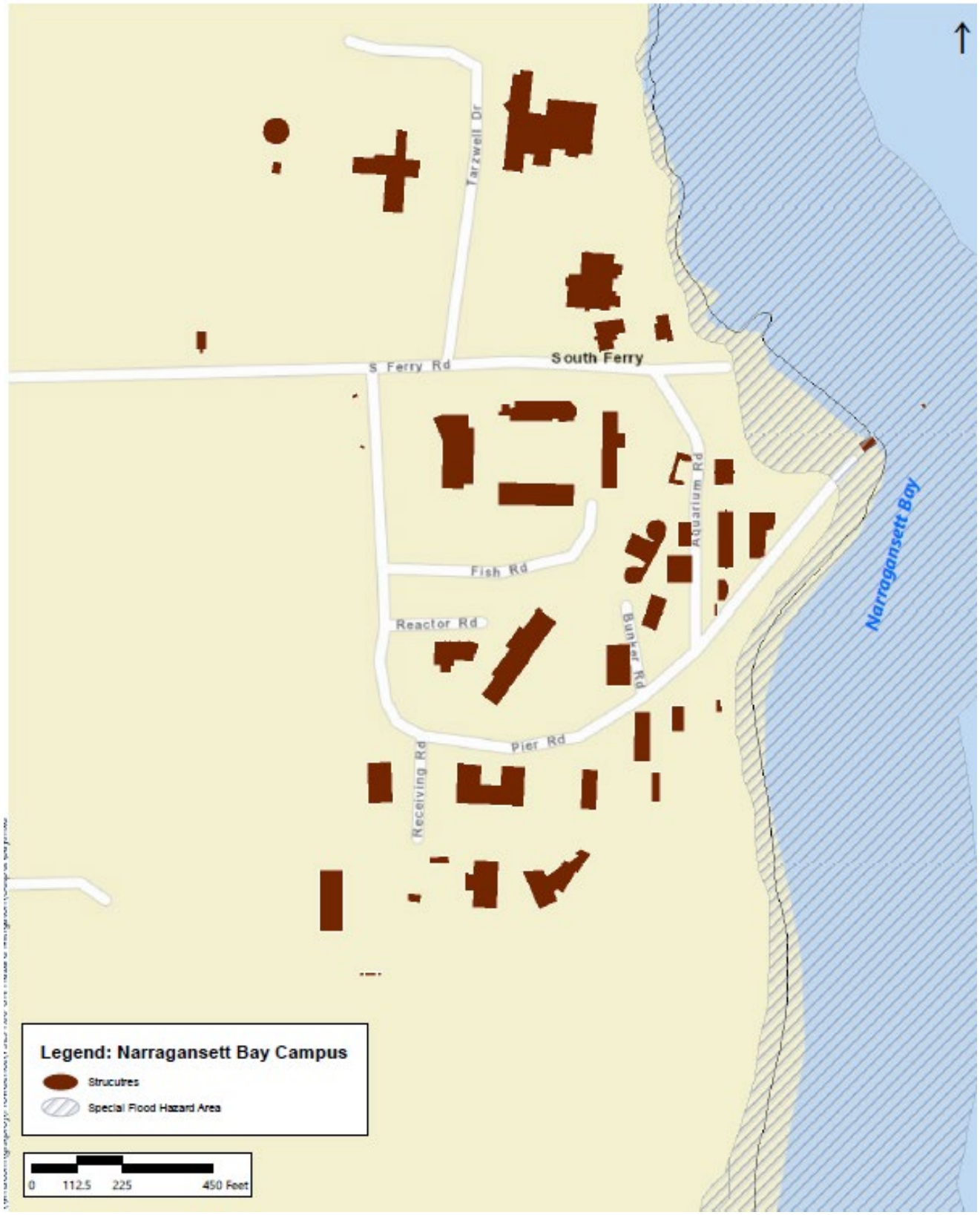
A draft of the plan has been posted for public review and comment on the Office of Emergency Management website and is available at https://web.uri.edu/emergency/wp-content/uploads/sites/188/Draft-URI-HMP-March-2023.pdf.

The comment period is open through April 7, 2023.

Please send all comments to emergency@etal.uri.edu.

Appendix C: Community Assets Map


White Horn Brook
Kingston
Legend: URI Kingston Campus
URI Public Safety
Kingston Fire Station
Emergency Operations Center
Strucutres
Special Flood Hazard Area
0
350
700
1400 Feet


Tarzwell Dr
S Ferry Rd
South Ferry
Aquarium Rd
Fish Rd
Reactor Rd
Bunker Rd
Pier Rd
Receiving Rd
Narragansett Bay
Legend: Narragansett Bay Campus
Strucutres
Special Flood Hazard Area
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