City of East Providence, Rhode Island

Local Hazard Mitigation Plan

A Multi-Hazard Mitigation Strategy

2017

Ten Mile River, March 30, 2010. Photo: East Providence Planning Department

East Providence Hazard Mitigation Committee

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ACKNOWLEDGEMENTS

City of East Providence, Rhode Island
Local Hazard Mitigation Plan

City of East Providence Hazard Mitigation Committee
Timothy Chapman, City Manager, Public Safety Director
Oscar Elmasian, Fire Chief
Christopher Parella, Police Chief
Stephen Coutu, Public Works Director
Erik Skadberg, P.E., City Engineer
Tony Feola, School Department Safety and Security Officer
Jeanne M. Boyle, Planning Director
Wayne Barnes, Senior Planner, Deputy Emergency Management Agency Director

East Providence City Council
James A. Briden, Mayor
Robert Britto, Assistant Mayor
Anna M. Sousa
Joseph A. Botelho, Jr.
Brian J. Faria

Rhode Island Emergency Management Agency
Jessica Henry, State Hazard Mitigation Officer
Michelle Burnett, Chief of Planning, State NFIP Coordinator
Christina Cosgrove, Cyber-Security Program Specialist

Federal Emergency Management Agency (FEMA)
Melissa Surette, Senior Planner, Risk Analysis Branch

Maps
Rhode Island Emergency Management Agency
East Providence Planning Department
GIS Shapefiles: Rhode Island Geographic Information System (RIGIS)

State Hazard Mitigation Committee

The State Hazard Mitigation Committee, overseen by the Rhode Island Emergency Management Agency (RIEMA), was established to identify current hazard mitigation needs, to review project applications and set priorities, and to update recommendations. The committee consists of representatives of various state agencies, many of which are listed below, and meets quarterly.

- Rhode Island Building Code Commission
- Rhode Island Coastal Resources Management Council
- Rhode Island Department of Administration
- Rhode Island Department of Business Regulations
- Rhode Island Department of Environmental Management
- Rhode Island Department of Transportation
- Rhode Island State Fire Marshal's Office
- Rhode Island State Police
- University of Rhode Island

ADOPTION

Recommended for City Council Adoption by the Planning Board: November 14, 2016
Approved by the East Providence City Council: February 21, 2017
Adopted by the East Providence City Council: March 7, 2017

Please see Appendix G for Plan Adoption Documentation.

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EXECUTIVE SUMMARY

Purpose

The purpose of the East Providence Local Hazard Mitigation Plan (hereafter referred to as "Plan," or "Plan update") is to provide comprehensive guidance for hazard mitigation in the City of East Providence. The City has experienced its share of natural disasters in recent years with four Federal disaster declarations since the start of 2010. This Plan serves the people of East Providence by providing the impetus for making homes, businesses and communities more resilient to the impacts of hurricanes, floods, severe local storms, winter storms, temperature extremes, and other natural hazards. In response to these events, hazard mitigation actions are designed and implemented to reduce or eliminate long term risk from hazards and their effects. The Plan also provides our constituents with information regarding the overall capabilities of the City and the State to reduce or eliminate natural hazard threats and vulnerabilities.

Hazard Mitigation Planning in East Providence

The City completed its initial Hazard Mitigation Plan in 2004 (adopted by the City Council in 2005), and performed an extensive update to the Plan in 2010. This update was adopted by the City Council in January of 2011 and then subsequently approved by the Federal Emergency Management Agency (FEMA), valid May 1, 2011. This Plan update was guided by the East Providence Hazard Mitigation Committee and RIEMA, using a format provided by RIEMA. The State of Rhode Island 2014 Hazard Mitigation Plan was used extensively as a guide to formatting and content, and many other resources were used as noted within the Plan. The Hazard Mitigation Plan consists of the following sections and appendices:

Section 1: Introduction and Background describes Hazard Mitigation Planning in general and in East Providence, and discusses general characteristics of the City and recent significant natural hazard incidents.

Section 2: Planning Process discusses plan development and input from local leadership and other stakeholders including City residents and local commercial interests. The schedule for plan implementation and maintenance is described briefly, with more detail on this aspect of the plan in Section 6, Plan Adoption, Implementation and Maintenance.

Section 3: Hazard and Risk Assessment describes the natural hazards that threaten the City in detail, with historical information on various hazards and a generalized categorization of the degree of risk that each represents to the City. Also included are descriptions of areas of physical vulnerability to natural hazards including floodplains, industrial areas, historic properties, City facilities and recreational areas, and future development. The City's National Flood Insurance Program (NFIP) repetitive loss areas are addressed within this section. A detailed matrix breaks down vulnerability to hazards by location, public or private ownership, hazard type, impacts, mitigation benefits, and/or potential for incident occurrence.

Section 4: Capability Assessment reviews current local government hazard mitigation and emergency management mechanisms including the Community Rating System (CRS), as well as partnerships with other programs including State and Federal agencies, other communities, and non-profit agencies. This

section also incorporates integration with other local plans including the City's Comprehensive Plan and Emergency Operations Plan and others; and looks at recent successes along with future needs and challenges with an eye toward increasing our hazard resilience.

Section 5: Mitigation Strategy lists and describes mitigation goals and objectives that can be reasonably undertaken or investigated during the five-year operational time frame of this plan. These action items include suggestions for responsible parties, available resources, a general timeline and a current status on each item as appropriate. There is also a review of previous Hazard Mitigation Plan action items and progress made during the most recent hazard mitigation planning cycle.

Section 6: Plan Adoption, Implementation, and Maintenance reviews the process of plan review and adoption and provides information on tracking implementation progress and keeping the Hazard Mitigation Plan up-to-date.

Appendices: The Appendix section includes hazard mapping; technical and financial assistance resources with website and contact information; evidence of public outreach and participation during the planning process; documentation with regard to FEMA plan approval and City adoption; references; and the FEMA "Local Mitigation Plan Review Tool."

Scope of the Plan

The Plan addresses all natural hazards which pose a significant threat to the City of East Providence. Each hazard has been assessed using the same methodology with information including historical significance, vulnerability, exposure and potential losses, as available, for all hazards in the Plan. The following types of hazards are analyzed and discussed in the Plan:

- Wind Related Hazards- Including hurricanes and storm surge, severe local storms including tornadoes, and larger-scale high wind events;
- Winter Related Hazards- Including heavy snow, ice, and extreme cold;
- Flood Related Hazards- Including coastal and riverine flooding, urban flooding, local flash flooding, coastal erosion, dam breach, and climate change/sea level rise;
- Geologic Related Hazards- Including earthquakes; and
- Additional Hazards- Including wildfires, drought and extreme heat.

Extensive information about these hazards can be found in Section 3, Risk Assessment.

Hazard Mitigation Plan – Updated Strategies List

A list of recommended Mitigation Strategies for the upcoming five-year hazard mitigation planning cycle can be found on Page 10, below. Section 5 of the Plan details these items including descriptions, relative priorities and suggested timelines, possible funding sources as appropriate, the items' mitigation benefits, and a status of each initiatives as of 2016. Hazard mitigation planning is a fluid process; priorities and timelines indicated are based on the best available information as of the development of this Plan update, and can be adjusted during the course of the planning cycle.

Hazard Mitigation Mission, Goals, and Specific Strategies

City of East Providence Hazard Mitigation Mission: East Providence is prepared for natural hazards and has the resources to mitigate, prepare for, respond to, and recover from a disaster.

Goal 1: Reduce the vulnerability of our residences, businesses and government to natural disasters.

Strategies:

1. **Upgrade alternate power capability at municipal facilities including City Hall, other City Buildings, and at water and wastewater pumping stations.**
2. **Upgrade the City's participation in FEMA's Community Rating System.**
3. **Upgrade and strengthen infrastructure at school facilities.**
4. **Update Emergency Action Plans for local high hazard dams and coordinate with upstream communities.**
5. **Implement education program for residents regarding the purpose and use of mapped evacuation routes and coordinate with neighboring towns.**
6. **Prepare post-disaster Continuity of Operations Plan for City government.**
7. **Increase shelter capacity and capability with infrastructure upgrades.**
8. **Upgrade water lines.**

Goal 2: Reduce property damage caused by natural disasters.

Strategies:

9. **Reduce poor drainage flooding at locations, as identified in Section 3.2c of this Plan update, and in the Southeast Drainage Area.**
10. **Implement physical mitigation activities in repetitive loss areas.**
11. **Acquire or secure conservation easements on flood-zone and other environmentally sensitive properties.**
12. **Develop a recovery and reconstruction ordinance for post-disaster rebuilding.**
13. **Perform emergency/disaster planning for the City's historic properties.**
14. **Research and implement a backflow valve retrofit program.**
15. **Conduct outreach regarding tree trimming.**
16. **Research coastal erosion mitigation options.**

Goal 3: Increase public outreach on disaster preparedness, response and recovery.

Strategies:

17. **Increase resident participation in City-wide hazard mitigation priority identification.**
18. **Increase outreach to commercial interests.**
19. **Increase hazard and hazard-mitigation communication in hard copy form and via the use of technology.**
20. **Develop and distribute City specific earthquake damage mitigation information.**

SECTION 1 – INTRODUCTION AND BACKGROUND

Section 1.1- Hazard Mitigation and the Hazard Mitigation Plan Update

Definition of ***Hazard Mitigation***: An action of a long-term, permanent nature that reduces the physical, social, and economic loss from a hazardous event.

It is intended that this plan will serve as the foundation for policies and actions to be undertaken by the City in order to reduce the physical, social, and economic loss that can result from a natural disaster. Physical, social, and economic losses include the loss of life, debilitating injuries and their inherent costs, destruction of property, disruption of transportation systems, loss of communication systems, loss/interruption of jobs, damage to local businesses, and the loss of historically significant structures. Natural hazards that have been taken into consideration for the purpose of this plan include: hurricanes, tornadoes, severe thunderstorms, hail, nor'easters, snowstorms, ice storms, extreme cold, flooding, storm surge, coastal erosion, dam breach, climate change and sea level rise, earthquakes, wildfire, drought, and extreme heat.

Formal adoption of this Plan update will allow the City to maintain credit points under FEMA's CRS program, which provides discounts on NFIP flood insurance premiums for residents of the City who carry flood insurance. In addition, the adoption of the Plan reaffirms the City's eligibility to apply for federal grants for hazard mitigation efforts that include FEMA's Unified Hazard Mitigation Assistance (UHMA) Program. Copies of this revised Plan will be available to the public at the East Providence Planning Department, the Weaver Library, the Riverside Branch Library, and on the City's website.

The mitigation strategies recommended in Section 5 of this Plan are intended to:

- Save lives and reduce injuries;
- Prevent or reduce property damage for residential and commercial interests;
- Strengthen existing emergency plans;
- Enhance public education/outreach;
- Develop pre- and post-mitigation opportunities;
- Incorporate hazard mitigation into the City's Comprehensive Plan;
- Incorporate hazard mitigation into the development plan review process;
- Protect critical facilities and infrastructure; and
- Protect cultural, historical, natural, and economic resources.

According to Code of Federal Regulations (CFR) Title 44, Sec 201, "The local mitigation plan is the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Local plans will also serve as the basis for the State to provide technical assistance and to prioritize project funding". Additionally, "A local government must have a mitigation plan approved pursuant to this section in order to apply for and receive mitigation project grants under all other mitigation grant programs."

Previous Hazard Mitigation Plan Documents
The City's original *"Strategy for Reducing Risk from Natural Hazards in East Providence, Rhode Island"* (hereafter, Hazard Mitigation Plan) was produced by the East Providence Planning Department in 2004, and was updated in 2010 followed by subsequent FEMA approval in May of 2011.

Section 1.2 - Community Planning Area

Map 1: East Providence Street and Locator Map

1.2a Location and Geography

The City of East Providence is situated along the eastern border of Rhode Island and represents the start of the transition from the urban environment of Providence to the more suburban and, in places, rural areas of southeastern Massachusetts to the east and northeast, and to Rhode Island's East Bay region to the southeast. A large portion of the City is bordered by bodies of water: The Seekonk and Providence Rivers to the west, Narragansett Bay to the southwest and south, and the Runnins and Ten Mile Rivers (including Central Pond and the James V. Turner Reservoir) along most of its eastern border. The City has 13.24 square miles of land area and 3.21 square miles of water area. Orientation is long and narrow, with dimensions of 7 to 8 miles north-to-south, and about 2 miles west-to-east. Topography is relatively low, though a very large majority of the land area is at an elevation higher than the coastal and inland Special Flood Hazard Areas.

1.2b Demographics and Housing

According to the 2015 U.S. Census Bureau estimate, the City of East Providence has a population of 47,408 persons. The City's population decreased slightly from 2000 to 2010, but in general has been very stable near or a little under the 50,000 mark for several decades. The resulting population density of the City is now 3,552 persons per square mile of land area. Persons 65 years and over make up 18.4% of the population, higher than the statewide average of 14.4%. East Providence has traditionally had one of the highest over-65 percentages in Rhode Island. The 2010 housing unit total was 21,440. The average household size is 2.3 persons. The rate of homeownership in East Providence is 57.3%, which is lower than the state average of 61.2% mainly due to the urban characteristic of the central portion of the City.[1]

1.2c Land Use and Infrastructure

The character of the City consists largely of residential neighborhoods, with numerous commercial corridors along with several manufacturing facilities and scattered business parks. With a couple of exceptions, the interior of the City is close to build-out capacity. Population density is highest in the west-central portion of the City within about one-half mile north and south of Interstate 195, where there is the highest percentage of multi-family housing and a predominance of small parcel sizes; however, there are many single-family properties in the mix. Elsewhere in the City, single-family properties are the more common residential land use. Waterfront residential areas are found in the far south. Farther north along the waterfront are some open areas, two wastewater treatment facilities, some industrial development and, in a few areas, the remains of the former waterfront industry. This is changing though, with a number of new waterfront developments either completed or in various stages of development (see Section 1.2d immediately below).

1.2d Community Development and Development Trends

Both commercial and residential development in East Providence were significantly affected by the slowdown in the economy from 2008 through 2013. Development activity showed an increase by the beginning of 2014, especially in the commercial and manufacturing sectors. Several manufacturing firms have either moved into or expanded in the City over the last few years, and City Economic Development staff are actively pursuing additional modern manufacturing entities. So-called "advanced manufacturing" has become a notable component of the City's economy (see Section 1.2e. below).

[1] "United States State & County QuickFacts", United States Census, accessed October 28, 2015, http://quickfacts.census.gov/qfd/states/44/4422960.html

New "infill" housing, which had slowed to a virtual halt during the recession, is picking up, and at least three new major residential or mixed use developments are moving forward. Two of these new developments are located in the City's *Waterfront Special Development District,* an area consisting of over 300 acres of mainly waterfront property along the Providence and Seekonk Rivers. The Waterfront Special Development District Plan, adopted in 2003, guides the development of available parcels in the district and offers expedited project review and permitting. The East Providence Waterfront Commission provides the planning process for the District, and works with City officials and State agencies to ensure structural and environmental compliance. The Commission strives for responsible economic development that does not put people at unnecessary risk to natural hazards. The Waterfront District projects that were getting closer to vertical development as of late 2015 include: Village on the Waterfront, on the shorefront site of a former oil-tank farm, along the northern portion of Veterans Memorial Parkway; and the Kettle Point residential development, about one-half mile to the south. Both of these developments will feature several hundred modern residential units; mainly apartments initially due to market demand. Construction in both cases will be above the coastal floodplain, and each development will feature dedicated open space and passive recreational amenities within the development and along the shore.

1.2e Commercial, Industrial, and Academic Sectors

East Providence's economy is comprised of a mix of employment sectors, with the largest component falling under the retail industry sector. The City, however, maintains a relatively diverse economy with significant employment in manufacturing, construction, health care, social services, banking and finance, insurance, warehousing, and other professional services industries.

Projects within the City's Waterfront District are expected to generate significant job growth over the next decade. In addition to the creation of thousands of temporary construction related jobs as the waterfront is developed, the City's Waterfront District is expected to see substantial job growth in high tech and light manufacturing, the service and hospitality industries, and in professional services.

East Providence is also home to Bradley Hospital, a residential psychiatric facility for children and adolescents, located near Veterans Memorial Parkway and Pawtucket Avenue, which includes a school. East Providence Emergency Management Agency (EMA) and Fire Department personnel are part of the Hospital's emergency committee and attend meetings at the facility. City Emergency Management has provided information to inform the development of their natural hazard matrix. The City will continue to work with Bradley Hospital on emergency initiatives both natural and man-made in nature.

The City has a total of twelve public schools including eight elementary schools, two middle schools, and a high school complex that includes East Providence High School and the East Providence Career and Technical Center. None of the City's public schools are in a Special Flood Hazard Area. School risk analysis and assessment are included in Section 3.4 of the Plan.

There are several other schools in the City including St. Margaret's School for grades pre-K through 8 in Rumford; Sacred Heart School in central East Providence near City Hall for grades K through 8; Bay View Academy on Pawtucket Avenue in the Boyden Heights area, a pre-K through 12 Catholic school for girls; the private pre-K through 8 Gordon School near Martin Street and South Broadway; and the Wolf School, a K through 8 school in on Ferris Avenue in Rumford, serving students with learning challenges.

1.2f Historic Resources

The City of East Providence has numerous historic properties from different eras in the State's history, including over 20 structures, properties, or districts that are listed in the National Register of Historic Places. These tend to be scattered around the city as either individual properties or small groupings of properties. The East Providence Historic District Commission and the City's Planning Department have done extensive work in recent years recognizing and documenting neighborhoods with good collections of relatively unmodified homes from the early part of the 20th Century in Riverside. Additionally, two historic districts have recently been recognized in Rumford. One of these is in the residential area of Pawtucket Avenue, Greenwood Avenue, and Pleasant Street. Another "new" historic district in the Phillipsdale section along Roger Williams Avenue contains a mill complex and a cluster of unique mill housing, and is also home to the Nathanial Daggett house, one of the oldest in the State. Two other areas with well-preserved period homes are found just off of the northern portion of Willett Avenue in Riverside. Most of these historic properties are well maintained, and none are directly in a Special Flood Hazard Area, though a few in the Phillipsdale district are on properties that are clipped by the very narrow floodplain along Omega Pond.

Photo 1. Rumford Historic District. Photo: Wayne Barnes

1.2g Natural Resources

The City has numerous natural areas that have been preserved, including some that are likely to remain relatively untouched and others that include trails and serve as valuable passive recreation areas. Four of these areas are particularly noteworthy.

Central Pond/Turner Reservoir: The City's Water Division owns dozens of parcels totaling about 60 acres of land in a narrow strip of varying width immediately abutting Central Pond and the James V. Turner Reservoir, which are part of the Ten Mile River system. Part of this land includes the **Turner Reservoir Loop Trail**. This 2.7 mile trail, mostly in East Providence, but with a portion in Seekonk, MA, includes several distinct sections, most of which are woodland trails. There are sidewalk segments, mainly in Seekonk, and three raised walkway sections through a wetland area. The raised walkway segments are within the floodplain and were flooded during the March 2010 floods (just months after project completion), but they held up extremely well and this fully handicap-accessible section of the loop trail is very popular with area residents.

Photo 2. Turner Reservoir Trail raised walkway segment. Photo: Wayne Barnes

Hunts Mills Historic Area: Hunts Mills is a 44-acre property along the Ten Mile River, located a short distance downstream from the Turner Reservoir. The property includes the historic 1750 Hunt House which is home to the East Providence Historical Society, a stone-construction Pump House that was used when the Turner Reservoir was the source of the City's water, and a popular one-mile hiking trail. This

was the site of a small amusement park around the turn of the 20th Century. The site contains interpretive signage that locates long-vanished structures, including a dance hall and buildings that housed midway games and a Carousel. The floodplain of the Ten Mile River extends onto parts of the property. The river overflowed its banks along the rapids just below the Hunts Mills Dam in 2010, but there was no resulting damage to structures on the property.

Boyden Heights Conservation Area: Briefly the site of a waterfront amusement park in the very early 1900's, this 11-acre Conservation Commission property in the Boyden Heights neighborhood of Riverside includes blazed woodland trails and a wetland boardwalk, has frontage on Narragansett Bay, and is directly on the East Bay Bike Path. Area residents have helped to maintain the property as a passive recreation area. The wetland areas and the wetland boardwalk are within the coastal special flood hazard area, but much of the property is elevated.

Willett Pond: Located along Willett Avenue in Riverside, Willett Pond is surrounded by a narrow strip of City property that includes a nature trail. A good variety of wildlife is found here considering its close proximity to suburban commercial and residential development.

Section 1.3 - NFIP Community Highlights

The City of East Providence participates in the NFIP, along with the other 38 municipalities in Rhode Island. The City has an active local floodplain program and answers several resident inquires monthly regarding flood insurance and FEMA flood zones. East Providence was enrolled in FEMA's CRS program as a "Class 9" community on May 1, 2014, in fulfillment to one of the high-priority action items of the 2010 Hazard Mitigation Plan. City EMA, with assistance from the Department of Public Works, the Planning Department, and RIEMA, will take measures to maintain our CRS enrollment with a goal of improving our status to Class 8 during this Hazard Mitigation Plan cycle.

Section 1.4 Significant Natural Hazard Events since the Last Plan Update

Since the date of FEMA's approval of the 2011 Hazard Mitigation Plan (May 10, 2011), there have been four weather events that have received Federal disaster declarations in all or part of Rhode Island. Providence County, including East Providence, was included in three of these declarations; Tropical Storm Irene, the February 2013 Blizzard, and the January 2015 Blizzard. The three declared events, and two other non-declared yet still significant-impact events, are briefly described below.

Tropical Storm Irene – August 29-30, 2011: This storm, which was categorized as a hurricane for much of its trek northward along the Atlantic Coast, brought gusty winds and about two inches of rain to East Providence. The storm was downgraded from hurricane to tropical storm strength just before passing over New York City. Typical of northern latitude tropical systems, the storm was transitioning toward post-tropical status and most of its heavy rain fell near and west of the storm track. The storm caused devastating flooding in parts of eastern New York and western New England, including much of Vermont. Locally, the effects were confined to minor local flooding and widespread but largely minor tree/power line damage. Power was completely restored to the City within a few days. A geographically large Federal Disaster Declaration followed that included all of Rhode Island.

Hurricane Sandy (Post-Tropical): This late-season tropical cyclone originated over the eastern Caribbean and stayed well off of the East Coast until turning toward the left, or west, and making a direct landfall on the New Jersey shore south of Atlantic City. The storm caused major and well-documented coastal flooding from New Jersey through New York City and Long Island, the Connecticut shoreline, and the south shore of Rhode Island. Storm effects in East Providence included tree and power line damage and minor coastal flooding, which did not directly affect any residences. A portion of Veterans Memorial Parkway near Watchemoket Cove was closed for a time as water covered the road during the evening high tide. High water-marks and debris lines from this high tide were photo-documented and compared to Fox Point Tide Gage data from the same time period. This material will aid in the prediction of flood levels during future storm-surge generating events. The State of Rhode Island, *minus* Providence County, was included in the Federal Disaster Declaration for Sandy; hence East Providence was not in the FEMA declaration area for this storm.

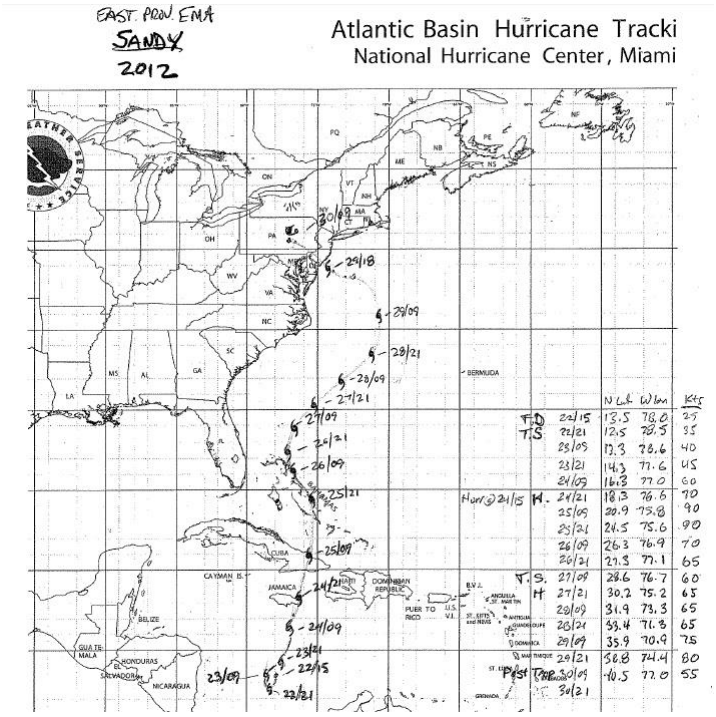


Figure 1. Hurricane Sandy as plotted by East Prov. EMA.

February 2013 Blizzard: This major snowstorm dropped upwards of 20 inches of snow across the City with winds gusting to 50 mph. Considerable power line damage occurred due to heavy, wet snow combined with strong winds. At one point, over three-quarters of the City was without power and some residential outages continued for over 48 hours. Downed trees and utility lines hampered efforts to plow some streets, as National Grid assistance is required to remove debris such as electrical wires. This storm helped to illustrate the likelihood of major debris and power issues that will occur in the event of a widespread strong wind event such as a hurricane. Providence and Kent Counties were included as a part of this storm's Federal Disaster Declaration, making East Providence eligible for Federal disaster aid.

January 2015 Blizzard and subsequent snowstorms: The storm of January 26-27, 2015 also brought heavy snow and wind gusts to 50 mph to the City with snowfall of close to 20 inches. A big difference between the 2013 event and this storm was that temperatures were far below the freezing point on this occasion, resulting in little if any accumulation on trees and power lines and no power grid problems in the City. Snow removal and public safety expenses were high locally and indeed statewide due to the volume of snow, and this resulted in a FEMA disaster declaration for the entire State. Snowstorms continued to hit the region on an average of twice weekly right through the first week of March, leading to the second snowiest winter on record for the area despite the early part of the winter featuring very little snowfall. Additionally, February of 2015 was the second coldest month on record for Rhode Island, resulting in snow piling up to very unusual depth on the ground. That snow depth prompted roof inspections at City buildings, and it was determined that snow needed to be removed from portions of two public school buildings.

August 2015 Severe Thunderstorm: A large, severe thunderstorm complex moved from eastern Connecticut across Rhode Island and nearby Massachusetts around daybreak on August 4, 2015, resulting in a swath of serious wind damage from parts of Coventry and West Warwick eastward across portions of Cranston, Warwick, and southernmost East Providence. Many large trees were snapped or uprooted in the Narragansett Terrace neighborhood and nearby Larisa Park, with several homes and cars also damaged in the neighborhood. Tree and minor property damage occurred on a scattered basis elsewhere in Riverside and on a very isolated basis farther north in the City. RIEMA compiled municipal damage estimates from this storm, but they were insufficient for any of the State's counties to qualify for Federal disaster aid.

Photo 3. Tree damage from August 2015 severe thunderstorm at Larisa Park in Riverside. Photo: Wayne Barnes

SECTION 2 – PLANNING PROCESS

Section 2.1 - Purpose, Overview and Background

2.1a Purpose of Local Hazard Mitigation Plan

The purpose of this Hazard Mitigation Plan is to recommend policies and actions to be undertaken by the City of East Providence in order to reduce the physical, social, and economic loss that can result from a natural disaster. Revisions will be made to this plan by the East Providence Hazard Mitigation Committee and submitted to RIEMA and FEMA in order to ensure consistency with state and national goals. The process is also being integrated with that of the 2017 East Providence Comprehensive Plan Update.

2.1b Plan Updates

Strategy for Reducing Risk from Natural Hazards in East Providence, Rhode Island (East Providence Hazard Mitigation Plan) was prepared by the East Providence Planning Department in 2004, adopted by the East Providence City Council, and approved by FEMA in 2005. An extensive update to the Plan was performed in 2010. This update was adopted by the City Council in January of 2011, and was approved by FEMA on May 10, 2011.

The 2017 Plan update utilizes a new Rhode Island Local Hazard Mitigation Template. This template, developed by RIEMA, reorganized the Plan elements and added some additional guidance as an aid to standardize the format of Hazard Mitigation Plans across the State. Elements of the 2010 plan that remained pertinent, including the base hazard information, were migrated into the new template and updated as needed. Given this guidance along with published FEMA guidance, significant changes to the Plan include:

- Updated lists of relevant personnel in the Acknowledgements section at the beginning of the document, along with new resources lists in the Appendix section, with updated contact information and web addresses;
- An updated *Natural Hazard Profile* section, already substantially enhanced in 2010, to take into account recent hazard occurrences;
- The *Risk Assessment Matrix* as updated based on evaluation by City Emergency Management and comments received from City departments; and
- 2010 *Action Items* as reviewed and evaluated to determine implementation progress, with a status chart added. Action items for this Plan update were reformatted to reflect current practice in their organization.

Additionally, FEMA Flood maps were revised over the past five years and those changes are reflected in the maps in this Plan update. Also included as part of mapping are hurricane inundation zones for direct hits from hurricanes rated Categories 1 through 4.

Section 2.2 - Building Support: Community Involvement, Roles & Responsibilities

2.2a Planning Team, Technical Assistance and Local Leadership

The City's Hazard Mitigation Planning Team consists of the City Manager as Public Safety Director, along with high-ranking personnel from the Planning, Police, and Fire Departments and the Department of Public Works (DPW). This group, and invitees including the Information Technology Director, a high-ranking School Department official, and the Public Buildings Superintendent, have met on the dates below to discuss emergency management initiatives including hazard mitigation, post-incident activity, emergency preparedness, and security.

- December 16, 2011: Year-end meeting discussing CDBG grant for mitigation activities in the State Street neighborhood, updated Emergency Operations Plan, and Tropical Storm Irene after-action including potential mitigation initiatives (mainly power-oriented);
- November 9, 2012: Post-Irene meeting including preparedness and mitigation options ahead of future storms that are similar or worse in scope;
- December 19, 2013: Meeting with then-new City Manager to discuss EOC, about-to-be-submitted CRS application, note commencement of Hazard Mitigation Plan 2015 update research and request for input;
- February 27, 2014*: (School Department): School system safety/security meeting with request for hazard mitigation input from top ranking school officials and school building superintendent;
- July 22, 2014*: EOC facility review, hurricane season planning and forecast, request Hazard Mitigation Plan input, FEMA grant application update;
- March 4, 2015*: Meeting to discuss EMPG and SHSP grant roll-out, input for Hazard Mitigation plan update, January 2015 blizzard after-action; and
- September 14, 2015*: Hazard Mitigation Plan initial draft final input solicitation, discussion of new flood maps dated 10/2/2015, introduce NWS StormReady® program (since applied for).

*Meeting agenda or notes available and found in Appendix D starting on Page 115.

Additionally, Command Staff incident after-action meetings and reports have been a source for both future preparedness actions and mitigation options. This group will maintain an open dialog regarding mitigation and preparedness, including a regular schedule of meetings in the future.

The City's Emergency Management Agency (EMA) has been a division of the Planning Department since 2009. Planning staff contributed economic development, historic property, land use, and demographic information along with comprehensive planning survey results to this Plan update. EMA collaborated with Command Staff as listed above regarding determination of risks and hazards, and on potential mitigation actions. The DPW Engineering Division and the Finance Department's Assessment Division provided mapping technical assistance and an array of property value data for purposes of economic vulnerability and incident damage estimation.

2.2b Public Involvement

Hazard Mitigation Public Meetings

A public workshop was held on May 5, 2011 to solicit public comment regarding Community Development Block Grant Disaster Recovery options specifically for mitigation actions in the State Street neighborhood. Among options discussed with about two dozen residents were drainage channel

maintenance, culvert improvements, and property acquisition. Ultimately, channel maintenance and culvert improvement projects were approved for grant funding after an extremely lengthy process and that work is underway.

Public meetings were held on August 21, 2014 and on October 20, 2015 at East Providence City Hall to gather public input on hazard mitigation planning in the City. Particular emphasis was placed on reviewing 2010 Plan action items and receiving input on potential additional action items. These meetings were designed as come-and-go events spanning two to three hours in the early evening. Advertising was done via two local newspapers, one of which is mailed free to each household in the city; social media; the City's webpage, and by announcement at the East Providence City Council Meetings held prior. Please see Appendix C for evidence and brief summaries of these events.

Comprehensive Plan Meetings

Four Comprehensive Plan meetings were held in the spring of 2014; one for each of the City's four wards, and a city-wide Comprehensive Planning Open House was held in November of 2014. East Providence Emergency Management was represented at each of these meetings, and a Hazard Mitigation display board was produced to encourage discussion regarding the City's hazards and mitigation options (See Appendix C). Perhaps the two most hazard-oriented concerns that came out of these meetings include:

- More areas seem susceptible to frequent street flooding now than was the case years ago; and
- Erosion of the coastal bluff along the Providence River south of the City's Wastewater Treatment Plan is an increasing concern for residents of that area.

Comprehensive Plan Survey

An element of the Comprehensive Planning process was a survey that was made available to City residents in 2014. Two questions related to hazards were included in the survey, these yielded many written comments regarding natural hazards and a few regarding hazard mitigation. A vast majority of comments were centered on residents' recent experience with natural hazards, and as a result most of these comments were with regard to either property damage from flooding (especially basement flooding), power outages, or snow removal. From the input, a few mitigation statements can be made:

- Efforts at flood mitigation and methods to reduce the frequency of nuisance flooding should be a high priority of mitigation planning in the City;
- More public outreach is needed with regard to what residents can do to mitigate the effects of flooding on their property and in their homes (i.e. elevation of utilities, less intensive use of basements in areas prone to basement and area poor drainage flooding, etc.);
- Slightly over half of survey respondents were of the opinion that the City should pro-actively engage in planning for climate change and sea-level rise with regard to City infrastructure and coastal erosion measures. The remaining respondents were closely split between a negative response to the question and no opinion; and
- On the preparedness side, outreach is needed to increase the awareness that lengthy power outages will result from certain natural hazard incidents and that residents need to be prepared for a certain degree of self-sufficiency during these time periods.

Bar charts displaying responses to the survey question by percentage are included in Appendix C.

Section 2.3 Discovery and Gathering of Resources

The Hazard Mitigation Plan Committee utilized multiple resources in updating our Hazard Mitigation Plan. The lengthy tenure of most members of the group results in substantial institutional knowledge, which only increases as staff works through actual natural hazard incidents. In addition to commonly used sources of information and data including the United State Geological Survey (USGS), various National Oceanic and Atmospheric Administration (NOAA) resources, and statewide resources from RIEMA and the Rhode Island Coastal Resources Management Council (CRMC), City staff now have numerous incident after-action reports which offer insight as to future preparedness and mitigation possibilities.

Coordination with Neighboring Municipalities
East Providence borders four other communities; Providence to the west across the Seekonk and Providence Rivers, Pawtucket to the north, Seekonk, MA to the east and Barrington to the south. It is to the advantage of neighboring jurisdictions to coordinate activities with each other as natural hazards have little regard for municipal and state boundaries.

Among the more important issues requiring cooperation with neighboring towns is emergency storm sheltering. The American Red Cross has designated East Providence High School as a regional shelter in their statewide sheltering plan. In addition, the State of Rhode Island Shelter and Coordination Plan (2015) has identified East Providence High School, as well as East Providence Senior Center and Riverside Middle School, as State shelter locations to be used by residents of East Providence and neighboring communities in the event of a major emergency. For example, a direct hurricane hit that causes significant storm surge flooding would have major or perhaps catastrophic implications for Barrington, as large sections of the town are in flood and inundation zones. Evacuation routes would likely include roadways in East Providence. Therefore, sheltering and evacuation routes should be coordinated between the two communities.

Concurrent with RIEMAs review of this Plan update, the Plan was made available online with notifications made on social media and by e-mail to Emergency Managers in Barrington, Warren, Bristol, Pawtucket, and Providence, as well as to the Town Planners in Bristol, Barrington, and Seekonk for a solicitation to review and comment. No comments were received.

Section 2.4 - Plan Maintenance

2.4a Method, Responsibilities, and Schedule

Plan Update Review, Adoption, and Approval
The City of East Providence, Rhode Island Local Hazard Mitigation Plan was submitted to the East Providence Planning Board for their consideration at their meeting of November 14, 2016. The Board issued a positive recommendation to the East Providence City Council regarding its adoption. Actual Council adoption was granted at the Council meeting of March 7, 2017 (see final documentation in Appendix G on Page 122).

Monitoring, Evaluation, and Updates
The 2010 Plan Update has been available on the City's Emergency Management webpage for public review since its adoption, with the invitation to provide comments and suggestions. Respondents may comment via e-mail or by phone directly to the Deputy EMA Director as Hazard Mitigation Committee Chair (contact information provided on EMA webpage). No comments were submitted during this time. This new Plan update, once adopted by the Council, will remain on the webpage, with copies available to the public at the Department of Planning in Room 206B at City Hall and at the City's public libraries.

The East Providence Hazard Mitigation Committee, under EMA leadership, will meet annually to monitor, evaluate and update the plan. There will be an annual solicitation of plan review from the Committee, with a particular focus on the following plan components, based on circumstances present at the time of the review:

- Natural Hazard Profile: Account for any major disasters, particularly if they result a presidential disaster declaration;
- Mitigation Action Items: Review status of and progress on action items and revise as necessary, identify any implementation issues; and
- Risk Assessment: Evaluate matrix, especially with respect to hazard impacts and hazard ranking.

Public notice regarding any Plan revisions will be submitted to the East Bay Newspapers group (locally, the East Providence Post, distributed free at locations throughout the City) and the monthly East Providence Reporter which is mailed free to all City households. Such notice will also be posted in the lobby of City Hall, at the public libraries, the City's webpage, and on City and EMA social media sites.

The Committee will also meet following a hazardous event that has resulted in the loss of life and/or damage to property within the City. This practice has been followed in the wake of all recent incidents, including the March 2010 floods, Tropical Storm Irene, Hurricane Sandy, and major snowstorms, with elements of disaster response and new options for mitigation incorporated into this Plan update.

2.4b Accounting for Ongoing and Anticipated Changes in Development
As noted elsewhere, the "Great Recession" experienced across the nation slowed down development substantially in East Providence and elsewhere, with little recovery in development activity evident through 2012. In 2013, as the local economy began showing signs of progress, projects began filtering into the City. From late 2014 into 2016, projects were being proposed and executed at a rather robust pace. In collaboration with the East Providence Planning Department, the Hazard Mitigation Committee will monitor these development trends and determine any resulting changes in vulnerabilities that natural hazards will present. The anticipated development of many housing units along with other uses in the City's Waterfront Special Development District over the next five to ten years will add to the population and infrastructure that is vulnerable to hazards. Additionally, advanced manufacturing and leisure-time service industries are on the upswing in the City. These trends and their interplay with our expected natural hazards will be monitored closely during the course of the cycle of this Hazard Mitigation Plan.

2.4c Continued Public Involvement

An update of the City's Hazard Mitigation Plan is required within five years of the adoption of the currently-valid plan. The Hazard Mitigation Committee will commence a *complete* review of the Hazard Mitigation Plan roughly 18 months in advance of the expiration date of the adopted plan. Review and revision will be based on State and Federal guidelines current to the time of the update. Invitations for review and comment will be sent to local organizations, including the East Providence Chamber of Commerce, the Downtown Business Association, and the East Bay Community Action Program. Public meetings will be scheduled and advertised via print and social media. The revised Plan will be submitted to RIEMA and FEMA as required for their approval.

In addition to a running solicitation for public review and comment via the City's website, East Providence Emergency Management will host annual public meetings to speak with constituents on an individual (or group, as interest determines), basis regarding the City's natural hazards. Emergency Management, in capacity as the City's Floodplain Coordination Office, will continue to offer our flood zone and flood insurance informational service as we have over the last five years.

SECTION 3 – HAZARD AND RISK ASSESSMENT

Section 3.1 - Introduction

3.1a Population at Risk

Depending upon the severity and extent of a natural hazard, all residents of the City of East Providence are potentially at risk; especially the elderly, those with functional needs, and children in daycare facilities. Specific information regarding risk to our population is included within the Extent sections within each hazard discussion, as well as in Section 3.4, Risk Analysis and Risk Assessment Matrix.

Section 3.2 - Natural Hazard Analysis

3.2a Hazard Identification

Local jurisdictional natural hazards considered for inclusion in this Plan update were determined by analyzing the list of natural hazards that were included the 2014 Rhode Island Hazard Mitigation Plan, considering any additional hazards upon consult with the City's Hazard Mitigation Committee, and utilizing historical significance and local institutional knowledge of natural hazards that had been presented in that past. The results of this analysis provided the Plan with additional hazards to be profiled within the Hazard and Risk Assessment Section. These additional natural hazards include: severe thunderstorms, including hail; and nor'easters.

Wind Related Hazards	Winter Related Hazards	Flood Related Hazards	Geologic Related Hazards	Additional Hazards
Hurricanes	Snowstorms	Riverine Flooding	Earthquakes	Wildfire
Tornadoes	Ice storms	Flash Flooding		Drought
Severe Thunderstorms • Hail	Extreme Cold	Urban Flooding		Extreme Heat
Nor'easters		Coastal Flooding		
		Storm Surge		
		Coastal Erosion		
		Dam Breach		

Table 1. Natural Hazards Identification

Table 1 reflects the natural hazards that were included within the Plan update, as these are the natural hazards that are commonly recognized to affect East Providence and the City's planning efforts.
The natural hazards that were omitted from this Plan, including tsunami and landslides, were not specifically addressed due to each hazards extremely low probability of future occurrence, as well as lack of historical data and previous occurrences in East Providence and the surrounding areas. Should this change, future Plan updates will address these hazards.

3.2b Natural Hazard Profile Notes and Organization
Natural hazard profiles, as developed for this Plan update, have been organized as follows:

Description: Detailed descriptions of each hazard from a local and regional meteorological perspective, or a general hazard description for non-meteorological phenomenal such as earthquakes.

Location: An idea of the general physical scale of impact for each hazard within East Providence, including more likely specific locations when possible. In the case of some hazards, the scale of hazard events is such that no one area is more, or less, favored for impact. In other instances, the scale of the hazard incident may be very small, right down to neighborhood-scale, but no one area is more susceptible to impact than any other.

Extent: Information regarding the strength or magnitude of a hazard on a qualitative and, where possible, quantitative basis, with indication of potential worst case scenario.

Previous Occurrences: An up-to-date listing if significant events for each hazard as localized as possible, but generally by Providence County, Providence *and* Bristol Counties, or the State of Rhode Island.

Probability of Future Events: For purposes of this Plan update, probabilities of hazard occurrence have been assigned as follows:

Low:	Expected occurrence interval of less than once in 50 years.
Medium:	Expected occurrence interval of between once in 50 years and once in 5 years.
High:	Expected occurrence interval of once or more in 5 years (one full Hazard Mitigation Plan update cycle).

3.2c Natural Hazard Profiles

Wind Related Hazards

1. Hurricanes

Description
Hurricanes present a very serious threat to all of southern New England including the City of East Providence. August and September are considered the peak months for hurricane activity in the region, but the Atlantic hurricane season officially runs from June 1st through November 30th. Our area has been affected by tropical weather systems during this entire period and, in rare instances, in December. Hurricanes present multiple major hazards for the City including tidal flooding, storm surges, damaging winds, and excessive rainfall causing riverine and poor drainage flooding. All hurricanes, and most tropical storms, that make landfall in southern New England will feature each of these hazards somewhere in the region. The degree to which each affects the City is dependent on the storm's strength and track. A track to the west of Narragansett Bay will result in a more severe storm surge up the Bay and more powerful winds, while a track to the east may produce a weaker surge and somewhat less wind, but will likely result in substantially heavier rainfall and an enhanced threat of riverine and urban flooding.

Characteristics of New England Hurricanes

Hurricanes that reach the New England area have certain characteristics that make them somewhat different from those in the tropics and sub-tropics. Changes occur in the satellite signature (shape) and structure of hurricanes as they move into the mid-latitudes. As they approach our region, hurricanes begin (and in the case of Sandy, nearly complete) the transition from tropical to "post-tropical" storm and take on characteristics of a very strong nor'easter. The satellite photos below illustrate the typical difference in satellite appearance between tropical and mid-latitude hurricanes.

Photo 4. Hurricane Andrew, 1992[2]

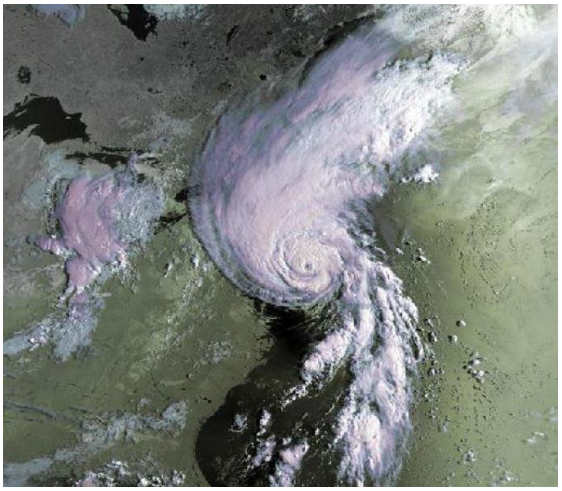


Photo 5: Hurricane Bob, 1991. Local hurricane archive.

Hurricane Andrew, shown here east of Florida and moving into the Bahamas, was a classic low-latitude hurricane with a round, buzz-saw shape and a well-defined eye. Hurricane Bob, still centered south of New England on this photo, displayed a typical mid-latitude satellite signature with more cloudiness to the left of and ahead (in this case to the west and north) of the storm's track, along with a cold-frontal structure to the south of the storm. The end result is that nearly all hurricanes that reach our region contain very heavy rainfall to the left (generally west) of the storm's path, and the very strongest winds and worst storm surge along and to the right (generally, east) of the storm's path. This is not to discount effects of rain and wind on the other sides of the storm, but as a planning tool it is reliable to expect flooding rain left of the storm's path, and very strongest winds and surge to the right.

Location

Most hazards associated with hurricanes will have at least a residual effect on the entire city. The most widespread hazard that would affect the entire City would be the damage caused by strong winds. The degree of storm surge, and riverine and flash flooding will depend on the storm's track and strength. Please see the discussion on Storm Surge (Page 45) in the Flood Hazard section for specific locational information of these hazards as they relate to hurricanes and to other natural hazard incidents.

[2] Hurricane Photo: NOAA. Andrew, http://www.hurricanescience.org/history/storms/1990s/andrew/

Extent

Hurricane intensity is categorized based on the *Saffir-Simpson Hurricane Wind Scale* (see Table 2 below). The scale is based strictly upon wind speed and *does not* assign any other specific conditions such as central barometric pressure, storm surge, structural damage, or flooding effects to the categories.

Saffir-Simpson Hurricane Wind Scale

The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, however, and require preventative measures. In the western North Pacific, the term "super typhoon" is used for tropical cyclones with sustained winds exceeding 150 mph.

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	**Very dangerous winds will produce some damage:** Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Table 2. Saffir-Simpson Hurricane Wind Scale[3]

Note that in the Saffir-Simpson classification (Table 2 on Page 27), storms of Category 3 and higher are further categorized as “Major.”

A hurricane of any category would be sufficient to cause widespread tree and power line damage. An important seasonal aspect of hurricanes from a wind standpoint is that they occur when foliage on the trees is fully developed. This factor, added to the fact the New England tropical storms and hurricanes are commonly preceded by heavy rainfall, results in the likelihood of many uprooted trees and trees that are snapped above their trunks from a strong hurricane, causing extremely

[3] “Saffir-Simpson Hurricane Wind Scale”, NOAA- National Hurricane Center, accessed November 16, 2015, http://www.nhc.noaa.gov/aboutsshws.php.

widespread power line damage. This not only creates massive debris and power issues, but also limits access to streets and neighborhoods, which hinders efforts to assist residents and begin clean-up and recovery operations. It is important to realize that a storm bringing winds of Category 3 and higher speed would damage or take down a large majority of all of the trees in the City and result in nearly complete power failure. The City will do what it can to remove debris with all of the resources available, but direct assistance from National Grid and/or other utility providers brought into the region will be required to clear the huge amount of debris that would contain utility wires. Because of the large regional scale of these storms, the outside assistance required would also be needed by *all* jurisdictions in the region, and, as a result, those resources will be stretched very thin.

The extent of storm surge and flooding are discussed in the respective sections for those hazards later in the Plan.

Previous Occurrences

Date	Name	Wind Speed(MPH)	Property Damage ($ Millions)	Deaths
9/21/1938	N/A	95+	100	262
9/14/1944	N/A	82	2	0
8/31/1954	Carol	110	200	19
9/11/1954	Edna	40	0.1	0
8/19/1955	Diane	45	170	0
9/12/1960	Donna	58	2.4	0
9/27/1985	Gloria	81	19.8	1
8/19/1991	Bob	75	115	0

Table 3 (above). Significant Hurricanes affecting Rhode Island from 1935-2015.

Date	Name	Wind Speed(MPH)	Property Damage ($ Millions)	Deaths
8/28/2011	Irene	Up to 60	.19	0
10/29/2012	Sandy	Up to 70	8	0

Table 4. Other recent major tropical weather systems affecting East Providence.

Probability of Future Events

Tables 3 and 4 above display 10 hurricanes that have affected our area since 1935. Note the uneven time distribution of these storms with three of them occurring in a two-year period during the mid-1950s. Figure 2 below provides well-researched recurrence intervals of hurricanes passing within 50 miles of defined areas along the Atlantic and Gulf of Mexico coasts. A hurricane track within that distance would have a strong and lasting impact on the area. Figure 2 displays a 17-year recurrence interval for such a storm track for Rhode Island. Based on the significant influence of additional hurricanes that passed somewhat outside of this 50 miles radius (e.g. Hurricane Gloria for our area), it can be estimated that long-term recurrence intervals for hurricane impacts may be every 10 to 15 years, or in the medium category. It is important to note that while hurricanes do not have the highest of all probabilities of occurrence, the extreme impact of a hurricane direct hit in the area combined with the fact that it would affect our entire region makes hurricanes perhaps the most dangerous of all natural hazards for East Providence.

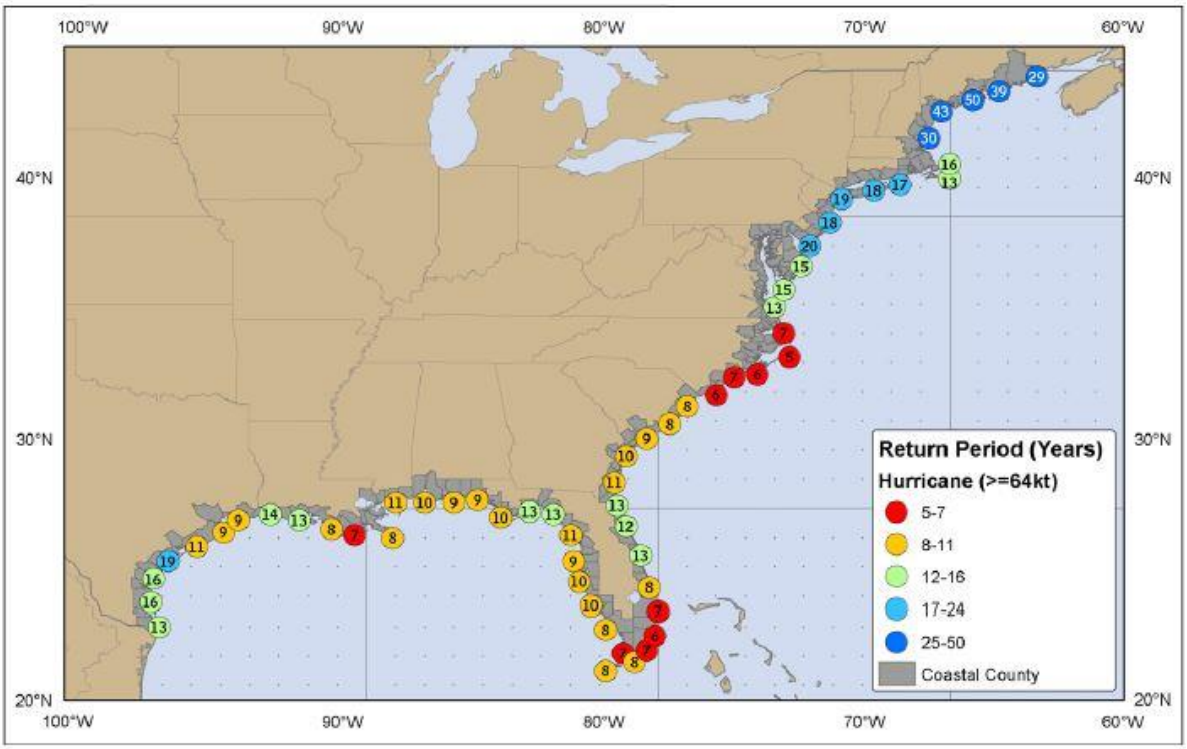


Figure 2. Estimated return period in years for major hurricanes passing within 50 miles of various locations.[4]

Wind Damage Estimating

The Florida Commission on Hurricane Loss Prevention Methodology was created by Florida Legislature in 1995 to develop standards and review hurricane loss models as an aid in developing property insurance rates and probable maximum loss levels. The Commission solicits and posts various hurricane loss studies which include wind damage rate ratios for categories of 10-meter one-second wind speeds, in 10 mph increments. The wind damage rate ratios from five submitted studies for 2013[5] have been averaged for Table 5 (right) to produce structural damage estimates across East Providence for wind speed increments, based on the total estimated assessment value of structures in the City as of 2015.

Wind Speed (mph)	Estimated Ratio of Wind Damage	Total Structural Wind Damage Estimate
61-70	0.018	$52,872,010
71-80	0.043	$126,305,357
81-90	0.084	$246,736,045
91-100	0.141	$414,164,076
101-110	0.214	$628,589,449
111-120	0.361	$1,060,377,528
121-130	0.461	$1,354,110,915
131-140	0.584	$1,715,402,982
141-150	0.673	$1,976,825,697
151-160	0.718	$2,109,005,721

Table 5: Potential total monetary wind damage across East Providence.

[4] Eric S. Blake, Christopher W. Landsea, Ethan J. Gibney, "The Deadliest, Costliest, and Most Intense United States Tropical Cyclones from 1851 to 2010 (and Other Frequently Requested Hurricane Facts)", NOAA Technical Memorandum NWS NHC-6, http://www.nhc.noaa.gov/pdf/nws-nhc-6.pdf

[5] "Modeler Submissions", Florida Commission on Hurricane Loss Prevention Methodology, accessed October 28, 2015, https://www.sbafla.com/methodology/ModelerSubmissions/tabid/785/Default.aspx.

2. Tornados

Description

A tornado is a violently rotating column of air extending from a cloud to the surface of the earth. Top winds in weaker tornadoes are 100 mph or less, but in the most violent (and fortunately least frequent) tornadoes, wind speeds can exceed 250 mph. Tornadoes typically track along the ground for a few miles or less and are commonly less than 100 yards wide, though some can remain in contact with the earth for well over fifty miles and exceed one mile in width.

Photo 6. Narragansett Bay waterspout, July 2008. Photo: Nicholas Caisse (used with permission).

Tornadoes are found within strong to severe thunderstorms, generally near the back edge of the storm with respect to its movement. On many occasions, they are "behind" the thunderstorm's rain shield, which is why so many of them are very clearly seen during daylight hours. Nighttime tornadoes are particularly dangerous, but fortunately for New England they are very rare in the region. Major recent advancements in weather radar and tornado research have led to much greater awareness of atmospheric conditions that are favorable for tornado development, and Doppler radar upgrades now allow for more timely detection and tracking of tornados and other severe weather.

Location

In general, southeastern New England including Rhode Island is less favored for tornadoes than most of the United States westward through the Midwest and the Plains states, and southward to the Gulf Coast. New England's generally accepted *Tornado Alley* consists of the Connecticut Valley in north central Connecticut and western Massachusetts and eastward into Worcester County, MA. This area also has a higher probability of a large tornado. Historically, tornadoes that have affected Rhode Island have been small, narrow, and for the most part short-lived.

Extent

Tornadoes can cause serious devastation amounting to millions of dollars in a small area. For East Providence, this could include any of the City's densely populated neighborhoods and could result in significant loss of life and destroyed utility lines, causing power outages for many residents. In terms of statewide geographic probability of a tornado occurrence, the possibility is slightly higher in the northern half of Rhode Island and west of Narragansett Bay, but they have occurred very close by and waterspouts (funnel clouds over water) have been sighted in Narragansett Bay, and have even come ashore as tornadoes. There is no one section of the City that is more or less likely to experience a tornado than any other.

The *Enhanced Fujita Tornado Scale* (or "EF Scale") classifies tornadoes into six categories ranging from EF 0 (EF "zero") to EF 5. This scale rates the intensity, and probable maximum wind speed, associated with a tornado based on damage to structures and vegetation using 28 damage indicators and 8 levels of damage. The indicators include types of vegetation and numerous structural variables including structure height, type, and building materials. The wind estimate is based on the maximum "3-second gust," as a single tornado's presence at any given point is of very short duration.

EF Rating	Wind Speeds	Expected Damage	
EF-0	65-85 mph	'Minor' damage: shingles blown off or parts of a roof peeled off, damage to gutters/siding, branches broken off trees, shallow rooted trees toppled.	
EF-1	86-110 mph	'Moderate' damage: more significant roof damage, windows broken, exterior doors damaged or lost, mobile homes overturned or badly damaged.	
EF-2	111-135 mph	'Considerable' damage: roofs torn off well constructed homes, homes shifted off their foundation, mobile homes completely destroyed, large trees snapped or uprooted, cars can be tossed.	
EF-3	136-165 mph	'Severe' damage: entire stories of well constructed homes destroyed, significant damage done to large buildings, homes with weak foundations can be blown away, trees begin to lose their bark.	
EF-4	166-200 mph	'Extreme' damage: Well constructed homes are leveled, cars are thrown significant distances, top story exterior walls of masonry buildings would likely collapse.	
EF-5	> 200 mph	'Massive/incredible' damage: Well constructed homes are swept away, steel-reinforced concrete structures are critically damaged, high-rise buildings sustain severe structural damage, trees are usually completely debarked, stripped of branches and snapped.	

Table 6. The Enhanced Fujita Tornado Scale

Previous Occurrences

The National Climate Data Center (NCDC) tornado database for Rhode Island lists 11 tornadoes in the State since 1970. Note that all of the reported tornadoes have occurred during July, August or September. While the warmest time of the year is by far the most favored period for tornadoes in our area, they have occurred in other seasons elsewhere in New England; in fact, one was recorded in December of 1951 on Martha's Vineyard. The most destructive recent tornado in New England occurred on June 1, 2011, when a long-lived tornado formed in West Springfield, MA and traveled eastward nearly 40 miles on its 70-minute trek into the Sturbridge area, causing $227 million in damage along the way. Later that day, another thunderstorm cell touched off three weaker tornadoes in the area of the Mass. Pike in the same part of the state. This outbreak illustrated that, while major tornado outbreaks don't occur in New England to the same magnitude as in the Great Plains and Midwestern U.S., multiple tornadoes can occur in the region from the same weather system. That was demonstrated in Rhode Island in August of 1986 when three tornadoes occurred in two days, including one in Cranston and Providence which caused $2.5 million dollars in damage.

Location	Date	Time (EDT)	Magnitude*	Deaths	Injuries	Property Damage
Bristol County	9/14/1972	5:45 PM	F-0	0	0	$0
Glocester	8/26/1985	3:00 PM	F-1	0	0	$0
Lincoln	8/7/1986	3:30 PM	F-1	0	0	$250,000
Cranston, Providence	8/7/1986	4:15 PM	F-2	0	20	$2,500,000
Burrillville	8/8/1986	10:15 AM	F-1	0	0	$250,000
Cranston	9/23/1989	3:30 PM	F-0	0	3	$250,000
Warwick	10/18/1990	11:10 PM	F-1	0	0	$250,000
Coventry	8/13/1994	6:30 PM	F-0	0	0	$0
Foster	8/16/2000	3:00 PM	F-0	0	0	$0
Barrington, Warren	7/23/2008	4:05 PM	EF-1	0	0	$45,000
Block Island	8/10/2012	3:54 PM	EF-0	0	0	$50,000
Totals:				0	23	$3,595,000

Table 7. Tornadoes reported in Rhode Island since 1970[6]

*** Note:** Prior to 2007, magnitude was based on the original Fujita (F) Scale. The Enhanced Fujita (EF) Scale has much larger and more detailed set of damage indicators, along with a more intuitive wind scale (see Table 6, Enhanced Fujita Tornado Scale chart on Page 31).

Probability of Future Events

A tornado has occurred in Rhode Island on an average of about once every 4 years since 1970. None of these have directly hit East Providence. Due to factors that typically enhance thunderstorm development, western interior Rhode Island is slightly more likely to experience a tornado than areas closer to the water, but it is evident that tornadoes can affect any part of the State. There is no one portion of East Providence that is more susceptible to a tornado than any other area. The probability of a tornado event in the City is in the medium category, but it is important to recognize that some years feature repeating patterns of severe weather in certain areas and, conceivably, there could be multiple tornadoes somewhere in the State in the same year, or within a few days or less. Also of importance is that any tornado that does impact the City can cause devastating damage where it makes contact with the ground.

3. Severe Thunderstorms

Description

A severe thunderstorm is defined by the NOAA Storm Prediction Center as a thunderstorm that features one or more of the following: a wind gust of 58 mph or greater, one-inch or larger sized hail, or a tornado. Severe thunderstorms are less common in the Providence area than they are in central and western New England, as storms often weaken moving eastward onto the coastal plain due to "downsloping" off of the hills to the west, and due to marine influences from the south or east on the local air mass. Despite these factors, East Providence can rely on experiencing a thunderstorm anywhere from about 15 to 30 days each year, including a few incidents of at least localized severe weather.

[6] "Storm Events Database", NOAA-NCDC, accessed October 26, 2015, http://www.ncdc.noaa.gov/stormevents/.

Thunderstorms are always capable of producing strong wind gusts, torrential rainfall, fallen tree/limbs, downed power lines, flooding, and deadly lightning strikes. Notable severe thunderstorms in the immediate area include one in July of 2008, as seen in Photo 7, during which a lightning strike caused an explosion and major fire at the Port of Providence, and strong winds from the same cell caused extensive tree damage along a small area of Veterans Parkway in East Providence directly across the river from the port.

Photo 7. Severe thunderstorm in formative stage over central East Providence, July 2008. This storm moved northeastward causing damaging winds in parts of Seekonk and Rehoboth.

Photo: Wayne Barnes

While tornadoes do infrequently occur in our area (see tornado section above), the greatest wind hazard from severe thunderstorms here is almost always straight-line wind gusts. Squall lines can result in strong wind gusts (of various speeds but generally the same direction) occurring across most or all of the City. Somewhat more common are discreet thunderstorm cells that produce strong wind gusts in a portion, but not all, of the city. These can be in the form of "microbursts" (less than 2.5 miles in width) or "macrobursts" (2.5 miles or greater in width) which are caused but a strong rush of relatively cold downward-moving air (a "downburst") than fans out when it hits the ground. The damaging August 4, 2015 storm, as seen in photo 8, qualified as a macroburst due to its width. Top winds from damaging downbursts can exceed hurricane-force, and are often determined after the fact by damage surveys. These surveys sometimes employ the EF-tornado scale damage indicators to determine wind speeds from a local downburst or microburst where wind-sensing equipment was not available.

As with many weather hazards, the frequency of strong to severe thunderstorms varies from year-to-year. The summer of 2008 featured a weather pattern that brought localized severe weather to the Rhode Island and southeastern Massachusetts area on numerous occasions, while the relatively dry and cool summer of 2014 featured almost no thunderstorms in East Providence.

Location

While thunderstorms often produce very localized severe weather, the atmospheric conditions that cause them are generally larger in scale. As a result, there is no portion of the City that is statistically more prone to the effects of severe thunderstorms than any other.

Extent

See the Hurricane section above for more general information on the potential extent of wind damage. Note that the damage extent is likely lower and more localized from thunderstorms than from a hurricane due to smaller scale and very brief duration of strong thunderstorm winds in comparison with that of hurricanes. Regarding lightning; building construction, location, and proximity to trees will have a large impact on how vulnerable a location is to a lightning strike. 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 lightning can jump to.

Electrical and communications utility lines are also vulnerable to direct lightning strikes. Damage to these lines has the potential to cause power and communications outages for businesses, residences, and critical facilities.[7]

Photo 8. Damage from severe thunderstorm "macroburst" along Terrace Avenue on the morning of August 4, 2015. Photo: Ernie Germani

For severe thunderstorms as a whole, the August 2015 microburst, if it affected a larger portion of the city to the extent that it did in the southernmost portion of Riverside, represents a model for a high-end thunderstorm event in the City. This storm is described in more detail in Section 1.4 on Page 18.

Previous Occurrences

Strong to severe thunderstorms have occurred in most years in Rhode Island and nearby Massachusetts. For instance, as noted above, they can occur frequently in some years when a weather pattern that favors strong thunderstorm-producing weather systems persists for a period of time. Individual locations can see many years pass without experiencing a damaging thunderstorm, then have two or three incidents with damage in the same year. The late-spring and summer months are the most likely time to experience severe thunderstorms in our area, but they have occurred well into the fall and even early winter with strong cold frontal passages.

Location	Date	Time	Wind Est. (mph)	Property Damage
Lincoln	6/20/2010	2:16 PM	50	$10,000
East Prov./Kent Hts.	6/28/2010	4:05 PM	50	$1,000
Cumberland	8/5/2010	3:37 PM	50	$15,000
Providence	6/8/2011	9:10 PM	50	$3,000
East Prov./Vets Pkwy	6/9/2011	1:15 AM	50	$30,000
North Providence	6/9/2011	1:15 AM	50	$250,000
Cranston/Oaklawn	6/9/2011	1:15 AM	50	$50,000
Cumberland	8/10/2011	6:17 PM	50	$5,000
Northwest RI	7/1/2012	2:34 PM	55	$50,000
Smithfield	7/18/2012	2:15 PM	50	$10,000
Barrington / Warren	9/3/2013	3:26 PM	60	$85,000
North Scituate	6/23/2015	4:47 PM	50	$5,000
Cranston	6/23/2015	4:50 PM	50	$20,000
North Providence	6/23/2015	4:50 PM	50	$15,000
Warren/Bristol	7/28/2015	3:55 PM	40	$2,000
Cranston, EP, elsewhere.	8/4/2015	6:00 AM	40-70	$200,000
			Total:	$751,000

Table 8. Severe Thunderstorms in Providence and Bristol Counties from 2010 to 2015 with winds of 50 mph or greater and reported property damage.

[7] "Rhode Island Hazard Mitigation Plan 2014 Update," Rhode Island Emergency Management Agency.

Probability of Future Events
Given the fact that most years feature 20 days or more with an occurrence of thunder, and that more years than not feature at least one incident of some damage in the City due to a thunderstorm, there is a high probability of such an occurrence in East Providence.

3a. Hail

Description
Hail, described by NOAA as "Showery precipitation in the form of irregular pellets or balls of ice more than 5 mm in diameter, falling from a cumulonimbus cloud,"[8] occurs occasionally within strong to severe thunderstorms in New England. Serious hailstorms are not common in southeastern New England due to the factors noted above that affect thunderstorms over the area, but they are a hazard. The minimum size of severe hail has recently been increased from ¾ inch to 1 inch by the NOAA Storm Prediction Center, as a result of extensive studies of damage from hailstorms.

Location
Large hail within a thunderstorm can occur anywhere in the City. These incidents tend to be very isolated and localized in our area. Damaging hail is unlikely to affect a large portion of the City on any single occasion and can, in fact, affect an area as small as several City blocks.

Storms featuring damaging hail *have* occurred in the Providence area. In recent years, numerous incidents of large hail were reported in June and July of 2008, a particularly active severe weather period. In one storm on June 24, golf ball sized hail damaged several windshields, dented cars, and smashed windows in the area surrounding the Pawtucket YMCA on Newport Avenue. In addition, hail piled up on the roof of a bank, causing a portion of the roof to collapse. A similar storm that same month caused a significant accumulation of hail in parts of Riverside (see Photo 9 below).

Extent
Structural 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 be damaged by denting. Exposed windows and vehicles are also susceptible to damage. 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 shelters. Individuals who immediately seek shelter in a sturdy building or metal-roofed vehicle are much safer than those who remain outdoors.

Photo 9. Hail on street in Riverside, June 2008. Photo: Diane Feather

Previous Occurrences
According to the NCDC database, hail of a diameter of three-quarters of an inch or greater has been reported an average of 5 times a year since 2000 in Rhode Island. The majority of these incidents have occurred in Providence County, which makes sense as interior portions of New England,

[8] "Glossary", NOAA National Weather Service, http://w1.weather.gov/glossary/index.php?word=hail.

including Rhode Island, are somewhat more prone to severe thunderstorm activity than coastal areas. Due to the localized nature of hail storms, incident reporting is less consistent for hail than for most other weather hazards, since multiple incident reports can result in densely populated areas compared to a similar event in a rural area where relatively few people live.

Location	Date	Time	Estimated Diameter (Inches)	Injuries	Deaths
Pawtucket/Woodlawn	4/22/2010	2:26 PM	1	0	0
Burrillville/Pascoag	5/26/2010	10:19 PM	1	0	0
E. Prov/Kent Heights	6/9/2011	1:15 AM	1	0	0
Glocester/Chepachet	7/1/2012	2:37 PM	1	0	0
Scituate	7/1/2012	2:51 PM	1	0	0
Burrillville/Pascoag	7/18/2012	2:02 PM	1.75	0	0
Smithfield/Sprague ville	7/18/2012	2:15 PM	1.75	0	0
Cumberland	7/18/2012	2:18 PM	2	0	0
Burrillville/Mohegan	7/18/2012	3:16 PM	1	0	0
West Barrington	9/3/2013	3:24 PM	1	0	0

Table 9: Occurrences of Severe Hail in Rhode Island 2010-2015.

Probability of Future Events

According to the NCDC Database, there were 11 reports of severe hail (one-inch diameter or greater) from 2010 through late 2015 in Rhode Island, of which one of these occurrences was in East Providence. None of the incidences from 2010 forward resulted in reported property damage or casualties, but as discussed above hail has caused significant property damage on a localized basis in the past. Given the recent history of hail incidents, its chance of occurrence in the City is medium.

4. Nor'easters and Other Synoptic (Regional) Scale Storms

Description

The coastal Northeastern U.S. is very prone to regional-scale mid-latitude storm systems, which are often several hundred miles wide and can produce a very wide variety of weather at any given time in our region. As an example, a storm that is causing heavy snow with very cold temperatures in western and northern New England could be producing damaging ice accretion in central New England, and warm, wind-driven heavy rain here in the coastal plain. The term "Nor'easter" is derived from storms which pass along the coast or offshore to our east, where the counter-clockwise circulation around the storm center results in (generally cold) northeasterly winds in our area. Occasionally, one of these storms will move northward to the west of Narragansett Bay and East Providence bringing with it strong (and relatively warm) southerly winds. These storms are sometimes referred to as "inside runners" as they travel inland with respect to our location.

Location

Given the relatively large scale of these storms, effects of any given storm are felt throughout the City and statewide. During southerly events, as described above, coastal locations of East

Providence are somewhat more prone to damaging wind gusts given the open exposure to the south.

Extent
Many nor'easters and mid-latitude storms do not produce wind gusts that are strong enough on their own to cause major tree or structure damage, nor do they routinely produce enough rain, snow or both to cause unusual consequences that are beyond the capability of the City to handle. Below are three examples of very different types of storms which illustrate severe conditions that are well beyond the average storm expectation.

1. Snowstorms accompanied by temperatures a few degrees of more below freezing typically do less damage since they occur mainly when leaves are off of the trees, and this sort as the snow tends not to stick to above-ground features. However, the accumulation of wet snow or ice on trees and power lines, when combined with strong winds, can cause substantial damage and create very widespread power outages, as was illustrated during the blizzard of February 8-9, 2013. Most of this storm featured temperatures near freezing along with heavy snow and 50-plus mph wind gusts which caused widespread tree and power line damage.

2. Storms which pass west of the City and Narragansett Bay can cause strong southerly winds which can result in at least localized damage to trees and power lines, and can also produce a couple of feet of storm surge, which needs to be watched if it comes during a time of high tide. A strong surge from these storms is not common as the southern fetch (distance of strong winds over the water) tends to be smaller than that of tropical systems. The portion of New England from the Narragansett Bay/Providence area eastward can expect a few of these southerly wind producing storms each year, favoring (though not confined to) late fall and the first half of the winter. A storm in December of 2008 caused a small storm surge that came close to coastal roadways and knocked out power on a localized basis due to fallen trees and large branches.

3. A three-day cold nor'easter in December of 1992 tapped into some tropical moisture and dropped 5.8 inches of precipitation on the City, including over 5 inches in about 36 hours. No other winter storm over the last 50 years (at least) has resulted in that magnitude of total precipitation. Fortunately, some of this fell as snow and sleet, lowering the run-off somewhat, but there was still widespread street flooding and minor local river flooding.

Probability of Future Events
Nor'easters and other non-tropical storms are a primary concern for Rhode Island residents due to the disruption and damage potential in larger storms. These storms are considered to have a high frequency in our area.

Winter Related Hazards

Winter weather hazards includes heavy snow, ice, mixed precipitation types, and extreme cold, and affects the entire State. Heavy snow is generally defined as a fall of 8 inches or more in less than 24 hours. Heavy snow can bring a community to a standstill by disrupting transportation, knocking down trees and utility lines, and causing structural collapse in buildings not able to withstand the weight of snow and ice. The latter impact is uncommon locally but has occurred on rare occasions. Repair and snow removal costs can be very high and surpass annual municipal salt and snow

removal budgets before the end of a season. A winter storm warning is issued when snowfall is expected to accumulate more than 4 inches in 12 hours or 6 inches in 24 hours; and/or a quarter inch or more of freezing rain accumulation (also referred to as “ice accretion”).

5. Snowstorms

Snowfall, while lower here than in areas farther inland, is an important component of winter weather in East Providence. Seasonal snowfall averages 34 to 38 inches. Historically, storms featuring 6 inches or more of snowfall occur on average a little less than twice per season, while storms of 10 inches or more have occurred an average of about four times in ten years. Nearly every year, storms in East Providence start as snow and then change over to rain, commonly after a few inches of snow accumulation. The impact of these “changeover” storms depends heavily on temperatures just prior and immediately following the storm, as well as how far above freezing temperatures get while rain falls. On occasion, hard freezes immediately follow these changeover storms, disrupting transportation until roads can be treated.

Location
The entire City is equally prone to heavy snowfalls due to the large regional scale of these storms.

Extent
The City has experienced the closing of schools and businesses, disruption of transportation systems, fallen trees/wires leading to power outages, dangerous road conditions and roof collapses from snowstorms, as well as local flooding resulting from rapid snow melt. The Blizzard of 1978 remains the highest impact snowstorm to hit East Providence in the modern era. City schools, businesses, and roadways were closed for many days as a result of nearly 3 feet of snow and strong winds. During the storm, the Washington Bridge, which is the main transportation route to the State’s hospitals from the East Bay, was closed. Another major impact storm was the “April Fools Storm” in 1997, when 18 inches of windblown wet snow that immediately following heavy rain closed roadways and took down power lines causing numerous outages. This storm also resulted in three school “snow days” to start the month of April.

Previous Occurrences

Date	Event	Comments
2/18/2003	Heavy Snow	Nor’easter brought heavy snow to much of southern New England with gusty winds causing blowing and drifting snow. Very cold temperatures and light dry snow resulted in very few power issues. Snowfall totaled around 21 inches.
12/6/2013	Heavy Snow	Big early-season storm brought 15-17 inches of very wet snow over two days with temperatures hovering right around freezing for the duration of the storm.
1/23/2005	Blizzard	Major nor'easter caused widespread heavy snowfall across New England. Snowfall locally was around 19 inches. This was a cold, dry storm in the Providence area with blizzard conditions as winds gusted to 50 mph.
12/13/2007	Heavy Snow	Ten inches of snow in about 6 hours starting shortly after noontime caused massive traffic problems leaving some motorists stranded on area streets and highways for many hours. This storm became known as the "December Debacle" and resulted in greatly increased planning for future commute time storms.
3/2/2009	Heavy Snow	A quick 11 inches of snow in the Providence area caused many traffic accidents and hundreds of flight delays and cancellations at Logan and T.F. Green Airports.

Date	Event	Comments
12/19/2009	Heavy Snow	Coastal storm brought over a foot of snow from southern and eastern CT through RI, southeastern MA and the Boston area. 15 inches of wet snow fell locally.
1/12/2011	Heavy Snow	Second of 3 snowfalls of around a foot in East Providence during this winter. Snowfall was lighter to the east and heavier just west of the City. Most of this was a heavy and wet snow and came in two bursts, prolonging snow removal efforts.
1/27/2011	Heavy Snow	Wet and heavy snowstorm brought another 12 inches across the City with increasing concerns about roof collapses as snow continued to pile up. There was one partial roof collapse at a vacant shopping plaza unit in Riverside.
2/8/2013	Blizzard	"Blizzard of 2013" brought 20 inches of snow, mostly very heavy and wet, knocking out power to over 3/4 of the city at one point. A quick hard freeze followed, then a brief thaw which resulted in some street flooding.
1/2/2014	Heavy Snow	Fast-moving low dropped 9 inches of snow in the area. This was not a high impact event, but it was notable for being one of the coldest snowstorms of the last several decades as temperatures dropped to near zero during the storm.
1/26/2015	Blizzard	Huge nor'easter brought widespread very heavy snow and strong winds across the region. Snowfall of about 20 inches and winds gusting to 50 mph caused heavy drifting snow, but very cold temperatures prevented accumulations on elevated surfaces and there were no power problems.
2/14/2015	Heavy snow	Another in a long sequence of snowstorms dropped 10 inches of snow locally but much more toward Boston. This storm left the area with close to 30 inches of snow on the ground and increased roof loading concerns. Prolonged cold and additional snowfall would maintain snowcover in the area until the end of March.

Table 10. Major Snowstorms from 2000-2016

In recent years, three consecutive seasons, from 2002-03 through 2004-05, featured a single snowstorm of 15 inches or more, as did storms in December of 2009, February of 2013 (Photo 10 below), and January of 2015. Each resulted in school and business closures, and required a many hours of snow removal activity. Lesser storms can also cause major problems, as witnessed by a short-duration yet intense 10 inch snowfall in December 2007 that caused traffic jams lasting up to 8 hours in the Providence area when many schools and businesses released students and workers at once.

Most Recent Major Snowstorms

Blizzard of February 8-9, 2013

This well-predicted storm brought 18 to 20 inches of snow to the City, most of which occurred with temperatures at the freezing point, making it a very heavy, wet snow. Snow fell at a rate of 2 to 3 inches per hour with winds gusting to 50 mph at the height of the storm. This resulted in many downed branches and power lines along with transformer damage on utility poles. At one point, 78% of the City was without power and temperatures had dropped into the teens. The thick, slushy snow followed by a hard freeze

Photo 10. February 2013 Blizzard aftermath. Photo: Wayne Barnes

during the storm created an extremely difficult snow removal operation; and while most power was restored by the morning of February 10th, there were some homes out for another two days. Fortunately, traffic problems were minimized as the storm started slowly and most people made it home before the very heavy snow arrived. This storm illustrated that power outages in cold weather are a driver of storm shelter use.

Blizzard of January 27-28, 2015 and Subsequent Storms
The January blizzard in 2015 also brought around 20 inches of snow and strong winds to the area. Advanced warning was limited for this storm as it was poorly modeled until about 48 hours ahead of time. It also differed from the 2013 storm in that temperatures throughout the storm were between 15 and 20◦F. This meant little or no snow accumulated on trees and power lines and there were no power issues in the City. School and business operations were interrupted and, as lesser snowstorms continued on a twice a week pace into early March, snow depths reached levels that are rarely seen in southeastern New England. Additionally, February of 2015 was the second coldest month on record for our area, with several mornings seeing temperatures below zero. Concerns around snow loading on roofs increased as snow piled up during the month, and eventually a couple of the City's schools had snow removed from their roofs upon inspection of those buildings.

Probability of occurrence
Given the frequency of accumulating snow during the winter season and the likelihood of several large storms occurring in any given five-year period, snowstorms are considered to have a high probability of occurrence in East Providence.

6. Ice Storms

Icing, generally thought of as an accumulation of ice on surfaces such as streets, trees, and power lines, occurs on occasion in southeastern New England but is much more likely farther inland (see "Location" discussion below). Icing is caused during rainfalls when temperatures are below freezing near the ground (and above freezing within a layer above ground).

"Black Ice," consisting of condensation then refreezing on pavements as air warms up after a cold snap, can be an issue here, and did occur across South County and south coastal Massachusetts on December 11, 2010, causing dozens of accidents. This type of phenomenon occurs much more frequently in colder areas in the interior Northeast and in other colder climate regions. Recently, the term black ice has been liberally used to describe all instances of ice on roadways including frozen puddles, evening re-freezing of snowmelt on roadways, and more, which are very common locally. DPW crews must often treat City streets for these occurrences. In any case, notification of black ice indicates the likelihood of hazardous icy roadways, which can develop without warning particularly when driving or walking at night.

Location
Severe ice storms are uncommon in East Providence due to the proximity to the relatively warm ocean water found along the south coast. Icing is more common across northwestern Rhode Island, and occurs much more frequently farther north and west especially from Worcester County, MA through the Connecticut River Valley in Massachusetts and northern Connecticut. Recent examples of ice storms in southern New England, both from the Worcester County area, include a widespread

major ice storm from Worcester and northward into southern New Hampshire in December 2008, and a more localized ice storm incident in the Worcester area that caused a 65-vehicle pile-up in December of 2013.[9] The 2008 ice storm left some homes in northern Worcester County without power for weeks.

Extent

Ice storms can be devastating 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. Fortunately, severe ice storms are an extreme rarity in our area. The greatest threat from ice storms is to essential utility and transportation systems, or "lifelines." Ice coats power and communications lines, trees, highways, bridges and other paved surfaces. Ice-weighted wires, antennae, and structures holding them can break and collapse. Downed trees and limbs can also damage lines and block transportation routes. Pedestrians and automobiles passengers are at risk. Locally, a rather widespread ice storm in January of 1978 caused significant damage in the Providence area including some downed power lines and tree damage and ice accretion of about a half-inch. This may be the heaviest ice storm to occur in East Providence in the last 50 years.

Previous Occurrences

In addition to the 1978 ice storm, a notable storm occurred in January of 1994, affecting mostly southern portions of the City. In northern East Providence, glazing was lighter due to more sleet and snowfall on this occasion. This storm illustrated the localized nature of many icing incidents. Ice resulting from rapid temperature falls following a winter storm is a more common public safety hazard, especially from around late December through late February. A extreme recent incident of this type occurred on Valentine's Day of 2007, when 2.4 inches of cold rain on frozen ground was followed by an instantaneous drop in temperature into the 20s, resulting in a "flash freeze" that caused hundreds of accidents across the State within minutes as streets and highways froze instantaneously; much faster than crews could possibly treat them. These flash freezes are not routine, but are always a possibility especially when the region is in a cold weather pattern.

Probability of Future Events

The NCDC does not identify any incidents of icing in Rhode Island since 2000 in their storm database, though icing has occasionally occurred on a localized basis. Given the infrequent occurrence of ice storms that cause a significant accretion of ice on elevated surfaces, the probability of future occurrences in East Providence is considered to be medium. Impact would be very high in the rare event if a lengthy period of ice accretion were to occur.

[9] David Abel, "On busy travel day, black ice led to massive pileup in Worcester". *Boston Globe*, December 2, 2013, accessed September 18, 2014.

7. Extreme Cold

Description

Southeastern New England is generally protected from prolonged extreme cold due to a number of factors including proximity to the coast, modification of Arctic air by the Great Lakes, and the fact that air warms as it descends off of the higher terrain to our west and north. One factor *not* in our favor is that our coldest weather is often accompanied by wind, which compounds the effect. Most years, our coldest stretches of weather last for only a few days at a time. The coldest days locally generally have a high temperature in the teens. The lowest winter temperature in East Providence is below zero in about one year out of three, though 2015 saw six mornings with a low temperature below zero in parts of the City.

Photo 11. Shore ice and "Arctic Sea Smoke" along the Providence River on a frigid morning in January of 2015. Photo: Janet Godet.

Location

Occurrences of extreme cold are regional or larger in scale and, as a result, will affect the entire City when they occur.

Extent

The greatest danger from extreme cold is prolonged human exposure, which can cause frostbite or hypothermia and become life threatening. The risk of hypothermia due to exposure greatly increases during episodes of extreme cold, especially when accompanied by wind. Infants and elderly people are most susceptible. House fires and carbon monoxide poisoning are also possible if people use supplemental heating devices improperly. Also possible during cold spells of unusual duration is damage to marine infrastructure, including docks and moorings, if there is significant formation of ice in tidewater areas. A few tide cycles of rising and lowering ice can dislodge these structures from their anchoring systems.

An additional consequence of extreme cold is frozen water pipes. This is not a common occurrence locally, but does occur during the unusual occasions when temperatures get well below zero. Low temperatures approaching 10 degrees F. below zero produce a spike in frozen pipe incidents. Shutting the valve to the outside faucet for the winter and protecting it with a low-cost outside faucet cover will lower the possibility of such an incident.

The very coldest individual nights, where temperatures reach close to -10 degrees F, occur in East Providence on an average of about every 10 years. The coldest temperature recorded at T.F. Green Airport in the period of record dating back to 1904 was -17 degrees F in February of 1934.

Previous Occurrences

Brief cold spells where temperatures bottom out near or a little below zero happen every winter. Periods of prolonged below-average temperatures are unusual due to the nature of averages, for one, and the fact that coastal regions are less prone to extreme temperature than interior portions of the country. That being stated, there have been times where extended periods of unusual chill have occurred in southeastern New England. For purposes of documenting these periods for this Plan update, Table 11[10] (right) displays months when the average temperature has come in at less than 23 degrees F. at the official observation station at T.F. Green Airport. Such periods correlate well with development of significant tidewater ice. It is acknowledged that temperature patterns occur without regard to the monthly calendar, but all of these months represented periods of unusual and lasting cold. In some cases, including 1978, 1994, and 2015, the period of below-normal winter chill lasted two or more months; in others, including December of 1989, the following winter months were much milder and came in well above normal on temperatures.

Month	Average Temp. (◦ F)
January 1970	19.6
January 1971	22.9
January 1977	20.9
February 1978	22.1
January 1981	20.3
January 1985	22.5
December 1989	21.8
January 1994	22.7
January 2004	21.4
February 2015	18.4

Table 11. Coldest months in the Providence area since 1970.

Probability of Future Events

At least brief periods of very cold weather occur nearly every year in our area, so the probability of occurrence is high. Severe impacts from cold air are not common. Tidewater ice formation sufficient enough to cause damage to marine infrastructure is assigned a medium probability as it occurs on average about once in 8-10 years.

Flood Related Hazards

8. Flooding

Photo 12. Ten Mile River flooding on Pawtucket Avenue, March 2010. Photo: East Providence DPW.

Flooding is a localized hazard that is generally the result of excessive precipitation, but can also be caused by a coastal storm surge. Flooding is the most commonly occurring natural hazard nationally and locally, due to the widespread geographical distribution of rivers and streams and coastal areas, and the attraction of human settlements to these areas. Floods are among the most frequently seen and most costly natural disasters in terms of human hardship and economic loss.

[10] Source: NCDC climate records, East Providence EMA Winter Temperature Study.

8a. Riverine Flooding

Riverine flooding is a function of precipitation and water runoff volumes within a stream or river. It is defined as the periodic occurrence of over-bank flows of rivers or streams resulting in partial or complete inundation of the adjacent floodplain. When land next to or within the floodplain is developed, these cyclical floods can become costly and dangerous events. In East Providence, areas along the Runnins River north of Route 195 and along the Ten Mile River, downstream from the Turner Reservoir Dam, are most prone to riverine flooding.

8b. Flash Flooding

A flash flood is the fastest-moving type of flood. It happens when heavy rain collects in a stream or gully, turning the normally calm area into an instant rushing current. Any flood involves water rising and overflowing its normal path. Flash floods appear and move quickly across the land with little warning, making them very dangerous.

Flash floods are the result of heavy rainfall concentrated over one area. Most flash flooding is caused by individual slow-moving thunderstorms, multiple thunderstorms that repeatedly move over the same area, or heavy rains from hurricanes and tropical storms. Dam failures can create the most damaging flash flood events (See Dam Failure section later in this Plan). When a dam or levee breaks, a large quantity of water is suddenly let loose downstream, destroying anything in its path.

Flash flood waters move at fast speeds. They have the power to move boulders, tear out trees, destroy buildings, and obliterate bridges. Walls of water can reach heights of 10 feet or higher, and generally carry a huge amount of debris with them. The best response to any signs of flash flooding is to move immediately and quickly to higher ground. Flash floods are not common in East Providence compared to more hilly areas of New England.

8c. Urban Flooding

Urban flooding occurs where there has been development within stream floodplains, or in other low areas that drain slowly. In many areas including parts of East Providence, floodways and wetlands that were at one time the natural storage basins for flood waters were filled to accommodate development. The price of this urbanization and accessibility to rivers and is an increase in the magnitude and frequency of floods via a greater amount of impermeable surface, increasing speed of stormwater collection and reducing of “storage capacity” of the land, which can all combine to overwhelm stormwater and sewage systems. On occasion, when heavy rains occur, Rhode Island’s aging sewer systems or combined sewer overflows (CSOs) are overrun and this results in raw sewage flowing into Narragansett Bay, often creating Bay closures to shell-fishing and swimming.

8d. Coastal Flooding

Coastal flooding is typically a result of storm surge and wind-driven waves, which push water inland from the shore and erode the coastline. These conditions are produced by hurricanes (tropical storms) during the summer and fall, and nor'easters and other large coastal storms (extra-tropical storms) during the fall, winter, and spring. Storm surges (see below) push sea water up coastal rivers and inlets, blocking the downstream flow of inland runoff. Many acres of lands may be inundated by both saltwater and freshwater. Escape routes may be cut off, stranding residents in flooded areas and hampering rescue efforts.

8e. Storm Surge

The storm surge is potentially the most dangerous aspect of any hurricane. A storm surge is a dome of ocean water that can be up to 20 feet high at its peak and 50 to 100 miles wide over the open ocean. The surge has the potential to devastate coastal communities as it sweeps ashore. Historically, 9 out of 10 hurricane fatalities are attributable to the storm surge during a hurricane event. The Great New England Hurricane of 1938 and Hurricane Carol in 1954 stand out as two examples of storms where storm surges caused major devastation. Not only do storm surges flood the areas and structures they affect, but the hydrostatic pressure from the rushing water and pounding waves can completely wipe out many structures and leave little behind.

Location – Storm Surges

The south coast of New England, including its bays and harbors, is particularly well-situated to receive the effects of hurricane storm surges. Locations to the right (generally east) of the storm track are particularly vulnerable to storm surges, as the counterclockwise circulation around storms drives winds and seas forward along with the storm's movement. Interestingly, shoreline areas of coastal bays and harbors like Narragansett Bay can experience higher storm surges than open coastal areas like the South County barrier beaches due to the tendency for water to "funnel" as the bay becomes narrower moving inland. This places East Providence in an area where the storm surge from a 1938-type of hurricane can push the water level to 15 feet or more higher than normal, with water velocity and wind-driven waves increasing the hazard. The City's Hurricane Evacuation Zone Map, (See Appendix Map A-2), displays the best estimate currently available of the farthest extent of hurricane inundation by category of hurricane. Several factors play into the extent of storm surges beyond just wind speed including forward speed of the storm and the angle at which the storm makes landfall along the coast.

Mid-latitude storms including nor'easters are another (lesser) driver of storm surges in the South Coast region. While generally lower, these systems can cause significant coastal flooding on a non-routine basis as they can be slow-movers or even stall for a period of a few days. Storms of this type, mostly likely to cause a surge affecting East Providence, are strong "inside runner" storms that pass to our west, bringing a (usually brief) period of strong southerly winds that can top 50 mph. These incidents are high tide dependent, but can affect low lying areas including Watchemoket Cove, Bold Point and Sabin Point Parks, and the Narragansett Terrace beach and coastal bluff.

Location – General Flood Related Hazards

FEMA Flood Insurance Rate Maps (FIRMs) identify areas of the City that are within the 100 and 500 year flood plain. The 100-year and 500-year flood plains have an assigned probability of 1% and .2% of flooding during any given year, respectively. See Maps 1 and 2, "Risks in East Providence" and "Critical Facilities in East Providence," for areas within the City that are designated as 100 and 500 year flood plains and hurricane inundation zones.

The following areas in East Providence have been identified by the Committee, in consultation with the Engineering Division of the DPW, as having a history of flooding caused by heavy rainfall and/or rapid snowmelt, or high tides/storm surge:

- Residential and commercial areas located north of Waterman Avenue, east of Rockaway Avenue, and west of Seekonk, Massachusetts border due to the flooding of the Runnins River (commonly referred to as the State Street neighborhood);
- Commercial area at the intersection of Commercial Way and Taunton Avenue due to a combination of heavy rains, low elevation, and poor drainage;
- Residential, private country club, and open space areas located along the Ten Mile River, either side of Pawtucket Avenue, east of North Broadway and north of Centre Street, including the Agawam/Fynn Playground, due to the flooding along the Ten Mile River. This includes a portion of Pawtucket Avenue;
- Commercial area along Newport Avenue between Moore Street and Vista Drive due to local poor drainage of heavy rainfall;
- Corner of Ferris Avenue and Circle Street due to local poor drainage of heavy rainfall;
- Western segment of Dewey Avenue due to local poor drainage of heavy rainfall;
- Residential area located between Grosvenor Avenue and I-195, west of North Hull Street, and east of North Rose Street due to undersized drainage lines located under I-195;
- Pawtucket Avenue in front of Bayview Academy due to poor drainage of heavy rainfall;
- Portion of Tripps Lane due to heavy rainfall;
- Veterans Memorial Parkway adjacent to Watchemoket Cove due to severe weather that coincides with high tides;
- The intersection of South Broadway and Lee Road;
- Sabin Point Park and surrounding area due to severe weather that coincides with high tides;
- Residential area along west shore of Bullocks Cove, and Crescent View Avenue in the area of the cove, due to severe weather that coincides with high tides; and
- Residential and commercial areas located east of Willett Avenue, south of Forbes Street, and north of Barrington town line due to flat terrain, poor drainage, and high water tables.

Extent – General Flood Hazards

Riverine, urban poor drainage and groundwater (generally basement) flooding are most common types experienced in East Providence and can cause major property damage; even leaving some homes uninhabitable until major repair work is completed to replace walls, floors, utility equipment and service, and necessary appliances. Riverine floodwaters, in particular, can carry chemicals, sewage, and toxins from roads, industrial properties, and farms; as such, property affected by the flood may be contaminated with hazardous materials.

High, wind-driven storm surges can cause devastation of the areas they affect. As the surge moves inland, it carries with it most of the natural and structural debris that it took out closer to the shore, compounding its impact. The inland terminus of a major storm surge is marked by lines of this debris, which can hamper rescue and recovery efforts in the stricken area. Debris lines can require an extended period of time to go through and clean up.

Previous Occurrences

Date(s)	Property Damage ($)	Remarks
3/28/2005	50,000	3-5 inches of rain, river and poor drainage flooding.
10/15/2005	900,000 (1.6M statewide)	Tropical storm remnants; last in series of heavy rain events. Major river flooding statewide including State Street neighborhood of East Providence.
6/7/2006	25,000	Late-season coastal storm, rainfall around 3 inches, poor drainage flooding mostly Providence area and East Bay.
10/28/2006	5,000	Major coastal storm, widespread urban poor drainage flooding and small storm surge.
11/24/2006	0	Major coastal storm, 3-4 inches of rain causing localized urban flooding.
3/2/2007	30,000	Brief snow changing to 2-3 inches of rain, Local urban flooding, and some roads briefly closed in Warren and Bristol.
4/15 to 4/17/2007	30,000	"Patriots Day Storm," 3-day nor'easter with heavy rain, local urban flooding, strong winds, coastal erosion.
2/13/2008	30,000	Coastal storm, heavy cold rain on frozen ground, poor drainage flooding, followed by flash freeze.
9/6/2008	0	Tropical Storm Hanna brought strong wind gusts, 2-3 inches of rain, localized urban flooding.
7/23/2008	15,000	Severe thunderstorm, local urban flooding, East Bay tornado
12/12/2008	55,000	Strong storm passed just to west, southerly gale caused small storm surge and minor coastal flooding. Major ice storm interior New England.
8/5/2009	0	Very heavy thunderstorm with local urban flooding
3/15/2010	0	Third of series of heavy rain events, around 4 inches of rain, widespread urban flooding, minor to moderate flooding State Street neighborhood.
3/29 to 3/31/2010	32.5 M	Last of series of heavy rain events: up to 8 inches of rain. Widespread major to record flooding statewide. Major flooding, evacuations, damage in the State Street neighborhood. FEMA-Declared disaster.
9/8/2011	0	Cold front with moisture from Tropical Storm Lee cause widespread rain averaging 3-4 inches statewide. Local flooding mainly northern RI.
12/5/2011	0	Street/basement flooding, plus minor flooding in the State Street neighborhood. 2.5 inch rainfall following very wet late summer and autumn with rainfall 11 inches above average for that time period.
7/28/2012	40,000	Stalled cold front with locally heavy rain and areas of urban flooding.
6/7/2013	20,000	Widespread 3-5 inch rainfall from remnants of Tropical Storm Andrea caused local urban flooding.
8/31 to 9/2/2013	0	Stalled frontal system caused showers and thunderstorms over 3-day period, local urban flooding many locations Prov. area and East Bay.
7/28/2015	0	Stationary thunderstorms; up to 6 inches of rain to the East Bay. Brief widespread street flooding Bristol County RI and small part of Riverside near Barrington line. Little or no rain elsewhere in the City.

Table 12. Flood events in Providence and Bristol Counties 2005-2015. NCDC.

The greatest coastal flood since 1900 was likely as a result of the 1938 hurricane where a storm surge of 15 to as high as 20 feet pushed up Narragansett Bay. Worst-case scenario modeling of storm surge possibilities generally uses this event as the standard. The surge from Hurricane Carol in 1954 was almost equally high.

The March 2010 floods have come to represent the riverine flood of record for East Providence when 19 inches of rain over a period of 5 weeks resulted in river levels about 7 feet higher than average for that time of year.

Probability of Future Events
Given the frequency of flooding incidents in recent years and the proximity of residential and commercial areas to floodplains, the probability of at least a minor flood event of any type in East Providence is determined to be high. Table 12 on Page 47-48 lists some recent flooding events in the Providence and East Bay areas.

Specifically regarding types of floods, the probability of impact storm surge flooding in any given year is medium, but that impact would be very high if it were to occur. The probability of riverine flooding is medium, with impacts also potentially high. Urban/poor drainage flooding has a high probability of occurrence and can be expected most years, but in general the impact is lower and felt on a smaller and localized scale.

9. Coastal Erosion

Coastal zones are dynamic areas that are constantly undergoing change in response to a multitude of factors, wave and current patterns, hurricanes, coastal flooding, and human influences including sea level rise.

Erosion has been wearing away bluffs and moving beaches and barriers along coastal areas from the powers of flooding, storm surge, rising sea levels, and high surf. In addition to these natural processes that cause erosion, human alterations are affecting erosion rates. As shorelines retreat inland, waterfront homes, and public infrastructure, such as roads, bridges, wastewater treatment facilities, and stormwater drainage systems, eventually become severely damaged. Most damage from coastal erosion will occur in low-lying areas, which are areas subject to the highest risk of flooding. Additional damage will also occur along coastal bluffs as high waves reach the shoreline and erode the toe of the bluff, with gravity taking its course.

Location
While all shoreline areas in East Providence are subject to erosion from storm surges and strong wind-driven waves, the most significant problem area for coastal erosion in East Providence is along the western shore of the City, south of the City's Wastewater Treatment Plant in Riverside. The entire residential area facing westward across the Providence River and Narragansett Bay south of this facility consists of a steep coastal bluff that is generally 25 to 35 feet above sea level. For the most part, areas in the floodplain along the remainder of the City's shoreline are undeveloped.

Extent
Coastal erosion threatens many residences in the southern portion of the City, as noted above. Some residents have undertaken approved measures to slow the erosion on individual properties, but a substantial hurricane storm surge will almost certainly place some homes in danger of serious damage or destruction resulting from undermining of the coastal bluff. Farther north along the waterfront, recreational facilities including parts of the East Bay Bike Path could be damaged or destroyed by a storm surge and debris that the surge brings with it. A couple of City owned, natural areas could be altered and have passive recreational use impacted. Areas along the waterfront in

central and northern East Providence slated for future development will be at risk from coastal erosion as well. Development planning in these areas, with careful consideration of the associated risks, is being performed in cooperation with CRMC and other appropriate agencies.

There is little evidence of the amount of coastal bluff erosion from the hurricanes that have had the strongest effect on the City. In theory, a hurricane with high storm surge and wave action could erode segments of the two-mile long coastal bluff to an extent that would undermine a number of homes close to the bluff edge. This would depend upon factors including distance of structure from the edge, nearby bluff hardening features, and the directional orientation of the bluff at any given point.

Previous Occurrences and Probability of Future Events
As noted above, damaging coastal erosion in the City has not been specifically documented, but all strong tropical systems hurricanes and the occasional major mid-latitude storm system can be expected to result in at least minimal coastal erosion, and hence erosion is assigned a medium probability of occurrence.

10. Dam Breach

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

Location
Dams are categorized by the hazard that their failure would present in the community. The definition of a High Hazard Dam is "a dam where failure or misoperation will result in a probable loss of human life." [11] There are two dams in the City of East Providence that are categorized as "High Hazard Dams;" the City-owned Turner Reservoir Dam and the Bucklin Point Dam, both in Rumford. The Turner Reservoir Dam, located along the Ten Mile River along the City's eastern boundary, impounds the Turner Reservoir and, to some extent, Central Pond, which is immediately to the north of the reservoir.

Photo 13. Turner Reservoir Dam. Photo: Wayne Barnes

[11] "Rhode Island Hazard Mitigation Plan 2014 Update," Rhode Island Emergency Management Agency.

The Bucklin Point structure is a low impoundment of shallow water located within the Narragansett Bay Commission's Bucklin Point Wastewater Treatment Plant property.

Other City-owned dams, also along the Ten Mile River, include the Hunts Mills Dam and the Omega Pond Dam. The former is a low horseshoe-shaped structure located just above a short stretch of rapids and roughly one-quarter mile downstream of the Turner Reservoir, and the latter is a 10-foot high structure located at the point where the Ten Mile River spills into the tidal Seekonk River.

The "Mobil Dam," a very small, privately-owned structure, is located on the southernmost portion of the Runnins River toward the Barrington line.

Extent
Failure of the Bucklin Point Dam would affect the treatment plant itself with obvious secondary effects on the large population served by the plant, along with a significant environmental impact on the Seekonk River and the Providence River/uppermost Narragansett Bay.

Failure of the Turner Reservoir Dam would be a much more substantial disaster, affecting the recreation area at Agawam Playground and numerous homes near the river along Pawtucket Avenue, north of Centre Street, and along Roger Williams Avenue, and would also cause extensive damage to the Agawam Hunt Club Golf Course. Flooding would also likely occur across Route 44 (Taunton Avenue) and affect part of the Commercial Way industrial area. There is an updated Emergency Action Plan (EAP) for the Turner Reservoir Dam that was under State review as of early 2017.

Previous Occurrences
There are no known occurrences of dam breaches in East Providence. All structures have held up well historically including during the March 2010 floods.

Probability of Future Events
The probability of a high-hazard dam break in the City is considered to be low, but the City will continue planning and preparedness activities in the event of an incident, with EAP development including response protocols.

Geologic Related Hazard

11. Earthquakes[12]

An earthquake is a sudden rapid shaking of the earth caused by the shifting of rock beneath the earth's surface. Larger earthquakes usually begin with slight tremors but rapidly take the form of one or more violent shocks, followed by vibrations of gradually diminishing force called aftershocks. The underground point of origin of an earthquake is called its focus; the point on the surface directly above the focus is the

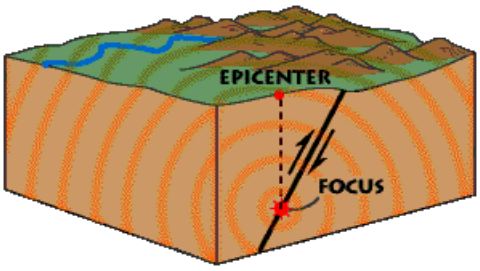


Figure 3. Earthquake epicenter diagram.

[12] Description and diagram: "Earthquakes Hazards," The Northeast States Emergency Consortium, accessed November 16, 2015, http://nesec.org/earthquakes-hazards/.

epicenter. The magnitude and intensity of an earthquake is measured by the Modified Mercalli Intensity (MMI) scale and the better-known Richter scale (see Table 13 on Page 53).

Location

Rhode Island is located on the North Atlantic tectonic plate and is in a region of relatively low seismicity. Only three or four earthquakes of Richter Scale 4.5 or greater have been centered in Rhode Island, including a 1951 South Kingstown earthquake of magnitude 4.6 on the Richter scale. Other past earthquakes centered in Narragansett Bay. Because of this low seismic level, there is a perception that the State has little risk of sustaining any earthquake induced damage. However, areas geographically close to Rhode Island have had moderate seismic activity historically. For example, the area off Cape Ann, Massachusetts has had several large earthquake events within the past 300 years. An earthquake of high intensity in that general location has the potential to cause damage to structures in Rhode Island not designed to withstand seismic loadings.

Other parts of New England most prone to (mostly minor) earthquakes historically include central and southern Maine, the Merrimack Valley of New Hampshire and northeastern Massachusetts, the lower Narragansett Bay area, and south coastal Massachusetts. Areas close to New England that have a greater frequency of earthquakes include the New York/New Jersey border region, northern New York, easternmost Ontario and southwestern Quebec (the "Western Quebec Seismic Zone"), the St. Lawrence Valley northeast of Quebec City, and New Brunswick province.

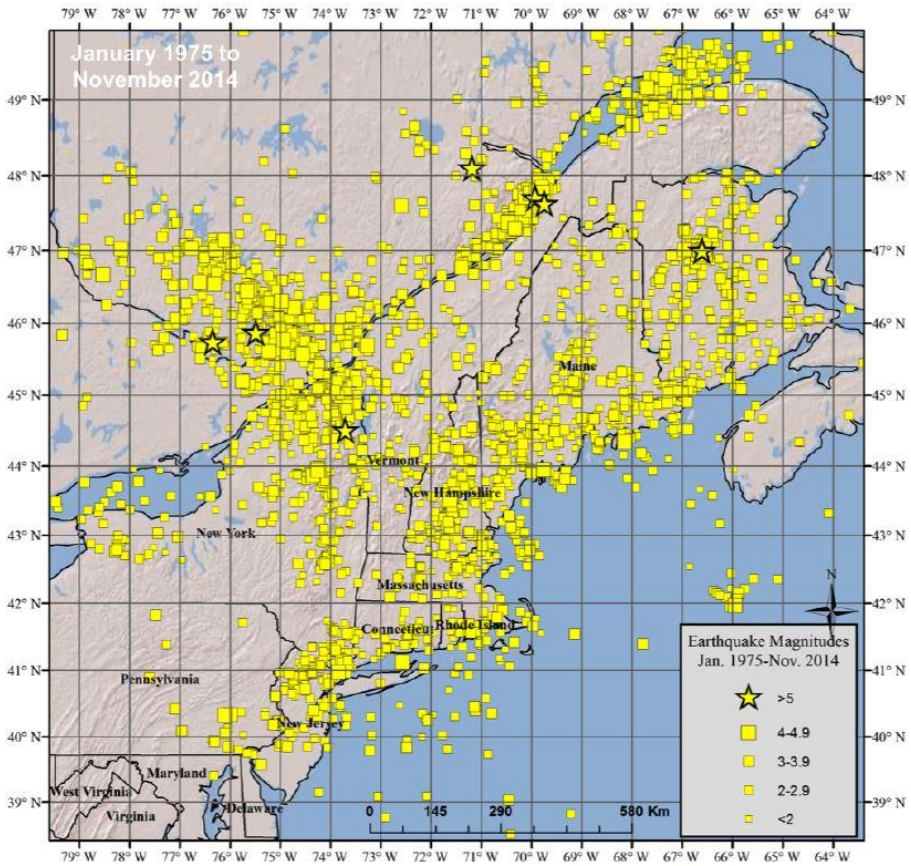


Figure 4. Weston Observatory Network Seismicity New England area map: *http://www.bc.edu/content/dam/files/research_sites/westonobservatory/jpg/Research_Folder/neus_network_seis_sm2.png*

About a dozen earthquakes affected a small area around Plainfield, CT, just west of the Rhode Island border in January of 2015, with smaller follow-up tremors into February. The largest of the January quakes measured a 3.1, enough to shake pictures off of walls in some residences in the southeastern Connecticut area.[13] This area was previously not distinguished for having enhanced seismic activity, which further illustrates that no part of New England including Rhode Island is immune to quakes sufficient to cause at least minor damage.

Extent

Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric, and communications lines on a large scale, and often cause landslides, flash floods, fires, avalanches, and tsunamis. Transportation systems can also be greatly affected as road and railroad tracks can sustain severe damage. Effects can be far-reaching; larger magnitude earthquakes (especially magnitude 5.0 and higher) even in more distant locations like southern Quebec and Ontario, northern New York, and northern New England have caused at least some minor structural damage in Rhode Island.

Richter Magnitude Scale	Modified Mercalli Intensity Scale
1.0 to 3.0	I
3.0 to 3.9	II to III
4.0 to 4.9	IV to V
5.0 to 5.9	VI to VII
6.0 to 6.9	VII to IX
7.0 and Higher	VIII or Higher
Defined Modified Mercalli Intensity Scale Rating	
I	Not felt except by a very few under especially favorable conditions
II	Felt only by a few persons at rest, especially on upper floors of buildings
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. Vibrations similar to the passing of a truck.
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 buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned
IX	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 are distorted. Objects thrown into the air.

Table 13. Richter Magnitude and Modified Mercalli Intensity Scale[14]

[13] John Penney, "1.5 Magnitude quake confirmed in Plainfield." *Norwich Bulletin*, February 24, 2015. Accessed August 19, 2015, http://www.norwichbulletin.com/article/20150224/NEWS/150229751/1994/NEWS?rssfeed=true.

[14] "Rhode Island State Hazard Mitigation Plan 2014 Update," Rhode Island Emergency Management Agency

A statement can be made regarding likely general impacts of a significant earthquake in close proximity to the City. Damage to underground utility infrastructure would be expected, including water and natural gas lines, likely reaching well into the millions of dollars and requiring years of recovery. This would impact supplies of potable water and increase the structural fire threat and the capability to extinguish those fires. Earthquake-initiated fires are a main cause of destruction of buildings immediately after a major quake. A majority of casualties resulting from an earthquake are caused by falling objects. Older masonry buildings, including some churches, former mill buildings, and many of the City's public buildings, would be particularly vulnerable to non-fire related structural damage from earthquake activity. City roadways would be subject to fracture and some roads could be damaged to the point of closure and the need for repairs in the millions of dollars.

Another probable impact of a significant earthquake is anxiety among residents, especially those in senior high-rises where the effect would be felt more. Public recognition of the earthquake threat is very low in Rhode Island. There are a number of relatively simple tasks that occupants of buildings, both residential and commercial, can undertake to create a safer environment in the case of an earthquake including securing items on shelves, securing tall bookcases to walls, and using care in the storage and display of breakable items, such as glass and china.

Previous Occurrences

The New England Seismic Network (see Figure 4 on Page 52) maintains a chart of all detected recent earthquakes on its website.[15] This chart reveals how remarkably frequent minor earthquakes are in the northeastern U.S., nearby southeastern Canada, and the near-shore waters of the Atlantic. There has been no history of an earthquake epicenter in East Providence.

Probability of Future Events

Earthquake events do occur in Rhode Island, though of less intensity than elsewhere in the region and much less intensity than in other parts of the country, including the West Coast and parts of the Mississippi Valley.

Seismologists and geologists agree that earthquakes are nearly impossible to predict ahead of time with any degree of accuracy. The State of California, where earthquakes are far more of a concern, was just rolling out a multi-million-dollar detection system for 2015 using a network of ground sensors that will give areas up to a minute of warning depending on distance from the epicenter,[16] which goes to illustrate the difficulty of earthquake prediction and warning.

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 somewhere in New England, in a 50-year period.[17] The probability of a damaging earthquake for the City is considered to be medium, but clearly the impact would be major and possibly catastrophic if one occurs.

[15] The New England Seismic Network. http://aki.bc.edu/cgi-bin/NESN/recent_events.pl.

[16] Rosanna Xia and Rong-Gong Lin II, "Earthquake early alert system ready to expand in California", *Los Angeles Times*, November 24, 2014. Accessed December 2, 2014. http://www.latimes.com/local/california/la-me-1123-earthquake-early-warning-20141123-story.html#page=1.

[17] "Rhode Island State Hazard Mitigation Plan 2014 Update", Rhode Island Emergency Management Agency.

Additional Hazards

12. Wildfire

Description

Wildfires are fueled by natural groundcover, including trees, brush, and grasses, along with weather conditions. While available "fuels" (defined as "all combustible material")[18] and dry and/or windy weather provide the conditions that allow wildfires to spread, most wildfires are caused by people through criminal or accidental misuse of fire.

Climatic and meteorological conditions that influence wildfires include the amount of sunshine, the 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, relative humidity below 20%, and combustible material type.

Lighting is the most common natural occurring cause of wildfires. Fires have also been set off during other extreme weather events, including the massive fire in the Breezy Point area of Queens, NY during Hurricane Sandy that was caused when seawater came in contact with electrical wires at residences.[19] On the other hand, arson wildfires are typically worse on a national basis than those caused by natural agents.

Location

Wildfires are a common hazard in the western part of the country. Wildfires are also a potential issue in the rural/urban interface of the eastern United States as well, including Rhode Island. Higher risk areas in Rhode Island are generally rural areas away from the greater Providence urban core.

There *are* areas throughout the City where brush fires may occur including undeveloped areas adjacent to the East Bay Bike Path and the Ten Mile River Greenway. Access for larger fire apparatus is difficult in these areas; but smaller Department equipment can access all areas as necessary.

Property owned by a major fuel distribution interest, bordered by the Wampanoag Trail, Forbes Street, and Pawtucket Avenue in south-central East Providence, encompasses an area of 850 acres. Close to half of this land is developed and utilized for business operations. The remainder of the property is largely wooded, but the risk of a large-scale brush fire threatening any of the buildings or operations is minimized as areas around the buildings dock and storage tanks have been cleared of brush and overgrowth. In the event that a large-scale brush fire does occur, there are numerous hydrants surrounding the property and on-property to provide adequate water for extinguishment, as well as 24/7 onsite security. Brush fires on the property are rare.

[18] "NFPA Glossary of Terms 2013 Edition", National Fire Protection Association, accessed September 30, 2013, http://www.nfpa.org/~/media/Files/Codes%20and%20standards/Glossary%20of%20terms/glossary_of_terms_2013.pdf.

[19] "Cause of Breezy Point Fire During Sandy Determined," WNBC-TV, accessed November 2, 2015, http://www.nbcnewyork.com/news/local/Cause-Breezy-Point-Queens-Rockaway-Fires-During-Sandy-Determined-184715051.html.

Extent
During periods of extended drought, the probability of forest and brush fires increases. The transition period from late winter into spring before the annual spring green-up is considered "brush fire season" in southern New England. This period of higher brush-fire risk occurs on average from mid to late March through April. This risk is somewhat weather-dependent; it is enhanced by unusually dry early spring weather and partially mitigated when overcast and wet weather prevails at this time, or when snow cover lingers well into March. A severe wildfire in East Providence could result in over 400 acres of burned area near the large fuel distribution company.

Previous Occurrences
The NCDC reports no wildfire events for Providence or Bristol Counties in recent years.

Probability of Future Events
The probability of wildfire development in East Providence is considered to be low.

13. Drought

Description
Drought is characterized as a continuous period of time during which rainfall is significantly below the average for a particular area. 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 it is not something that occurs 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.

Four methods are used to define the severity of drought: meteorological, hydrological, agricultural, and socioeconomic. Meteorological drought refers to a reduction in the normal rainfall for a given geographic area. This needs to be area-specific, as the average rainfall can vary greatly in different areas. Hydrological drought is based on the amount of surface and groundwater relative to normal levels. Agricultural drought deals with the amount of moisture in soils available for plants. The last, socioeconomic drought, measures the impact that any or all of the first three have on people and businesses.

There are currently three national commonly referenced drought monitoring resources, including:

- The Palmer Drought Severity Index (hereafter, Palmer Index) displays long-term drought, which for many years has been a closely-watched staple indicator in the agricultural commodities industry;
- The Crop Moisture Index (CMI), derived from the Palmer Index, is a shorter-term indicator, also heavily used for agricultural purposes; and
- The U.S. Drought Monitor, developed in 1999 and using a combination of drought indicators with significant human input, is tooled for both agricultural and water supply purposes. This is perhaps the most useful indicator of drought conditions for our area.

All of these indicators can be found on the U.S. Drought Portal website, http://www.drought.gov/. Being that the Palmer Index is the basis of drought categorization, we have used it in Table 14 on the following page to document periods of severe and extreme drought for Rhode Island.

Location
Past drought events have affected all of Rhode Island. There are no specific drought prone areas in East Providence.

Extent
Rainfall in East Providence averages about 47 inches a year, which generally ensures a plentiful water supply for the daily needs of the City's residents and businesses. The annual range of precipitation at T.F. Green Airport, dating back to 1903, includes a minimum or "driest" total of less than 26 inches in 1965 and a maximum or "wettest" total of nearly 68 inches in 1983. The former year was among a stretch of four below-average rainfalls from 1963 through 1967. This time period is generally considered the "drought of record" in the southern New England area. Shorter-term droughts where there has been a concern about water supplies in Rhode Island have occurred about every twenty years over the last century.

Drought Periods	Duration	Lowest PDSI
7/1944 - 8/1944	2 months	-4.17 in 8/1944
7/1949 - 8/1949	2 months	-3.34 in 8/1949
10/1949 - 2/1950	5 months	-4.05 in 12/1949
6/1957 - 11/1957	6 months	-4.45 in 10/1957
5/1965 - 10/1966	18 months	-5.03 in 12/1965
1/1967 - 2/1967	2 months	-3.26 in 1/1967
3/1985 - 4/1985	2 months	-3.70 in 4/1985

Table 14. Severe to extreme drought conditions for Rhode Island based on the Palmer Drought Severity Index. For purposes of the Palmer Index, all of Rhode Island consists of one single zone due to its compact size.

The City of East Providence is served by the Providence Water Supply Board (PWSB) and an estimated 95% of City residents are served by City water through the PWSB and the Scituate Reservoir, which has been a very reliable source of quality water over the years. In recent years, the greatest effect of prolonged below-average rainfall for the City of East Providence has been the imposition of partial outdoor watering bans, including odd-even calendar-day bans on activities such as watering lawns and washing vehicles, and this is very infrequent. Other impacts of drought include potential for water supply issues for the very small number of City residents not connected to the City's water supply, and water quality during the warm times of year in the City's freshwater ponds including Central Pond, the Turner Reservoir, and Willet Pond due to algae blooms that are not properly "flushed out" by the flow from upstream.

Previous Occurrences
Table 14[20] displays periods of two or more months of severe or extreme drought in Rhode Island, based on the monthly Palmer Index. (Period of record 1895 through August 2016). A Palmer Index value of -3.00 to -4.00 indicates "severe drought" conditions, while a value lower than -4.00 indicates an "extreme drought." The Palmer Index reached -2.74 in September of 2016 before beneficial rain arrived. In nearby central and eastern Massachusetts, severe drought criteria was reached in August and September of 2016. Rhode Island, due to its small size, constitutes one region for purposes of drought categorization, whereas other states are split into drought regions.

Probability of Future Events
While times of lean precipitation have occurred recently and will continue to occur, the trend over the last 100 years has been for a gradual increase in the average annual precipitation in our area. Nonetheless, based on the frequency of periods when severe drought criteria has been met, there is a medium probability for the development of drought conditions in our area.

[20] Palmer Index drought chart for Rhode Island Climatic Division: http://www.nrcc.cornell.edu/drought/RI_drought_periods.html.

14. Extreme Heat

Heat waves occasionally affect the Providence area, and have occurred as early as the latter half of May and as late as the middle of September. Heat waves in New England are defined as three consecutive days where the high temperature equals or exceeds 90 degrees F. In general, early-season heat up through the first half of June is accompanied by relatively low humidity and is seldom more than an inconvenience. During an astronomical summer, starting around the Summer Solstice, high temperatures are much more likely to be accompanied by high humidity, which is more problematic for people who are not have proximity to air conditioning.

Location
Heat waves are a regional phenomenon and affect most of Rhode Island evenly. Coastal locations generally have the benefit of lower temperature extremes, but with similar or higher humidity. All of the City is equally subject to extreme heat.

Extent
Lengthy periods of extreme heat and humidity are uncommon in our area, compared to interior parts of the country including the Midwestern and Mississippi Valley states and parts of the Plains states. When Rhode Island does experience these conditions, young children and the elderly are most susceptible, as are outdoor workers. Additional, periods of heat and humidity often cause a degradation in air quality in urban areas, increasing complications for people of all ages with respiratory problems.

Previous Occurrences
Perhaps the hottest stretch of weather over the last 50 years occurred in August of 1988, when high temperatures in the City reached 90 degrees or higher for 13 of the first 15 days of the month. On several of those nights, the lowest temperatures were only in the mid-70s. While this type of extended high heat and humidity period are very unusual, shorter stretches of heat and humidity can be expected in most years in our area.

Recently, July of 2010 featured a four-day heat wave from the 4th through the 7th, including a high temperature of 102 degrees on July 6th. For several days following July 7th, very high humidity continued, effectively prolonging the period of problematic heat. During this time period, the City enabled the East Providence Senior Center and the Weaver Memorial Public Library to serve as "cooling centers" for people who needed to get out of the heat. This has become common practice and is announced on local media outlets, posted in City facilities, and on City Internet resources such as social media. The City will continue these practices during times of excessive heat in the future.

Probability of Future Events
As heat waves are regionally defined, occurring nearly every year, the probability of future occurrence is considered to be high. Very high-impact heat waves that last an extended period of time, accompanied by high humidity, have a medium probability of occurring in the future.

Section 3.3 Vulnerability - Community Assets

3.3a Population

Depending upon the severity of a natural hazard, all residents of the City of East Providence are vulnerable; especially the elderly, disabled, and children in daycare facilities.

Flood and Storm Surge Studies

Recent storm surge research and improvements in elevation mapping locally and nationally has shown value in guiding decision-making with regard to areas and populations that would be affected by flood related hazards. As of the time of this Hazard Mitigation update, the City was beginning to analyze these new tools to further make out strategies and more completely define areas at risk. This effort, combined with ongoing coastal and riverine flood studies that we have been working on over the last five years, will inform decisions and improve our response capability ahead of and during future natural hazard incidents. Table 15 provides an estimate of the population that resides within the city's AE and VE zones, the total Special Flood Hazard Area population, and the population within the mapped Hurricane Inundation Zones. These estimates were produced through the use of inundation zone mapping, census data, and parcel data from the City Finance Department's Assessment Division[21]. Note that the Total Flood Zone (SFHA) population is somewhat lower than the sum of AE and VE zones; this is due to certain properties being affected by both types of flood zone and these duplicate properties were counted once for this analysis.

Flood or Inundation Zone	Est. Pop.
VE Zone	1,270
AE Zone	1,660
Total Flood Zone	2,650
CAT1 Indundation Zone	1,320
CAT2 Indundation Zone	2,410
CAT3 Indundation Zone	3,970
CAT4 Indundation Zone	8,280
City Population (2015 Est.)	**47,408**

Note: CAT1, etc, refers to projected inundation zones for Category 1-4 hurricane direct hits.

Table 15. Flood Zone and Hurricane Inundation Zone population estimates.

The City is fortunate to have a large majority of its land area at an elevation higher than the SFHA elevations. Total floodplain acreage in the City is roughly 760 acres, which represents about 8.85% of the City's total land area. That being stated, a much larger portion of the City would be subject to flooding from a severe hurricane storm surge or if long-term projected levels of sea level rise were to be realized.

Emergency Sheltering

Currently, there is one American Red Cross designated emergency shelter in the City. According to the American Red Cross, 25% of an area's population would most likely seek shelter from a natural disaster. For example, if the southern coastline of the City required evacuation, only 25% of the residents living on the coastline would seek the safety of an emergency shelter. The remaining 75% would seek shelter with friends, families, or make other arrangements such as hotel accommodations.

The City has improved its sheltering capability over the last five years with the recertification of East Providence High School as a Red Cross supported shelter. The Red Cross will stage a large truck trailer storing commodities including food, cots, and other supplies, and the City is increasing its inventory of

[21] Estimates based on average number of persons per residential parcel City-wide and number or residential parcels in each zone.

cots and blankets for to assist in large emergencies as well as smaller ones which may not qualify for Red Cross assistance.

A recommended action of the 2010 Hazard Mitigation Plan was the use of the Senior Center as a smaller emergency shelter or as a spontaneous daily use "Personal Care Center" where residents can charge devices and receive a meal. In November 2015, the State of Rhode Island Shelter and Coordination Plan[22] identified the East Providence Senior Center as State sheltering facility, as well as East Providence High School and Riverside Middle School. The East Providence Senior Center has been made available for resident storm assistance on four occasions since 2010. City staff will work with RIEMA and the Red Cross on some of the more complex aspects of sheltering, including provision of services for individuals with functional and medical needs, as well as pet sheltering.

While not necessarily "hazard mitigation" in the context of this Plan, the City considers strong sheltering capabilities for mitigating post-incident issues for East Providence residents, and in general as a crucial part of emergency planning.

3.3b Economy

Small businesses, such as small retail and service providers, are especially vulnerable to natural disasters considering they are extremely dependent upon the local infrastructure and local population. Natural disasters not only have the potential to damage communication and transportation systems, but they are also capable of influencing local consumer confidence and spending patterns. Small businesses often have fewer resources at their disposal than the larger commercial and industrial enterprises that possess backup generators, comprehensive insurance policy coverage, and the capital resources required to rebuild or relocate. The Committee has taken into consideration the fact that small businesses are especially vulnerable to natural disasters. The Planning Department and Emergency Management Agency have developed a strong working relationship with the East Providence Area Chamber of Commerce and we will utilize this relationship and other avenues to increase outreach to the local commercial sector.

There are also several large companies of national and international significance that have a physical presence in East Providence. These include:

- Santander Bank: Regional corporate office and call center, located at 95 Amaral Street;
- Bank of America: Regional corporate office and call center, located at 3400 Pawtucket Avenue;
- Citizens Bank: Regional corporate office and call center, located at 115 Tripps Lane;
- Aspen Aerogels: Manufacturer of aerogel insulation geared toward large scale energy providers, located at 3 Dexter Road in Rumford;
- Eaton Aerospace: International manufacturer of components for the aerospace and defense industries, located at 10 New Road;
- Igus: Major industrial cable and chain manufacturer. North American corporate and distribution headquarters, located at 275 Ferris Avenue; and
- Nordson EFD: International manufacturer of fluid dispensing equipment. American headquarters, located at 40 Catamore Boulevard.

[22] "State of Rhode Island Shelter and Coordination Plan," Rhode Island Emergency Management Agency, 2015.

3.3c Built Environment

1. Existing structures

As noted above, the City's total Special Flood Hazard Area acreage is relatively small. The SFHA itself includes about 285 structures, of which 150 are residential homes. Also included are portions of one large apartment building, one long-term care facility, several business and industrial buildings, and a few historic structures. Most of the residential structures are concentrated in three areas; along the Ten Mile River between Pawtucket Avenue and Omega Pond, in the State Street Neighborhood near the Seekonk, MA border, and along Bullocks Cove in Riverside. Each of these areas has at least one NFIP "repetitive loss property" with most of the 15 total properties located in the State Street Neighborhood.

Several residential homes in the floodplain are also found along Narragansett Terrace and both north and south of Sabin Point Park in Riverside. Additionally, there are close to 150 homes in this part of the City where the shoreline frontage of the parcel is obviously in the SFHA, but the homes themselves are at a higher elevation on a bluff above the SFHA. These structures vary in distance from the bluff's edge from just a few feet to as far as 40 or 50 feet.

Flood or Inundation Zone	Land Value ($)	Bldg. Value ($)	Total Parcel ($)	# Parcels
VE Zone	93,437,200	169,174,600	262,611,800	426
AE Zone	97,681,153	186,184,700	283,865,853	550
* Total Flood Zone	162,117,053	270,061,700	432,178,753	876
^ CAT1 Indundation Zone	121,007,553	198,846,700	319,854,253	445
^ CAT2 Indundation Zone	156,459,053	261,692,700	418,151,753	794
^ CAT3 Indundation Zone	196,826,053	353,120,800	549,946,853	1,313
^ CAT4 Indundation Zone	287,946,953	595,142,340	883,089,293	2,734
City Total Property Value	**$1,196,234,153**	**$2,937,333,873**	**$4,133,568,026**	**15,626**

Table 16. Assessed value of flood and inundation zone parcels. 2015 data courtesy of East Providence Assessment Division.

Notes on Table 16:

*Total Flood Zone accounts for duplicates that appear in both AE and VE Zone Databases.

^ CAT1, etc., refers to projected inundation zones for Category 1-4 hurricane direct hits.

Flooding from a major hurricane storm surge would impact a much larger portion of the City. Areas that would be flooded by a major hurricane storm surge include several sections of Riverside including:

- Much of Narragansett Terrace;
- Areas adjacent to Bullock Cove;
- Areas from Bullocks Cove northeastward through the lower Willet Avenue area and beyond;
- Locations close to the Runnins River including the State Street neighborhood;
- Properties north of Center Street and along Roger Williams Avenue near the Ten Mile River and Omega Pond;
- Lower-elevation portions of the Waterfront Special Development District;
- Oil company infrastructure in along the water in Riverside and near Bold Point; and
- Both wastewater treatment facilities.

While flooding is the most common natural hazard in the City, all structures are prone to certain natural hazards to a degree, as discussed in throughout Section 3.2.

2. City Infrastructure

A vast majority of City-owned structures are situated above the SFHA. This includes City Hall, the Police Station, the City's four fire stations, and all of its schools. There are park facilities and other areas of open space that are in the SFHA and have experienced flooding in recent years. Perhaps the most notable of these is heavily-used Agawam Park located along Pawtucket Avenue (Route 114) by the Ten Mile River, which has flooded on at least four occasions since June of 1998.

With regard to flooding and City property/rights of way, certain streets are of a higher concern than most city-owned buildings. Of the 160 miles of public streets in the City, roughly 3.8 miles are located in the floodplain, and a considerably greater amount of street mileage would be affected by hurricane storm surges of increasing height. Street flooding, especially from high tides with associated wave action, not only flood streets at the time but leave behind debris and can damage the road surface and road base.

3. Critical Facilities

Critical facilities in the City are at risk from natural hazards to varying degrees, with the most likely and possibly the most severe threat being from flooding. East Providence is fortunate in that most critical facilities are located in upland areas away from flood zones. These include City Hall, the Police Station, the four Fire Stations, the Public Works Complex, and all of the City's public schools. Other facilities within East Providence selected for location analysis with respect to natural hazards include dams, bridges and culverts, water storage tanks, wastewater treatment plans, pump stations, gas transmission lines, and overhead high-voltage electrical lines. Note that the City is nearly 100% served by underground sewer, water, and gas lines. See Appendix A, Maps A-1 and A-2, for locations of critical facilities in East Providence.

Facilities included for consideration in this section that are most vulnerable to flooding include the two wastewater treatment facilities (WWTF); the Bucklin Point WWTF operated by the Narragansett Bay Commission off of Campbell Avenue in Rumford and the East Providence WWTF off of Bullocks Point Avenue in Riverside. The latter facility is City-owned, but operated by Suez Environnement (formerly United Water). Related infrastructure prone to flooding includes some of the City's pump stations that feed the City's treatment plant. Bridges, culverts, and dams, by nature of their locations and function, are all within special flood hazard areas. The City's health care facilities, which include Bradley Hospital and a number of long-term care facilities, are out of the flood zone with the exception of Brookdale East Bay Assisted Living, where a corner of the building and part of the access road is within an A-Zone.

Hurricane storm surge flooding in a worst case scenario would be much more extensive with the potential to add additional pump stations, up to two more long-term care facilities, one school and, in an extreme case, the Public Works Complex to the list of facilities that could be flooded. This is in addition to several hundred homes that would be substantially damaged or destroyed in the event of a major hurricane. Flood and hurricane storm surge mapping resources have improved substantially in

recent years, as noted in the Capabilities Assessment in Section 4. The City will utilize all of the tools at its disposal to prepare for these hazards and to determine mitigation actions and execute these actions.

4. Historic and Cultural Resources

Properties of historic or cultural significance that are located throughout the City are at risk from a variety of natural disasters, including earthquakes, hurricanes, floods, fire, ice storms, and high winds. Below is a list of cultural and historic properties*[23] identified by the East Providence Planning Department as being at risk from natural disasters:

- Boyden Heights Bandstand (Octagon House), 21 Sunnyside Avenue;
- Bicknell-Armington "Lightning Splitter" House, 3591 Pawtucket Avenue*;
- Boston and Providence Railroad Bridge, spanning Roger Williams Avenue and Ten Mile River*;
- Bridgham Farm area, 120, 148, 150 and 160 Pleasant Street*;
- Caleb Williams Cottage, Hunts Mills Historic Site off of Pleasant Street;
- Carpenter, Lakeside, and Springvale Cemeteries, near Newman and Pawtucket Avenues*;
- Elm Tree Plat National Register District, south of Willett Avenue near Willett Pond*;
- Looff Carousel at Crescent Park, Bullock's Point Avenue*;
- District #6 Schoolhouse/Riverside Girl Scout House, 347 Willett Avenue*;
- First Baptist Church, 1400 Pawtucket Avenue;
- Humphrey Homestead and Mill, 1290 South Broadway;
- James Dennis House, 3120 Pawtucket Avenue*;
- John Hunt House, Hunts Mills Historic Site;
- Little Neck Cemetery, Read Street*;
- Nathaniel Daggett House, 74 Roger Williams Avenue*;
- Newman Cemetery, intersection of Newman and Pawtucket Avenues*;
- Newman Congregational Church, 100 Newman Avenue*;
- Odd Fellows Hall, 63-67 Warren Avenue*;
- Phanuel Bishop House, 150 Greenwood Avenue;
- Philip Walker House, 432 Massasoit Avenue*;
- Phillipsdale Historic District, mills and mills housing along Roger Williams Avenue*;
- Pomham Rocks Lighthouse, offshore below Whipple and Fuller Avenues;
- Pump House, Hunt's Mills Historic Site;
- Rose Land Park Plat National Register District, Florence St, Princeton and Dartmouth Aves.*;
- Richmond Paper Company Mill (Phillipsdale Landing), 310 Bourne Avenue*;
- Rumford Chemical Works and Mill Houses (now Rumford Center mixed-use development), Newman Avenue and North Broadway at Greenwood Avenue*;
- Rumford Historic District, area of Pawtucket Avenue, Greenwood Avenue and Pleasant Street*;
- Saint Mary's Episcopal Church, 83 Warren Avenue*;
- Squantum Association, 947 Veterans Memorial Parkway*;
- Weaver House, 31 Grove Avenue;
- Whitcomb Farm, 36 Willett Avenue*; and
- World War I Memorial, 145 Taunton Avenue.*

[23] "National Register of Historic Places Program: Research- Data Download", National Park Service, accessed November 16, 2015, http://www.nps.gov/nr/research/data_downloads.htm#spreadsheets.

Among the more important historic landmarks in the City is the 1895 Charles I.D. Looff Carousel at Crescent Park. This major local attraction is the only structure that remains of a popular amusement park than spanned either side of Bullocks Point Avenue for much of the 20th Century and included a Shore Dinner Hall fronting on Narragansett Bay. The park closed in the 1970's, but the Carousel has been restored and draws thousands of visitors including Carousel enthusiasts from across the country each year. The Carousel and adjacent Rose Larisa Park are home to a number of civic events including concerts, festivals, cruise nights, movie nights, and fund-raising social events. In addition to its inclusion on the National Register of Historic Places, the Carousel has also been designated as a National Historic Landmark by the National Park Service, one of 45 such properties in the state.[24]

Another outstanding structure of historic significance is the 1871 Pomham Rocks Light, located on a small, rocky island off of the coast of Riverside a short distance north of Sabin Point. An active citizens group has restored the exterior of this classic New England lighthouse, with plans in place to work on the building's interior.

Most of the properties listed above are privately owned by individuals or by non-government organizations. There are City-owned properties among the group including the Crescent Park Carousel, the Hunts Mills Historic Site structures, the Odd Fellows Hall, the Weaver House, and the World War I Memorial. Of these, the Odd Fellows Hall on Warren Avenue, acquired via tax sale in 2012, is currently the most at-risk of the historic properties listed as years of neglect left the structure in a compromised condition. The building has office space and an ornate meeting hall with stage. As of mid-2016, funding sources were being investigated to shore up the building for protection against water and wind damage, and the City was soliciting interest in rehabilitating the building for office/cultural use. Stewards of City-owned properties will be strongly encouraged to develop disaster plans using assistance available from the Rhode Island Office of Information and Library Services.

5. Port Infrastructure

There are two major port facilities along the Providence River in East Providence. Capital Terminals operates a regional home heating oil terminal just south of Bold Point Park, or about 0.6 miles southwest of the Washington (I-195) Bridge. From this point, petroleum is transported via underground pipeline about 2 miles to the northeast to a fuel oil tank farm along Dexter Road. Another port facility is a fuel terminal located about 2.5 miles south-southeast of the Washington Bridge. Fuel offloaded at this location is transported by pipeline eastward about 1.5 miles to a tank farm along the Wampanoag Trail (Route 114).

Considering the vulnerability of the coastlines to earthquakes, hurricanes, and floods and any cargo stored on the sites, the port districts pose a threat to the residents, environment, and the local economy in the event of a natural disaster.

6. Future development

The City's greatest opportunity for new large scale development is along its central waterfront area on the Providence and Seekonk Rivers. Historically, this portion of the City featured numerous industrial uses including an abundance of fuel industry infrastructure and several tank farms. Much of this

[24] "National Register of Historic Places Program: Research- Data Download", National Park Service, accessed November 16, 2015, http://www.nps.gov/nr/research/data_downloads.htm#spreadsheets.

infrastructure has been removed and properties are being remediated and restored. The East Providence Waterfront Special Development District Plan was adopted in 2004 to articulate a plan, vision, and strategies to transform over three hundred acres of this underutilized waterfront property. The Plan and associated zoning changed the Waterfront District to allow mixed-use development, with manufacturing encouraged in certain areas and sub-districts for medium and high-density residential uses, hotels and restaurants, marinas, and recreational uses oriented towards the water. The City's waterfront planning efforts encompass consideration of resilience to natural hazards including storm surge flooding and projected levels of sea level rise. Two large residential projects under development in the waterfront district, in different stages as of early 2016, will designate immediate waterfront areas as open space for passive recreational use, while structural development takes place at higher elevations away from the Special Flood Hazard Area.

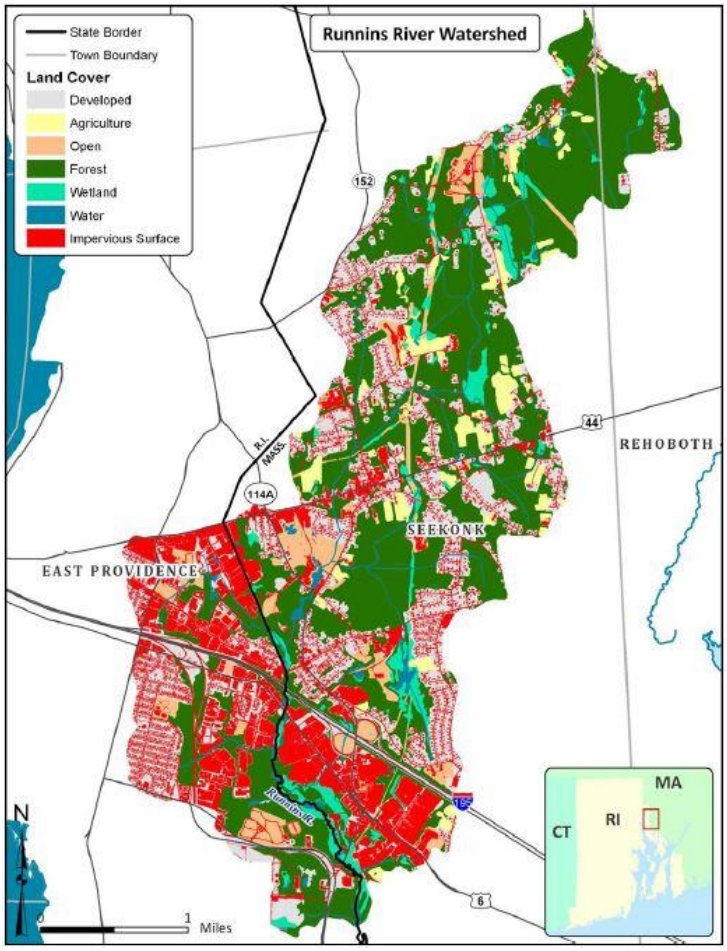
Development elsewhere in the City will continue to proceed with consideration for wetland and floodplain proximity. A general goal for the City's new development is to limit any hazard vulnerability to the new development itself, and to avoid adverse impacts off-site. For example, the 2015 retail development at 77 Highland Avenue (Route 6) near the Runnins River resulted in notably improved stormwater management when compared to the previous use of that property.

3.3d Natural Environment

1. Water Resources and Watersheds

Hydrologically, East Providence is split among a few drainage basins, including two distinct river basins and the coastal drainage area which is separated into the Providence River and the Seekonk River sub-basins.

The Runnins River Basin is relatively small, at about 11 square miles, but is associated with notable flooding issues for the City. The Runnins River flows south-westward from northwestern Rehoboth, MA through central Seekonk and either forms or is very close to the southern half of the City's eastern border. The Land Use Map to the left illustrates the abundance of impervious surface from commercial uses near the river, especially south of Route 44.
The low-lying residential area north of Waterman Avenue near the Seekonk line (the State Street neighborhood) has seen numerous flood incidents in recent years as noted above. The 2010 floods were especially severe with at least three dozen properties affected. Two projects are



Map 2. Runnins River Drainage Basin Land Use. Source: Barrington-Palmer-Warren Rivers Watershed Plan, Nov. 2012.

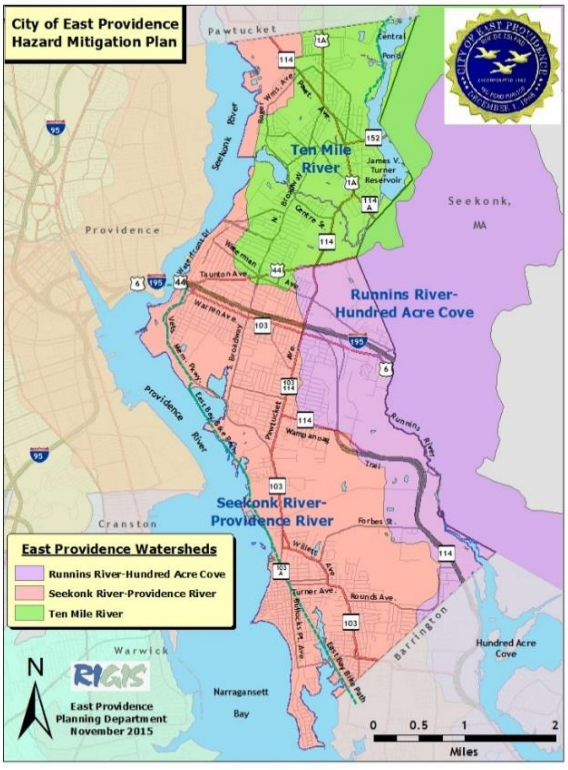
underway to mitigate the effects of severe flooding and significantly reduce the frequency of minor flood events.

These projects are:
Invasive Species Remediation- An unnamed Runnins River Tributary, immediately to the north of the State Street neighborhood, is choked with invasive species. Pending DEM approval, the plan is to implement both hand and machine clearing in and along this tributary and add some native species in order to help this wetland/tributary area return to a more natural state and improve drainage from the area.

High-Water Overflow Pipe- Construction of two high-water overflow culverts within the existing Warren Avenue Culvert structure along the Runnins River would aid in channeling water through this structure and away from the neighborhood during high water events.

This neighborhood would also be subject to at least shallow storm surge flooding from a direct major hurricane hit, as it sits generally from 14 to 18 feet above sea level. The City, in coordination with RIEMA, FEMA, and other partner organizations will continue mitigation measures to assist owners and residents in this neighborhood.

Terrain along the Runnins River remains low downstream (generally southeastward) through where it becomes tidal close to the Barrington line, but floodplain areas along this more southern stretch are less developed. Part of this area is discussed further in the Protected Natural Areas section below.



Map 3. East Providence drainage basins.

The Ten Mile River drains a larger area, mostly in Massachusetts, measuring 54 square miles. There are residences prone to flooding from major flood events, but the residential neighborhood along the river most vulnerable increases in elevation fairly quickly, limiting the number of homes that are in the regulatory floodplain. Larger flood-prone areas are found toward the Seekonk border where the river makes a sharp bend from a southerly to a northwesterly flow, but this area is less developed. Nonetheless, Ten Mile River flooding affected areas a considerable distance southward away from that bend in the river including the low point on Taunton Avenue (Route 44) and near businesses along the northern portion of Commercial Way. Recent flood studies and 2015 revised flood map panels for the Ten Mile River basin depict these flood-prone areas very well. Protection of the undeveloped land along the river in this area is key to preventing increases in flooding in this portion of East Providence.

Western shoreline areas of the City, along with areas close and east of Bullocks Cove, are subject to

coastal flooding including hurricane storm surges, as noted above in the Hazards section (see Map 3). Additionally, much of the Riverside area of the City, especially along and east of Willett Avenue, is subject to seasonal high water and many homes have basements that flood easily. Drainage improvements have been proposed that would require spending in the millions of dollars over a number of years. Infrastructure bonding is seen as a potential tool to achieve funding to execute at least some of this work in the coming years.

2. Protected Natural Areas

The preservation and creation of open space has three important benefits for the City. First, open space is capable of mitigating the severity of floods from hurricanes, severe storms, and snowmelt by acting as a natural buffer to adjacent developed areas. Second, parcels of land that are subject to flooding can be acquired by the City, maintained as open space, thereby preventing the development of land that is vulnerable to natural hazards. Third, open space may serve as parks, recreational facilities, cemeteries, golf courses, or as conservation areas that can provide natural habitat for plants and animals. Currently, the City maintains approximately 825 acres of open space. This open space includes:

- The 18.4-acre **Bridgham Farm**, owned by the East Providence Land Conservation Trust. Bridgham Farm serves as a passive open space area preserving the unique natural features and historic character of this former farm. There are no structures on the property. It is located close to the Turner Reservoir, which is part of the Ten Mile River system, but is above the floodplain;

- The immediate abutting land surrounding **Turner Reservoir and Central Pond** along the northern portion of the City's eastern border by the City's Water Department that provides a natural buffer between the water bodies and adjacent developed areas. These ponds are part of the Ten Mile River and were formed by the construction of the Turner Reservoir Dam in 1934. Nearly all of the narrow floodplain that surrounds the ponds is within the Water Department property. The land adjacent to the Turner Reservoir includes a walking trail that contains a handicap accessible portion with raised boardwalk segments. This trail segment, located within the Ten Mile River floodplain, held up exceptionally well during the March 2010 flooding;

- **Hunts Mills Historic Site**. This City property consists of 44.8 acres located off of Pleasant Street in Rumford along a sharp bend in the Ten Mile River. Portions of the site are in the Ten Mile River flood zone and are prone to flooding, though no structures were damaged here during the record March 2010 floods. This attractive property serves as a City park with picnic tables and also includes the historic John Hunt House and Pumping Station, the Hunts Mills Dam and Fish Ladder, small colonial period gardens, interpretive signs describing the area's history as a company amusement facility, and a mile-long upland hiking trail. The more downstream portion of this property would be subject to flooding from a severe major hurricane storm surge;

- **Freedom Green Park** is a one-acre park adjacent to the Ten Mile River, located at the intersection of Centre Street and North Broadway. A portion of this site along the immediate riverbank, which includes an informal kayak launch, is prone to moderate river flooding. Other park amenities that are above the floodplain include enhanced landscaping, a walking path, gazebo, and benches. Much or all of this park could be affected by a major hurricane storm surge;

- The **"Runnins River Critical Area,"** as identified in the Comprehensive Plan, is located in the Runnins River Drainage Basin south of Interstate 195 and to the Barrington line. The area is designated as an "Area of Special Drainage Concern." Along this 2.1 mile stretch of the lower Runnins River is a narrow strip of predominantly open space that serves as a buffer to adjacent residential, retail, and commercial uses. Much of this open land is in the floodplain, and the more southern portion consists heavily of marshland susceptible to shallow coastal flooding and effects from predicted sea level rise, and could be greatly affected by a hurricane storm surge;

- The **Boyden Heights Conservation Area** is a roughly 11-acre City property overseen by the East Providence Conservation Commission. This diverse area includes a salt-water cove, a tidal wetland, and stream and forested upland areas with a wetland viewing pier and a trail network. The pier has been rehabilitated in a way that will extend its life significantly and make it a more secure structure to withstand severe storms and flooding. This pier, located within the floodplain, and a concrete construction pump station well above the floodplain are the only structures on the property. As much as the lower one-fourth of the property would be flooded in a hurricane storm surge and the wetland viewing pier could be destroyed;

- **Willett Pond**, measuring 4.8 acres near the northern end of Willett Avenue, backs up to a small dam and is within City-owned property. There is a half-mile woodland trail around the pond that is maintained by the Conservation Commission and offers wildlife viewing. Residential properties border the pond to the west and northeast, with a small retail plaza to the southeast. Structures are several feet above pond level to the east and 15 feet or more higher to the west. Parts of the trail are subject to shallow flooding during times of unusual rain. High water can affect a portion of the area behind the strip plaza in rare instances, but there is not a record of street flooding at this location;

- The **Forbes Street Landfill/Southeast Area Drainage District** is located south of Forbes Street, west of Wampanoag Trail, and north of Rounds Avenue. This large area consists of approximately 240 acres, approximately 67 acres of the site was previously used as a sanitary landfill by the City from the late 1960s to 1979. An additional 5 acres or so is used by the City for composting yard waste, which is then used for City landscaping and made available to City residents. The City has successfully closed a portion of the landfill and has established a large solar facility at this site. Additional landfill closure and solar facility development was in the works in 2016. Aside from the manmade landfill ridge, this large area has flat topography and many areas have seasonal high water, but the area is not in the 100-year floodplain; and

- **Rose M. Larisa Memorial Park** consists of approximately 10.6 mostly landscaped acres owned by the City and serves as a recreational park and open space. This scenic property overlooking upper Narragansett Bay includes site amenities such as walking paths, picnic areas, overlooks, an outdoor covered performance stage, and parking facilities. It was part of the former Crescent Park which operated during much of the 20th century. The park is subject to tree damage from strong winds, especially given its location on a bluff along the Bay, and also erosion at the base of the bluff due to wave generating storms. Nearly all of the park is above the floodplain at an elevation of anywhere from 20 to 40 feet above sea level. A hurricane storm surge would likely cause significant erosion of the coastal bluff, loss of the small beach, and damage to the park's overlook.

3. Other Open Space

Additional public open space is associated with parks and playgrounds, which in a few places, are prone to flooding. Bold Point Park, across from Providence's India Point Park, and Sabin Point Park in Riverside, can flood from 5 to 6 feet or more of storm surge. Sabin Point Park has residential homes immediately to its north and east that are within the SFHA and are at risk from storm surges.

All City parks and recreation areas are prone to tree damage during high wind events. The City works to clear debris as quickly as possible following damage-generating events.

Section 3.4 Risk Analysis and Assessment Matrix

3.4a Repetitive & Severe Repetitive Loss Properties

Within the City of East Providence are 15 "repetitive loss" properties, including one "severe repetitive loss" (SRL) property. These 15 properties are located within three distinct areas of the City:

1. Runnins River – State Street Neighborhood

Map 4. East Providence Repetitive Loss Areas.

The City's primary Repetitive Loss Area is located in the east central portion of East Providence, bounded roughly by Waterman Avenue to the southwest, Almeida Avenue to the northwest, and the Seekonk, MA border to the northeast and east (known locally as the State Street Neighborhood). This neighborhood contains 12 of the 15 repetitive loss properties in East Providence, including the lone severe repetitive loss property. The principle drainage features in the area are the Runnins River (described in Section 3.3d above) and an unnamed tributary, which flows southeastward just north of the neighborhood area and converges with the Runnins River in Seekonk, MA, at a point just east of the state line.

The Runnins River floods during long duration heavy rainfall events, or during periods of repeating moderate to heavy rainfalls such as the rainfall that occurred in February and March of 2010. There are approximately 75 parcels with structures located in the area, mostly residential. Many of the residential parcels contain raised ranch style, single family dwellings. The number of pre-FIRM versus post-FIRM residential and commercial buildings is roughly split down the middle. There are a half-dozen or so commercial structures that are located predominantly along Waterman Avenue. These commercial parcels are partly landscaped but contain a high percentage of impervious surface. The residential dwellings have finished ground floor elevations

ranging from a minimum of 14 feet near the river to a maximum of 20 feet near Waterman Avenue. Properties in the area are connected to the City's sanitary sewer system and have City water. About 60% of the area is contained within the Special Flood Hazard Area, with generally flat topography and a high ground water table. The River itself passes beneath Warren Avenue through a reinforced concrete culvert. This culvert acts as somewhat of a choke point during high intensity storms.

The majority of damage caused by flooding in this neighborhood has occurred in houses that have (or had) finished lower levels, or had appliances and/or mechanicals within the lower levels that were damaged or destroyed by flood water.

2. Ten Mile River

East Providence also experiences very occasional riverine flooding issues along its stretch of the Ten Mile River, in the northern part of the City. The primary area of concern regarding residential properties is near the Pawtucket Avenue Bridge (Rte. 114) and downstream, or northwestward, along the river, from this point to Omega Pond. At the west end of Omega Pond, (just off of the map to the left) is a dam, which immediately beyond is the tidal Seekonk River. There are numerous residential properties fronting the river that are in the flood zone, including two repetitive loss properties. In general, the northernmost two or three properties along each of the streets that head north from Centre Street and a dead-end by the river are vulnerable to flooding during excessive rainfall events. Downstream from the Centre Street area is a group of homes along the southern end of Roger Williams Avenue that are also threatened by flooding of the same magnitude. Structures on these properties are slightly higher with respect to the river, so the threat to these properties is a bit lower.

Flooding of note along the Ten Mile River seldom develops from a single heavy rainfall event. On each occasion where it has happened in the last 20 years or more, it has been the result of a series of heavy rain events over a relatively short period of time. Examples include flooding episodes in June of 1998, October of 2005, and March of 2010. The latter, and most significant, of these came in the wake of a series of storms that dropped 17-20 inches of rain across the Ten Mile River basin in a 6-week time frame. The former two episodes resulted from rainfall of 10 to 15 inches over a period of 3 to 4 weeks.

The USGS has a stream gage at the Pawtucket River Bridge that the City monitors and receives alert-level emails for. The City is documenting water levels relative to gage readings during periods of unusually high water as an aid in predicting future flood events (see Section 4.2d – Local Flood Studies for more information on this effort).

3. Cove Street area

A third repetitive loss area is along the narrow tidal portion of Bullocks Cove in Riverside, north of Crescent View Avenue, that includes portions of Cove and Bell Streets. The flood zone in this area, which is an AE zone, clips a number of properties but encompasses only a couple of structures. One of these, located at the eastern end of Cove Street, is the lone repetitive loss property in this neighborhood. The claims from this property, most of which pre-date 1985, appear to have resulted from riverine flooding from upstream as opposed to tidal flooding, though certainly this immediate area would be subject to storm surge flooding from a hurricane. The remainder of structures in this neighborhood appear to be anywhere from 5 to 25 feet above the floodplain.

The floodplain areas within each of these repetitive loss areas is largely built out to the extent that they are likely to be. An application to fill/compensate a wetland and floodplain parcel in the State Street Neighborhood in 2009 was denied by DEM at the strong recommendation of the City. The remaining open land in this area is a mix of city-and privately-owned parcels and unimproved City rights-of-way.

3.4b Identified Risk in the Community

The purpose of the Risk Assessment Matrix, Table 17 below, is to assist in the formation of mitigation actions that are intended to reduce the physical, social, and economic loss that may result from a hazardous event. The Risk Assessment Matrix identifies vulnerable areas and assets of the City that have either sustained damage from a natural disaster in the past or have a reasonable probability of sustaining damage in the future. Natural hazards that were taken into consideration were hurricanes, tornadoes, severe thunderstorms, hail, nor'easters, snowstorms, ice storms, extreme cold, flooding, storm surge, coastal erosion, dam breach, climate change and sea level rise, earthquakes, wildfire, drought, and extreme heat. Once vulnerable areas and assets were identified, the Hazard Mitigation Committee determined the impacts to the residents, property, infrastructure, and economy. The benefits of pre- and post-mitigation efforts were determined by identifying the advantages gained if the impacts of a hazardous event could be prevented. Mitigation benefits include the protection of life, property, infrastructure, economy, and preservation of historically significant structures. One or more mitigation strategies, as described in Section 5.2, is assigned to each of the at-risk areas or facilities within the matrix.

Vulnerable Areas	Locations	Owner-ship	Natural Hazard	Impacts	Mitigation Benefits	Historic/ Potential	Strategies (Sec. 5.2)
Public Facilities	• City Hall • Fire Stations • Libraries • Police Station • Public Works • Transformers • Senior Center • Water Tower/ Related Facilities • Schools	Public	• Earthquakes • Hurricanes • Flooding • Wildfire • Snowstorms • Severe Thunderstorms	• Loss of life; • Disruption of city relief efforts; • Loss of public communication; • Loss of City computer networks and servers; • School disruption	• Protection of life; • Maintain City services during times of emergency • Maintain public communication; • Maintain public education	Historic	1, 3, 6, 20
Residential Mid- and High-Rise Structures	• City View Manor • Harbor View • Rumford Towers • Willet Avenue • Parkway Towers • Kent Farm Village • Goldsmith Manor • Winslow Gardens • Riverside House • Taunton Plaza • Office Parkway	Public/ Private	• Earthquakes • Hurricanes • Flooding • Wildfire • Severe Thunderstorms	• Loss of life; • Loss of housing units (senior, market and low-income); and • Loss of Emergency Communications (storage of radio equipment at City View and Harbor View).	• Protection of life and property; and • Maintain housing units (senior, market and low-income).	Potential	7, 19, 20

Vulnerable Areas	Locations	Owner-ship	Natural Hazard	Impacts	Mitigation Benefits	Historic/ Potential	Strategies (Sec. 5.2)
Other Residential Structures	City-wide	Private	• Flooding • Wildfire • Hurricanes • Severe Thunderstorms • Earthquakes • Storm Surge • Coastal Erosion • Dam Breach	• Loss of life; • Property and utility damage; • Sewage overflow; • Lost housing units.	• Protection of life and property; • Maintain housing; and • Maintain tax revenue.	Historic	4, 8, 9, 10, 12, 15, 16, 20
Historic Properties	• Looff Carousel • Pomham Rock Lighthouse • Others City-wide	Public/ Private	• Hurricanes • Earthquakes • Flooding • Severe Thunderstorms	• Loss/damage of property; • Loss of utility; and • Lost local heritage and historical icons.	• Protection of property; and • Maintain City landmarks.	Potential	13
Commercial Properties	• City-wide • In particular close to or in floodplain	Private	• Earthquakes • Hurricanes • Flooding • Wildfire • Severe Thunderstorms • Storm Surge	• Loss of life; • Disruption/loss of industrial services; and • Loss/disruption of employment.	• Protection of life; • Maintain industries and services provided; and • Secure workforce.	Historic	9, 10, 12, 18, 20
City Water Supply Pipelines	• Beneath nearly all City streets	Public	• Earthquakes • Flooding • Dam Breach	• Loss of water service; and • Decreased water quality	• Maintain water supply and quality.	Potential	8
Sewage Treatment Facilities, Sanitary Sewer Lines, and Pump Stations	• Narragansett Bay Commission Bucklin Point WWTF • City of East Providence WWTF	Public	• Earthquakes • Flooding • Hurricanes • Storm Surge • Dam Breach	• Loss/damage to utilities; • Loss of services to residents, businesses, and industries; • Public financial cost to repair/rebuild; and • Discharge of pollutants into marine environment.	• Maintain/ protect utilities; • Maintain services to residents, businesses, and industries; • Prevent/ decrease cost incurred to repair/rebuild; and • Protect marine environment.	Potential	1, 4
Dams	• Turner Reservoir • Hunts Mills • Omega Pond • Willett Pond	Public/ Private	• Earthquakes • Flooding • Dam Breach	• Loss of life; • Loss/damage to utilities; and • Loss of natural recreational facilities.	• Protection of life; • Maintain utilities; • Protection of natural recreation facilities; and • Protection of downstream facilities.	Potential	4, 5, 11, 19
Local Bridges and Culverts	City Wide	Public	• Flooding • Earthquakes • Hurricanes • Storm Surge • Dam Breach	• Disruption of transportation; • Disruption of emergency routes; • Loss of utility lines.	• Maintain both routine and emergency transportation routes; • Protection of utility lines.	Historic	4, 5, 9, 10

Vulnerable Areas	Locations	Owner-ship	Natural Hazard	Impacts	Mitigation Benefits	Historic/ Potential	Strategies (Sec. 5.2)
Care Facilities	• Bradley Hospital • Long-term care facilities City-wide	Private	• Hurricanes • Flooding • Earthquakes • Severe Thunderstorms	• Power and transportation disruption	• Minimize possibility of patient evacuation	Potential	7, 19
Streets	City Wide	Public	• Earthquakes • Hurricanes • Flooding • Snowstorms • Ice Storms • Storm Surge • Coastal Erosion • Dam Breach	• Loss of life; • Disruption of transportation; and • Disruption of emergency routes.	• Protection of life; • Maintain transportation; • Maintain emergency routes.	Historic	9, 10, 16
Indoor and Outdoor Recreation Facilities	City wide with special emphasis to facilities located in or adjacent to coastal areas and rivers.	Public and Private	• Flooding • Hurricanes • Storm Surge • Snowstorms • Ice Storms • Wildfire • Dam Breach	• Loss/damage to recreational facilities; and • Financial cost to repair/rebuild.	• Maintain recreational facilities; and • Prevent/ decrease cost incurred to repair/rebuild.	Potential	9, 11
Trees	Citywide	Public and Private	• Flooding • Hurricanes • Snowstorms • Ice Storms • Severe Thunderstorms • Wildfire • Drought	• Loss/damage to utilities; • Loss of services to residents, businesses, and industries; and • Public/Private financial cost to repair/rebuild.	• Maintain/ protect utilities; • Maintain services to residents, businesses, and industries; and • Prevent/reduce cost incurred to repair/rebuild.	Potential	15
Wetlands, Undeveloped Floodplains, Conservation Areas	• Scattered City and private properties City-wide	Public and Private	• Flooding • Hurricanes • Storm Surge • Severe Thunderstorms • Dam Breach	• Loss of passive recreational area • Loss of habitat • Loss of floodplain natural functions	• Protection of habitat and passive recreation areas • Retain functions of floodplains and wetlands • Retain sensitive open space in natural state	Potential	11

Table 17. Risk Assessment Matrix

Notes:

- All areas vulnerable to damage from severe thunderstorms are also vulnerable to tornado and hail damage.
- Extreme Heat and Extreme Cold are identified as hazards in the State Hazard Mitigation Plan and thereby are included in this local plan, but these hazards were not considered a priority by the local Hazard Mitigation Committee and are not indicated in Table 17.

SECTION 4 – CAPABILITY ASSESSMENT

Section 4.1 - Purpose

The Capability Assessment reviews existing plans, studies, programs and policies in the City and the state that focus on or include a component of hazard mitigation. Additionally, this section will highlight local accomplishments and shortcomings, and will briefly discuss goals and areas for improvement in the City's overall hazard mitigation strategy.

Section 4.2 - Local Government Capabilities

4.2a Local Government

Since its re-designation as a City in 1958, East Providence has operated under a Council-Manager form of government, whereby an elected City Council appoints a professional manager to oversee and administer day-to-day operations, serve as a focal point for City staff departments, and prepare a balanced annual City budget for review, possible modification, and approval by the Council. The City Manager also serves as the City's Director of Public Safety.

The City Council consists of five elected officials; one from each of four City wards and one elected "at-large" across the entire city. The Mayor is elected by the Council from among its members and thereafter presides at Council meetings and serves as the ceremonial head of government.[25] The Council meets regularly twice a month, except once monthly in July and August.

Several City Departments perform services and activities that can include a component of hazard mitigation, preparedness, response, and recovery. Mitigation activity is generally addressed by the East Providence Emergency Management, with assistance from the Engineering and Building Divisions of the City's DPW and from several other Departments and Divisions. These include the City Manager, the DPW Parks Division, Police, Fire, Community Development, and the Waterfront Commission.

4.2b Local Emergency Management Agency

The East Providence Emergency Management Agency (EMA), a division of the City's Planning Department since 2009, assumes primary responsibility for Natural Hazard Assessment and Mitigation. In recent years, local EMA has pursued and received preparedness and mitigation grants, collaborated with other municipal Departments and the City's School Department, and worked closely with Federal, State, and other agencies including FEMA, RIEMA, the Rhode Island Department of Health, the Rhode Island Fusion Center, and the Rhode Island Chapter of the American Red Cross. East Providence EMA also maintains active membership in the Rhode Island Association of Emergency Managers (RIAEM) and the Rhode Island Flood Mitigation Association. The City has two Certified Floodplain Managers (a certification of the Association of State Floodplain Managers) on staff.

In addition, East Providence EMA serves as both the City's Floodplain Coordinating Office and CRS Coordinating Office, and is responsible for maintaining the City's Hazard Mitigation Plan.
As Floodplain Coordinator, East Providence EMA maintains copies of the City's FIRMs, both current and historical, within the Planning Department (also available at the DPW Engineering Division Office), along

[25] City of East Providence Website- City Council, accessed October 15, 2015. http://www.eastprovidenceri.net/content/12101/11286/default.aspx.

with Flood Insurance Studies and Letters of Map Amendment. East Providence EMA maintains a log of floodplain inquiries and determinations and performs an average of one to three of these a month upon constituent request.

Staff consists of an operational meteorologist, allowing for the timely dissemination of localized weather forecasts, and local and regional weather data as needed.

Section 4.3 - Local Planning Integration and Regulatory Resources

4.3a Integration with Plans and Local Regulations

East Providence Comprehensive Plan
The East Providence Comprehensive plan, originally adopted in 1994, serves as the policy framework for decisions concerning land use, development, design, programs, and public investment priorities. The Planning Department was completing an extensive update of the plan in 2016. A Natural Hazards Element is being added to the Comprehensive Plan given the necessity to incorporate natural hazard assessment and hazard mitigation into local comprehensive planning. This element (or chapter) includes an abridged discussion of hazards and capabilities along with hazard mitigation and preparedness action items. The inclusion of a distinct Natural Hazards chapter in the Comprehensive Plan further supports hazard mitigation activities as a component of local government policy.

East Providence Waterfront Special District Development Plan
This plan, originally adopted in 2003, guides the development of roughly 300 acres along the central portion of the City's western shoreline along the Seekonk and Providence Rivers, and still remains in full effect. Historically, much of the waterfront land use in these areas was industrial in nature. While some industrial and port uses continue, many of these uses have ceased allowing for rezoning to less "intensive" uses including mixed-use, residential, and recreational developments, as further described in Section 3.3 above. The Plan calls for preservation of natural habitat areas and environmental protection as part of development proposals along the waterfront. The Waterfront Chapter of the Comprehensive Plan update, drafted in collaboration with the Waterfront Commission, provides general guidance for development along the waterfront taking into account sea level rise. The Commission consults with East Providence EMA regarding natural hazards, particularly with respect to the district's Special Flood Hazard Areas (which include both A zones and V zones) and any need for flood mitigation with regard to development in the Waterfront District.

East Providence Emergency Operations Plan (EOP)
The East Providence EOP, adopted in 2011, plans out emergency operations and authority with an emphasis on standard emergency support functions. It includes emergency roles and responsibilities and by design is preparedness and operations oriented, but also includes a discussion of the City's natural hazards and some general mitigation and preparedness information. Hazard Analysis from the Hazard Mitigation Plan is utilized to inform procedures with regard to emergency operations. The plan is National Incident Management System (NIMS) compliant and has been approved by RIEMA.

East Providence Severe Weather Standard Operating Guidance Plan
This internal emergency operations plan was developed in 2015 to serve as a quick reference guide for City command staff including the City Manager, heads of Public Safety and DPW, EMA, and others who would be part of Incident Command, particularly during an EOC activation and/or emergency shelter

activation. Development of this plan aided in determining mitigation benefits and future activity regarding sheltering (see box below), City-facility hazard mitigation, and continuity of government services. Updates are continuous.

SHELTER CAPABILITY

Currently, there is one American Red Cross designated emergency shelter in the City, located at East Providence High School; and two others, in addition the East Providence High School, as identified in the 2015 State of Rhode Island Shelter and Coordination Plan.

Name	Location	Capacity
East Providence Senior High School	2000 Pawtucket Avenue East Providence, RI 02914	1,068
East Providence Senior Center	610 Waterman Avenue East Providence, RI 02914	150
Riverside Middle School	179 Forbes Street East Providence, RI 02814	500

Table 18. East Providence emergency shelter locations.

According to the American Red Cross, 25% of an area's population would most likely seek shelter from a natural disaster. For example, if the southern coastline of the City required evacuation, statistically only 25% of those residents would seek the safety of an emergency shelter. The remaining 75% would seek shelter with friends or families, or make other arrangements such as hotel accommodations.

A recommended mitigation action of the 2004 Hazard Mitigation Plan was the use of the Senior Center as an emergency shelter. In light of recent renovations at the Center, this recommendation is now a reality as noted above, and the facility was made available during the March 2010 flooding as well as for Tropical Storm Irene. It was readied for activation to assist people with medical equipment who lost power from the August 2015 severe thunderstorm, but power was restored in timely fashion and the activation was called off. East Providence EMA, the Public Buildings Superintendent and the Senior Center Director are investigating increased generator capability for the Center to optimize its use as a small shelter.

Revised Ordinances of the City of East Providence

The City's Zoning Ordinance (Chapter 19 of the Revised Ordinances) contains the most pertinent City regulations regarding natural hazards, including FEMA-compliant floodplain regulations (Division 12-Special Flood Hazard Areas, Sections 19-306 through 19-315) and stormwater runoff / erosion control with respect to Development Plan Review (Section 19-455).[26] The Zoning Ordinance is revised as needed, and the floodplain was revised as recently as the summer of 2015 in advance of the most recent revised FIRM adoption. Reference to the City's building code is found in Chapter 4, Building and Building

[26] "Revised Ordinances of the City of East Providence", accessed October 28, 2015, http://clerkshq.com/default.ashx?clientsite=EastProvidence-ri.

Regulations, Section 4.1(a), which states that "The city hereby adopts the State Building Code, as amended, as the building code of the city."

East Providence Land Development and Subdivision Review
Included among the regulations regarding development projects is the assurance that floodplains and wetlands be accounted for, and that impacts of development be minimized. Land development regulations state that "Drainage systems shall be designed so that there will be no increase in the rate of runoff from the post-development site as compared to the pre-developed site based on an assumption of pre-development site condition of vacant land."[27] Hazard mitigation is incorporated into the subdivision and development plan review process for all residential and commercial developments. FEMA floodplain maps are consulted as part of the review of development proposals. All proposals, whether they are in or out of the City's special flood hazard areas, are carefully evaluated with an eye to drainage, impervious surface, and vegetative landscaping; and for the potential to affect floodplains or other areas that are prone to flooding.

City of East Providence Capital Budget/Five-Year Capital Improvement Program
The City's annual Capital Improvement Budget is prepared utilizing a list of projects and purchases that are solicited by all City Departments. The list of requested capital funding always far exceeds the capital budget that is available, but more City funding has been made available in recent years. Capital funding requests that relate directly to hazard mitigation have been principally oriented toward flood mitigation and include culvert upgrades or replacements, and neighborhood- or larger-scale drainage improvements to reduce street flooding from relatively routine rain events. These are costly projects that often require a multi-year investment. Future infrastructure bonding is a possibility to fund such projects. Including mitigation projects as part of a Capital Improvement Program indicates that their execution is part of the overall infrastructure budgeting policy and further, it supports future City and alternative funding efforts.

East Providence Harbor Management Plan - Storm Preparedness and Hazard Mitigation Plan for the East Providence Shorelines and Coastal Waters
This Plan is included as an appendix to the East Providence Harbor Management Plan and was developed in 2012 by the Planning Department, in coordination with the Harbor Commission and East Providence EMA. It includes detailed descriptions of the immediate coastal and nearshore environment and marine/boating amenities, a risk assessment table for shoreline and coastal water features, preparedness strategies and operational action timelines, and mitigation and preparedness action items. The plan recommends flood mitigation actions to commercial interests along the water including:

- Placing essential equipment and functions above the floodplain level;
- Installing dewatering pumps;
- Installing master shut-off valves for utility services where flooding may threaten those services;
- Reinforcing existing walls to carry hydrostatic and hydrodynamic loads; and
- Install safety glass in windows.

[27] East Providence Land Development and Subdivision Review Regulations, Sec. 13-9(b.)(6), http://www.eastprovidence.com/filestorage/9177/9461/9463/9925/9927/Subdivision_Regulations_Jan_9_2012.pdf.

State and Local Dam Safety Plans

The State Dam Safety Program identifies high-hazard dams across the State. These are dams which, if failure were to occur, could result in significant loss of life and property. The City owns three dams along the Ten Mile River; the most upstream of these, the Turner Reservoir Dam, is considered a high-hazard dam. A Dam EAP for the Turner Reservoir has been developed and was in the process of State review as of mid-2016. A high priority of this planning cycle will be the completion of the basic plan, and the improvement of mapping in the plan. A sub-group of the City's emergency notification database will be developed to cover the projected area of impact in the event of dam failure.

The East Providence Emergency Management Agency has a copy of the EAP for the Hebronville Pond Dam in Attleboro, MA., another high hazard dam along the Ten Mile River about 5.9 miles upstream from the Turner Reservoir Dam. That plan, most recently updated in 2013, includes notification protocols in the event of failure of this structure. The plan's study area includes riverbanks from the dam itself southward to the Turner Reservoir Dam. It is expected that the impact of failure at Hebronville would be less than that of Turner Reservoir Dam's failure, making the Turner Reservoir EAP representative of a worse-case scenario for such an incident.

An impoundment within the property of the Narragansett Bay Commission's Bucklin Point Wastewater Treatment Plant off of Campbell Avenue in Rumford, which also supports one of the property's roadways, is also classified as a high hazard dam. Failure of that structure would impact that facility and the constituency that it serves for wastewater treatment. The Narragansett Bay Commission is responsible for emergency action planning regarding that structure.

4.3b Local Flood Studies

Ten Mile River Gage

A USGS river gage (Station # USGS 01109403)[28] has been gathering and transmitting data since 1986 along the Ten Mile River at Pawtucket Avenue (Route 114) near Centre Street. The City has an extensive photo archive from recent high-water events including the March 2010 floods. Photos are correlated with river levels and the amount of rainfall that was received during and prior to that major flood event, and similar data is now collected for other flood events and close calls. This provides East Providence with guidance as to how high the water will rise and who it will affect along the Ten Mile River, up the peak level on March 30, 2010. EMA and the Engineering Department have also performed an ongoing useful study to use the Ten Mile River gage as an indicator of the potential for flooding along the Runnins River in the State Street neighborhood.

It is acknowledged that the Runnins River drainage basin is a separate and smaller basin than the Ten Mile River basin and that this correlation will never be perfect, but the two basins are adjacent to each other and we have found the Ten Mile Gage has shown skill as an indicator for flood potential along the Runnins River in the State Street Neighborhood. Unofficial gage alert levels are being developed to aid in anticipating the flood hazard along both rivers. Please see Figure 5 on the following page for a sample of the rainfall/streamgage correlation chart prepared as part of this study.

[28] "USGS 01109403 Ten Mile R., Pawtucket Ave. at East Providence, RI, Ten Mile River Gage at Pawtucket Avenue", USGS National Water Information System: web Interface, http://waterdata.usgs.gov/ri/nwis/uv/?site_no=01109403&PARAmeter_cd=00065,00060.

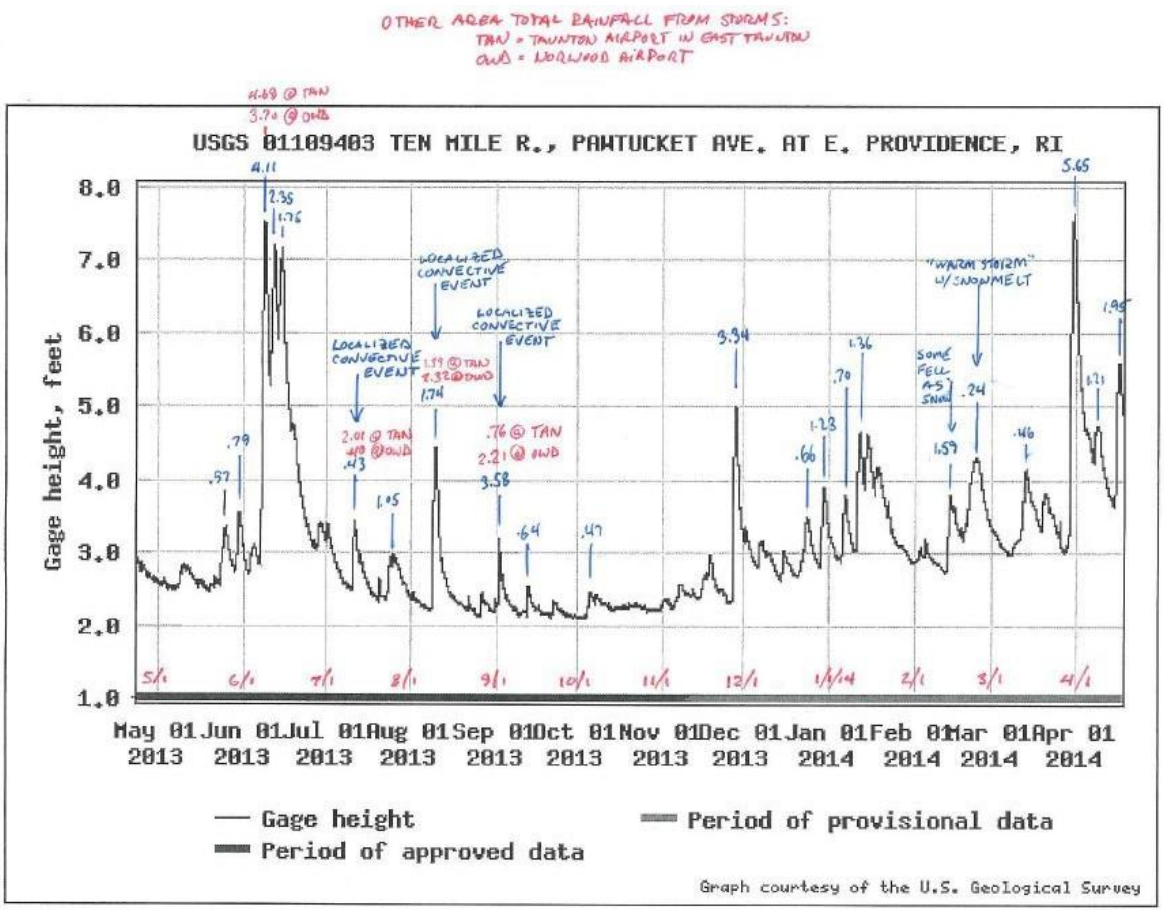


Figure 5: Sample from East Providence EMA/Engineering river gage flood and precipitation study.

Fox Point Tide Gage

The NWS Advanced Hydrologic Prediction Service (and locally, the Northeast River Forecast Center in Taunton) maintains tide gages in the Rhode Island area including "Narragansett Bay at Fox Point" (FOXR1),[29] located along the Port of Providence directly across the river from East Providence. The Fox Point gage and others can be linked via the website of the Marine Observation Page of the NWS Forecast Office in Taunton at www.weather.gov/box.

The City has photos from Hurricane Sandy which document high water levels and post-storm debris lines. City Public Safety staff visited numerous coastal areas during the highest storm tide on the evening of October 29, 2012 to view the height of the tidal surge. Having these pictures and this information, and comparing them to the tide gage at these times will aid in coastal flooding forecasts during future events, especially since this is a NWS forecast point for tide levels. In the future, we will also monitor the Conimicut Point tide gage off of Warwick, which is about 2 miles south-southwest of the southernmost portion of East Providence.

[29] NOAA Narragansett Bay at Fox Point Tidal Gage, National Weather Service Advanced Hydrologic Prediction Service, accessed October 15, 2015, http://water.weather.gov/ahps2/index.php?wfo=box.

Section 4.4 - National Flood Insurance Program and Community Rating System

The City of East Providence, along with the other 38 municipalities in Rhode Island, participates in the NFIP, which enables City residents to purchase Federally-backed flood insurance. Additionally, the City is now enrolled in FEMA's CRS, whereby City property owners can receive flood insurance discounts as a result of the City meeting more than the minimum NFIP requirements to help property owners prevent or reduce flood losses. CRS participation by East Providence is administered by local EMA. Assistance is provided in the form of maintenance of drainageways and infrastructure, and in identifying flood areas and study areas, by the DPW (in particular the Engineering Division, along with City Public Safety officials as incidents, needs, or opportunities present. As of 2015, the City was enrolled as a "Class 9" community, enabling a 5% discount for resident and commercial policies. This saves residents across the City a total of over $16,000. East Providence EMA has a goal of increasing this participation so as to achieve a "Class 8" ranking resulting in 10% discounts.

East Providence will maintain compliance with NFIP regulations by continuing to require permits for proposed construction and development in the City, and by ensuring that proposed building sites are reasonably safe from flooding. EMA, serving as the City's floodplain coordinator, reviews development plans where wetland and floodplain areas are in proximity to the site. Plans additionally come under City engineering review, with private engineering firms occasionally consulted when additional input is needed regarding drainage, groundwater, and nearby surface water. For development projects, site elevation contours and proposed building elevations are required, along with a determination of FEMAs flood zones and, if applicable, on-site or nearby floodplain elevations.

City EMA and Engineering offices maintain copies of the current FIRM, and EMA administers the City process for map revisions, which includes floodplain ordinance revisions when necessitated. The City maintains a log of floodplain-related inquiries, noting location, flood zone and base flood elevation, and information given to the inquirer.

NFIP	VE Zone	AE Zone	Non-SFHA	City Total
NFIP Policies in Force	4	122	145	271
# of Repetitive Loss Properties	0	15	0	15
Historic # of NFIP Claims	0	73	43	116
Total NFIP Premium				$295,270

Table 19. National Flood Insurance Program Information for East Providence. Courtesy of RIEMA.

Section 4.5 - Mapping Resources

East Providence EMA, with assistance from the City's Geographic information system (GIS) Coordinator, performs mapping for planning purposes including floodplain and inundation mapping using available RIGIS and City mapping layers. East Providence EMA and the City's Engineering Division both maintain copies of the City's FIRMs and FEMA Flood Studies. Other mapping resources utilized include RIEMA's "Rhode Island Floodplain Mapping Tool," Rhode Island CRMC's "STORMTOOLS," and NOAA's Coastal Flood Exposure Mapper.

Section 4.6 - Other Accomplishments

East Providence EMA, in collaboration with other City Departments and State agencies, has realized numerous accomplishments during the cycle of the 2010 Hazard Mitigation Plan update. These include enrollment in FEMA's Community Rating System, administering the FEMA disaster declaration process for several storms, conducting local riverine and tidal flood studies, obtaining mitigation and preparedness grants, and determining practicable mitigation activities in the flood-prone State Street Neighborhood.

Two flood mitigation projects were in development for that neighborhood to be financed by CDBG-DR funding. These projects are described on Page 66 within Section 3.3d. City staff, including Planning and Community Development personnel, worked many hours to navigate the complex process of approval for this project. Implementation is expected early in the planning cycle of this Plan update.

For a review of progress and accomplishments regarding action items from the 2010 Hazard Mitigation Plan Update, please see the chart in Section 5.3 below.

Section 4.7 - Capability Needs

While general emergency management and hazard mitigation functions in East Providence have advanced considerably over the five years leading to this Plan update, there is a need for increased capability in some areas including:

Local Emergency Management Staffing. Emergency Management remains a part-time function in East Providence, as is the case in many municipalities in Rhode Island and southern New England. The function of Emergency Management has increased in the City and with cooperation and assistance from the Planning Department, Public Safety, DPW, and City Management. The number of person-hours dedicated to emergency management limits the total scope of work that can be expected over any given period of time. A goal of the upcoming planning cycle will be to attain somewhat more formalized assistance for Emergency Management activities to ensure that its function continues when current dedicated part-time EMA staffing is unavailable.

Below are several other items that will be a priority during the planning cycle for this Plan update:

Continuity of Operations and Government Planning. While there is a wealth of institutional knowledge among City leaders, and those leaders know their role in the event of an emergency, policies regarding continuity of operations and government in the event of an extreme incident are not well documented on a City-wide scale. Formal continuity plans should be developed as soon as time allows.

Continued Progress in Emergency Storm Sheltering. Significant progress was made late in the 2010-2015 planning cycle regarding storm sheltering. The emergency sheltering of a large number of residents is a complex undertaking for any municipality. East Providence will work with RIEMA, the Red Cross, and other agencies as appropriate to improve our capabilities particularly with respect to functional needs and pet considerations.

Dam Emergency Action Planning. The Turner Reservoir high-hazard dam EAP has essentially been rewritten to update contact information, complete mapping, and review policies and protocol to ensure that the actions indicated in this plan remain viable and to recommend any additional activity with regard to disaster mitigation and preparedness related to dam failure. This plan will need to be updated for contact information and to review the information annually, or when there is staff turnover in any of the listed positions. Additionally, the plan would be well-served to have more detailed mapping of the potential impact area.

Expanded All-Hazards Public Outreach. Some State and local agencies across the nation have produced all-hazards information that can be that can be published as colorful, easy to read brochures for availability at municipal or county facilities and at events, and posted and shared on-line. Knowledge, resources, and examples of successful material are available, but time considerations make the execution of this task a challenge. Incremental work on this project with a goal for medium-term completion may be a realistic expectation. Meanwhile, single-page winter, summer, flood, and hurricane hazard sheets are being prepared for posting on the City's website and for hard-copy distribution.

SECTION 5 – MITIGATION STRATEGY

City of East Providence staff, with constituent input and aid from RIEMA and FEMA, have developed mitigation strategies for previous planning cycles in 2004 and again in 2010, prior to the current hazard mitigation Planning process. The most recent FEMA-approved Hazard Mitigation Plan (approved May of 2011), included 30 action items designed to address mitigation of future natural hazards. These are listed in the chart below along with their expected benefit at the time, and a statement regarding the progress and status of each item.

Section 5.1 - 2010 Action Plan Status Report

2010 East Providence Hazard Mitigation Plan Action Item Status Report

Action Item	Progress	2016 Status	Rationale
1. Expand Public Education and Outreach Programs	Greatly increased use of City website and initiated successful social media activity. CRS participation has resulted in additional outreach to residents of flood prone areas.	Modified New Strategy # 5, 16-19.	Continue effort and keep up w/ notification and social media changes.
2. Increase Emergency Sheltering Capability	East Providence High School re-certified as Red Cross Shelter. RIEMA developing statewide plan. EMA and City Command Staff developing local plan and acquiring commodities. Senior Center available for smaller activations	Modified New Strategy #7	Continue to acquire shelter commodities; increase alt. power capability
3. Provide for Continuity of Operations	Electrical generator capability being improved at several sites, FEMA grant obtained to upgrade City Hall generator. Discussions in progress re: essential staffing. Continuity of Operations Plan is priority item of this planning cycle.	Modified New Strategy #6.	Staff COOP plan for emergencies still needs to be memorialized.
4. Assess Vulnerability of Public Buildings	Capital funding has returned and is supporting building improvements City-wide. This effort will continue as will effects to improve safety and security for City staff, school students, and residents.	Modified New Strategy #1	Reduce potential for incidents
5. Assess Vulnerability of Public Records	Long-term effort in progress. Many land evidence records are now available electronically. Public records digitization ongoing.	Completed	Ensure availability and increase access to public records.
6. Protect Library Resources	Library building maintenance improved in recent years. Library developing new community facility at former Fuller Library.	Completed	Maintenance of highly used and regarded City facilities.
7. Assess Vulnerability to Cultural and Historic Resources	Local historic districts have been established to increase awareness of local sites and resources. Funding increased to support historic Looff Carousel. Efforts beginning to rehab historic Oddfellows Hall.	Modified New Strategy #13	Reduce potential for damage or loss due to natural hazards
8. Ten Mile River Stream Gage as Nat'l Weather Service Forecast Point	Pursued with NE River Forecast Center; drainage basin does not meet size criteria. Successful local study ongoing to use River Gage levels to predict flooding along both Ten Mile and Runnins Rivers	Cancelled	Local flood study is achieving the objectives of this action item.

Action Item	Progress	2016 Status	Rationale
9. Encourage Underground Utilities	Recent larger developments including Bridgham Farm and Seaview Estates subdivisions have underground electrical; similar plans for new Kettle Point and Village on the Waterfront developments.	Completed	Protect utility infrastructure, lessen vulnerability to outages.
10. Update the City's Debris Management Plan	Plan available and debris storage measures have been implemented during recent storms.	Cancelled	No current interest in update. Will re-evaluate late in cycle.
11. Maintain NFIP Participation and Compliance	Maintaining Hazard Mitigation Plan. City EMA and Engineering have worked to provide flood zone and flood insurance information to dozens of City residents and maintain log of inquiries.	Modified New Strategy # 9, 10	Ensure FEMA compliance, maintain NFIP eligibility
12. Enroll in FEMA Community Rating System	Successfully completed. CRS Class 9 enrollment achieved effective May 1, 2014.	Modified New Strategy #2	Improve to Class 8 to increase discounts for flood insurance policy holders.
13. Maintenance of Drainage Infrastructure	Ongoing DPW activity to clean catch basins and maintain drainageways. Significant capital funding necessary to improve drainage in certain locations. Potential for capital improvement bond funding.	Modified New Strategy #9, 14	Keep drainage-ways unclogged to reduce flood potential.
14. Tree Trimming Program	National Grid performs tree trimming. Through capital budget planning, the City has acquired a new tree truck to aid in citywide tree trimming effort.	Modified New Strategy #15	Reduce tree/wire conflicts to lessen incidents of downed wires.
15. Encourage Acquisition of Open Space	Parcel acquired in repetitive flood area north of Waterman Ave. Parcel with brook frontage in Riverside in acquisition process.	Modified New Strategy#11	Maintain open space areas for stormwater and floodplain functions.
16. Explore Financial Incentives for Conservation Easements	Option pursued in recent developments; tax reduction often not significant enough for commercial developers. May be more beneficial for residential interests.	Modified New Strategy #11	Maintain sensitive areas in natural state.
18. Inventory of Long-Term Care and Child Care Facilities	Long-term care facilities identified with contacts. EMA, EMS will continue involvement with state Long-Term Care Mutual Aid Plan along with collaboration with Dept. of Health and the Hospital Association of Rhode Island.	Completed	Assist facilities where possible in emergencies.
19. Examination of Land Uses	Open space has been preserved in new development where possible and drainage from these developments has been carefully engineered. Market forces create challenge to preserving developable land.	Completed	Maintain open space designations where possible.
20. Training Opportunities and Natural Hazard Seminars	Local EMA attends sessions in all possible Emergency Management sectors, additional public safety staff have become knowledgeable in disaster operations through recent major storms and relating trainings.	Modified	Continue education, keep up with policies and best practices.

Action Item	Progress	2016 Status	Rationale
21. Maintain NIMS compliance	EMA up-to-date with required FEMA/EMI training. Extensive School Dept. training achieved in recent years. Public Safety personnel have been trained as required.	Complete	Ensure FEMA compliance.
22. Emergency Management Volunteer Coordination	Smattering of volunteer interest. An individual or group is needed to coordinate a viable volunteer program.	Cancelled	Item will be re-evaluated if staffing assistance is provided.
23. Need for alternate power for sewer system pump stations	Most locations now fully generated. Working to improve service to stations that still rely on portable generators for alternate power.	Modified New Strategy #1	Ensure system functions during emergencies, preserve quality of environment.
24. Installation of Second Cross-Bay Water Pipeline	Highly expensive and complicated project. City will support any effort that may evolve in the future. In related effort, the City has approved $19M bond to improve water infrastructure and quality of City water.	Cancelled	City will monitor, requires major commitment from many entities.
25. Inspection, Maintenance and Repair of Culverts	Funding secured for improvement of Warren Avenue Culvert. Options being investigated for improvements to or replacement of culvert on South Broadway.	Modified New Strategy #9	Mitigate flooding, scour, and potential for street damage.
26. Dam Monitoring and Maintenance	City owns three dams on Ten Mile River. Turner Res. Dam is considered "high-hazard". RIEMA working w/ Narr. Bay. Comm. re: high-hazard structure on that property.	Modified New Strategy #4	Mitigate against dam failure, have plan available in case of failure.
27. Inventory of Bridges with Utilities	Inventory complete and information available in the City's GIS Database.	Completed	Update as necessary.
28. Private industry and Commercial Outreach	Outreach conducted and relationship built with EP Area Chamber of Commerce. Additional private and commercial outreach will be investigated.	Modified New Strategy #17	Provide prepared-ness and mitigation info on large scale.
29. Inventory of Commercial and Industrial Buildings in Floodplain	Improved orthophotos and new mapping tools have aided in identifying structures.	Completed	To be updated as facilities are built, replaced, or torn down.
30. Carefully Planned Future Waterfront Development	Development slowed during the recession but increased beginning in 2014. Waterfront review process includes thorough review of natural hazard impacts. Collaboration with EMA done regarding natural hazards as warranted.	Completed	Development review accounts for SFHA and other sensitive areas.

Table 20. 2010-2016 Action Item Progress and Status Report

Section 5.2 - 2016-2021 Action Plan and Mitigation Strategies

Action items (identified as "strategies" below) for this Hazard Mitigation Plan update were developed via review of implementation success of action items from prior East Providence Hazard Mitigation Plans, research of achievements in other local communities, constituent public outreach and input, and City staff public outreach and input. All strategies include:

- A brief description;
- A relative priority assignment based current conditions and general City priorities;
- The mitigation action type;[30]
- Strategy implementation lead agency and supporting agencies and/or resources;
- Description of expected mitigation benefits;
- Time frame as follows and will be put in to action following FEMA's approval of the plan:
    - Short-term = 0 to 6 months
    - Medium term = 6 months to 18 months
    - Long-term = 18 months to 5 years
- Approximate cost and funding options as applicable. The cost ranges used in this strategy are as follows:
    - Staff Time - Municipal Work Time
    - Minimal- Less than $25,000
    - Moderate- $25,000 to $100,000
    - Significant- Over $100,000
- Status of these action plan strategies as of late 2015 (beginning of planning cycle).

For purposes of this Plan update, the EPHMC has elected to highlight the highest priority hazards as determined by the group and for which mitigation goals could realistically be met, by considering actions aligned to the following mitigation categories:

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

Development of mitigation strategies and, in particular, their prioritization, was assisted using FEMA-suggested criteria as found in FEMA's 2013 Local Mitigation Planning Handbook.[31] This criteria includes:

- Life Safety: How effectively will the action protect lives and prevent injuries?
- Property Protection: how significant will the action be at eliminating or reducing damage to structures and infrastructure?
- Technical: Is the action technically feasible? Is it a long-term solution?
- Political: Does the public support the proposed action and is there the political will to support it?

[30] FEMA. Local Mitigation Planning Handbook." Page 6-4. March 2013. http://www.fema.gov/media-library-data/20130726-1910-25045-9160/fema_local_mitigation_handbook.pdf.
[31] FEMA. "Local Mitigation Planning Handbook." March 2013. http://www.fema.gov/media-library-data/20130726-1910-25045-9160/fema_local_mitigation_handbook.pdf.

- Legal: Is there local legal authority to implement the action?
- Environmental: What are the potential environmental impacts of the action? Will it comply with environmental regulations?
- Social: Will the proposed action adversely affect a segment of the population?
- Administrative: Is operational and administrative capability adequate to implement the action and maintain it?
- Local Champion: Is there a strong advocate for the action or project among local departments and agencies who will support implementation?
- Other community objectives: Does that action advance other community objectives and display consistency with local goals and with the Comprehensive Plan and other planning mechanisms?

Hazard Mitigation Mission, Goals, and Specific Strategies

Mission: East Providence is prepared for natural hazards and has the resources to mitigate, prepare for, respond to, and recover from a disaster.

Goal 1: Reduce the vulnerability of our residences, businesses and government to natural disasters.

Strategies:

1. **Upgrade alternate power capability at municipal facilities including City Hall, other City Buildings, and at water and wastewater pumping stations.**

   Ensure that municipal buildings and other infrastructure continue to provide service and function as designed in the event of an interruption of electrical power. Generator support exists but is currently inadequate due to technology demands at City Hall and the City Public Works Complex, and due to technology and a building addition at the Senior Center.

   Priority: High
   Action Type: Emergency Services
   Project Lead: DPW Public Buildings Division
   Supporting Resources: East Providence EMA, DPW Engineering Division, City Manager and City Council, Police Dept., Fire Dept., and Information Technology (IT) Dept.
   Benefit: Ensure full service to residents and safe conditions for public employees; protect communications and IT resources.
   Time Frame: Long-term. Complete by late 2018.
   Cost Estimate: Significant
   Funding Options: City Capital Budget, hazard mitigation grant opportunities.
   2016 Status: Project underway to install new generator at the City Public Works complex. Funding pending expected for a Senior Center generator. FEMA grant available for City Hall project; logistics still being determined. Working with the Public Buildings and Engineering Divisions to determine other infrastructure still in need of alternative power sources.

2. **Upgrade the City's participation in FEMA's Community Rating System.**

   The City achieved enrollment in the Community Rating System in 2014 as a Class 9 community, enabling floodplain residents to realize a 5% reduction in flood insurance policy rates. Goal of upcoming Hazard Mitigation Plan cycle is to upgrade to Class 8.

   Priority: High
   Action Type: Planning and Prevention

Project Lead: East Providence EMA
Supporting Resources: DPW Engineering Division, IT Dept. (public outreach assistance), RIEMA CRS User Group, FEMA CRS resources, and Insurance Services Office (ISO)
Benefit: Constituent flood insurance discounts, increased flood hazard awareness, increased public outreach.
Time Frame: Long-term. Complete by mid-2019.
Cost Estimate: Staff Time
Funding Options: n/a
2016 Status: Class 9 community status recertified in October of 2015. Data gathering, notification and other activities underway to maintain enrollment and upgrade classification.

3. **Upgrade and strengthen infrastructure at school facilities.**
School buildings have a well-built "shell" but in many instance doors and windows are not of the highest quality and strength. Improvements to doorways and especially windows are needed at a number of the City's public schools.
Priority: Medium
Action Type: Structural projects, Planning and Prevention.
Project Leads: School Administration and School Facilities.
Supporting Resources: Fire Dept. (inspection), DPW Building Division, School Committee.
Benefit: Increased school building resilience to wind-related hazards.
Time Frame: Medium-term.
Cost Estimate: Significant
Funding Options: Grant potential, staff time availability
2016 Status: Entryway, window, and other physical plant improvements are getting underway made as funding is available. RI Dept. of Education assistance has been used. Additional capital funding would help to increase execution of this very large task.

4. **Update Emergency Action Plans for local high hazard dams and coordinate with upstream communities.**
Ensure that local emergency action plans are up to date with regard to areas of impact, emergency notification protocol, and local contact information.
Priority: High
Action Type: Planning and Prevention
Project Lead: East Providence EMA
Supporting Resources: Police Dept., Fire Dept., DPW Water Division, RIEMA, and Narragansett Bay Commission.
Benefit: Higher level of preparedness and increased ability to move people from harm's way in the unlikely event of a dam emergency.
Time Frame: Medium-term. Complete early 2018
Cost/Funding Options: Staff time
2016 Status: Turner Reservoir Dam EAP is at RIDEM for review. More detailed hazard mapping is desirable. Need to integrate into emergency notification system. Coordination needed with Narragansett Bay Commission re: EAP for a structure at their WWTF facility in Rumford.

5. **Implement education program for residents regarding the purpose and use of mapped evacuation routes and coordinate with neighboring towns.**

   Evacuation route signs are posted along some roadways in East Providence but many are not aware of how best to use that information, where the signs are intended to lead them, and what happens at town and state borders. Survey residents and provide education based on knowledge gaps that are discovered.

   Priority: Medium
   Action Type: Public Education and Awareness
   Project Lead: East Providence EMA
   Supporting Resources: RIEMA, DPW, Police Dept., and IT Dept.
   Time Frame: Medium-term
   Benefit: Public understanding of use of this signage in the event of storm surge evacuation as part of a broader personal evacuation plan.
   Cost/Funding Options: Staff time.
   2016 Status: New action item for this Plan update.

6. **Prepare post-disaster Continuity of Operations Plan for City government.**

   Public Safety operations have clear guidelines and chains of command; City government as a whole would benefit from similar written guidance that could be implemented immediately if necessary. An outdated consultant-based Continuity of Operations/Government Plan needs substantial updating or replacement.

   Priority: Medium
   Action Type: Planning and Prevention
   Project Lead: East Providence EMA
   Supporting Resources: City Management, all City Department heads, and RIEMA
   Benefit: Continued operation and service to the Public in the event of a major incident or emergency.
   Time Frame: Medium-term
   Cost/Funding Options: Moderate if contracted out, substantial staff time if executed in-house.
   2016 Status: No recent activity. Plan templates are available; extensive project that requires prioritization from command staff level. RIEMA initiative to assist local continuity plans is anticipated during this plan cycle.

7. **Increase shelter capacity and capability with infrastructure upgrades.**

   Improved provision of sheltering aids in mitigating the impact from natural disasters. The City has an approved regional shelter at the High School and can utilize the Senior Center and Riverside Middle School if necessary. The High School has a large generator, but electrical upgrades to support it are needed. The Senior Center and Riverside Middle School need larger generators to work well as shelters. Work with groups including long-term care facilities and East Providence Housing Authority to develop protocol for sheltering in place.

   Priority: High
   Action Type: Emergency Services.
   Project Lead: East Providence EMA
   Supporting Resources: American Red Cross, East Providence Fire and Police Departments, East Providence Housing Authority, Rhode Island Department of Health
   Benefit: Improved service to all residents including those with additional needs in the event of an emergency that requires sheltering.

Time Frame: Long term
Cost/Funding Options: Staff time
2016 Status: Fire Department/EMS accesses the Dept. of Health Functional Needs registry. Coordinate with Dept. of Health to ensure list is up-to-date. The Red Cross has exercised the former St. Brendan's School in Riverside and is considering that facility for use as an approved shelter. That facility would need a generator if the Red Cross pursues this option. The City is working to improve alternative power provision at the Senior Center and is seeking funding to do the same at the High School.

8. **Upgrade water lines.**
   Water service is provided to nearly 100% of City residents. Underground infrastructure is many decades old in most cases. Action is needed to mitigate long term degradation of the system.
   Priority: High
   Action Type: Structural Projects
   Project Lead: DPW Engineering Division
   Supporting Resources: Other Department of Public Works Divisions and local contractors.
   Benefit: Pro-active avoidance of water main breaks. Strengthen existing brittle infrastructure to offer resilience to minor earthquakes and tremors. Maintain high water quality.
   Time Frame: Long-term. Complete 2021.
   Cost/Funding Options: Significant. $2-5 Million/year through 2021 for water main cleaning/lining thru RI Infrastructure Bank. Additional funding options include City Water Enterprise Fund, City Capital Budget.
   2016 Status: Major water improvement bond is being used to execute several water quality improvement projects. Some water main work completed within several City utilizing Federal ARRA funding in early 2010's and Rhode Island Infrastructure Bank program. More funds may be needed to complete program in the entire city.

Goal 2: Reduce property damage caused by natural disasters.

Strategies:

9. **Reduce poor drainage flooding at locations, as identified in Section 3.2c of this Plan update, and in the Southeast Drainage Area.**
   Nuisance street flooding occurs multiple times in most years at the same locations, and basement flooding is common in certain areas of the City, especially parts of Riverside east of Willet Avenue. Engineering projects have been identified to reduce these incidents, these include culvert upgrades and upsizing and construction of drainage swales.
   Priority: Medium
   Action Type: Structural Projects, Property Protection
   Project Lead: DPW Engineering Division
   Supporting Resources: Other Department of Public Works Divisions, City Management, City Capital Budget and Five-year Capital Improvement Program, and City Planning Dept.
   Benefit: Reduction in frequency and severity of minor flooding.
   Time Frame: Long-term
   Cost/Funding Options: $1-5 Million. Limited Capital Budget funding available.
   2016 Status: Drainageways and catch basins are maintained on scheduled basis. Capital project bond funding is a possibility to execute larger flood mitigation engineering projects.

10. Implement physical mitigation activities in repetitive loss areas.

Mitigation opportunities exist for residents of repetitive loss neighborhoods. These may include acquisition and elevation, or smaller-scale activities to allow residents to remain in their neighborhoods.

Priority: High
Action Type: Property Protection
Project Lead: East Providence EMA
Supporting Resources: RIEMA and FEMA's Unified Hazard Mitigation Grant Program.
Benefit: Increased awareness of flood hazard in these areas and of options to mitigate flooding.
Time Frame: Medium-term. Complete 2018.
Cost Estimate: Significant
Funding Options: Hazard Mitigation Assistance grants.
2016 Status: Two mitigation projects are in progress in the flood-prone State Street neighborhood as described in Section 3.3d of this Plan update. CRS participation has resulted in increased outreach regarding hazards; mitigation outreach will be increased during this planning cycle. A Flood Audit Task Force was developed to investigate the feasibility of providing residential flood mitigation audits for flood-prone properties; this initiative was getting underway as of late 2016.

11. Acquire or secure conservation easements on flood-zone and other environmentally sensitive properties.

Certain undeveloped properties, or portions of properties, in the SFHA or containing wetlands, may be best suited to remain or return to a natural state. These will be inventoried, with consideration given to these conditions as development proposals are presented.

Priority: Medium
Action Type: Natural Resource Protection, Property Protection
Project Lead: City's Planning Department
Supporting Resources: Waterfront Special Development District Commission, Conservation Commission, Law Enforcement, and DEM
Benefit: Protection of natural resources, reduction in imperious surface, mitigation of additional flooding due to intensified land use, avoid development in areas of high flood risk, natural treatment of stormwater runoff.
Time Frame: Long-term
Cost/Funding Options: Potential very occasional DEM funding, City Capital Budget, fee-simple acquisition.
2016 Status: City does not actively seek land acquisition or conservation easements but considers inquiries on a case-by-case basis. Subdivision and development plan review includes consideration of flood potential and of sensitive environments on-site and nearby.

12. Develop a recovery and reconstruction ordinance for post-disaster rebuilding.

In the wake of a major hazard incident, such as a hurricane, an emergency reconstruction ordinance that is specific to East Providence could expedite responsible rebuilding in affected areas. The State Department of Administration was crafting legislation for potential statewide implementation, if this is successful the City would take measures to ensure that is appropriately addresses conditions specific to our community.

Priority: Medium
Action Type: Planning and Prevention

Project Lead: City's Planning Department and DPW
Supporting Resources: East Providence EMA, Planning Board, City Council, and City Management, RI Dept. of Administration.
Benefit: Aid in streamlining the permitting process and expediting the return of the community to pre-incident conditions.
Time Frame: Long-term
Cost/Funding Options: Staff time availability
2016 Status: Research will be performed regarding similar communities' experiences with this type of initiative.

13. Perform emergency/disaster planning for the City's historic properties.

Provide disaster planning resources including templates for disaster planning for parties responsible for City-owned or affiliated historic properties and structures including the historic Crescent Park Looff Carousel.
Priority: Medium
Action Type: Planning and Prevention
Project Lead: East Providence EMA
Supporting Resources: Historic District Commission and the Rhode Island Office of Library and Information Services.
Benefit: Prepare for and potential mitigate damage to historic structures from natural hazards.
Time Frame: Medium-term.
Cost/Funding Options: Staff and volunteer time
2016 Status: State "Coordinated Statewide Emergency Preparedness" (COSTEP) program developed in early 2010s. COSTEP disaster plan template available.

14. Research and implement a backflow valve retrofit program.

Many homes in East Providence are prone to basement flooding and/or backflow into basements. Some communities have instituted successful cost-efficient programs to provide residents with backflow valves.
Priority: Low to medium
Action Type: Property Protection, Planning and Prevention.
Project Lead: East Providence EMA
Supporting Resources: DPW Engineering and Building Divisions, and programs in other communities.
Benefit: Reduction or prevention of backflow for participating residents.
Time Frame: Medium-term
Cost/Funding Options: Varies, $100-plus residential, $1,000's for most commercial applications. Funding sources for a City program will be investigated.
2016 Status: No activity at the current time. This initiative will be need to be researched and leadership polled to determine interest on the part of the City in implementation of such a program.

15. Conduct outreach regarding tree trimming.

Overhead utilities lines, streets and traffic, and property are all at risk from damage by falling, overgrown, or poorly-located trees. National Grid has existing tree trimming program. Provide City residents with information regarding maintenance of trees on private property that are

adjacent to power lines, may affect overhead utility connection to their property, or may otherwise cause property damage.

Priority: Medium
Action Type: Natural Resources Protection, Public Education and Awareness.
Project Lead: East Providence EMA
Supporting Resources: National Grid and DPW Parks Division
Benefit: Protection of overhead utilities, limit property damage especially during storm events.
Time Frame: Medium-term
Cost/Funding Options: Staff time.
2016 Status: Working with National Grid to determine rotating schedule of tree trimming activities and other line maintenance. Outreach to residents regarding trees on private property will be developed.

16. **Research coastal erosion mitigation options.**

Shoreline erosion resulting from high-than-normal tide events and from storm wave action is causing gradual incremental property loss in portions of Riverside and there is concern for structural damage in the long term based on expected climate events, and in the shorter-term in the event of a hurricane storm surge. Some individual property owners have undertaken their own shoreline protection measures and there is resident interest in a comprehensive strategy for erosion mitigation.

Priority: Medium
Action Type: Property Protection, Structural Projects.
Project Lead: East Providence EMA, Planning Department, DPW Engineering Division.
Supporting Resources: Coastal Resources Management Council
Benefit: Protection of property during major storm and high tide events.
Time Frame: Long-term
Cost/Funding Options: Significant. Funding options to be determined.
2016 Status: Preliminary discussions have taken place regarding this issue, but information is needed regarding mitigation options that may be available, along with the feasibility and regulatory ability to perform physical shoreline erosion mitigation measures on any large scale.

Goal 3: Increase public outreach on disaster preparedness, response and recovery.

Strategies:

17. **Increase resident participation in City-wide hazard mitigation priority identification.**

Inform population of natural hazard impacts through hazard mitigation plan meetings and/or workshops. Supplement public meetings with materials from State or Federal partners.

Priority: High
Action Type: Public Education and Awareness
Project Lead: East Providence EMA
Supporting Resources: IT Department (public outreach assistance) and RIEMA.
Benefit: Increased constituent awareness of natural hazards and government resources.
Time Frame: Long-term
Cost/Funding Options: Staff time
2016 Status: Greatest amount of input often comes in immediate wake of natural disasters. Research needed on best practices for pre-incident public engagement.

18. Increase outreach to commercial interests.

Provide hazard information to commercial interests via established information networks including the local Chamber of Commerce, realtor groups and other business organizations.

Priority: High

Action Type: Public Education and Awareness, Planning and Prevention

Project Lead: East Providence EMA

Supporting Resources: East Providence Area Chamber of Commerce and other local business organizations.

Benefit: Increase awareness of hazards and of resource availability.

Time Frame: Short-term. Complete in 2017.

Cost/Funding Options: Staff time availability

2016 Status: Increased outreach to Chamber of Commerce via social media accomplished, can provide additional outreach in person as practicable.

19. Increase hazard and hazard-mitigation communication in hard copy form and via the use of technology.

Use available resources including social media, City web platforms, and mass notification systems to conduct emergency management and hazard mitigation outreach. Develop hard copy mitigation content and designate locations for their distribution including at City Hall and other public facilities.

Priority: Medium

Action Type: Public Education and Awareness

Project Lead: East Providence EMA

Supporting Resources: IT Department, RIEMA, FEMA and NOAA resources.

Benefit: Increased constituent awareness and high level of constituent information service.

Time Frame: Short-term

Cost/Funding Options: Staff time

2016 Status: Recent strong success in expanded use of social media. Training underway on Code RED system. Outreach underway to increase resident mobile device enrollment. Hard copy hazard and hazard mitigation material under development.

20. Develop and distribute City specific earthquake damage mitigation information.

Little activity has occurred as region is generally not considered to be earthquake prone. Make information available to residents and business regarding basic earthquake preparation and property damage mitigation options.

Priority: Medium

Action Type: Public Education and Awareness

Project Lead: East Providence EMA

Supporting Resources: USGS and RIEMA

Benefit: Increased constituent awareness of earthquake risk, and of basic damage mitigation activities that may be easy to accomplish.

Time Frame: Long-term

Cost/Funding Options: Staff time availability

2016 Status: Awareness increased briefly with series of Eastern CT quakes in early 2015. Research is needed to develop basic information for constituents.

SECTION 6 – PLAN ADOPTION, IMPLEMENTATION, AND EVALUATION

6.1 - Plan Adoption

The adoption of this Hazard Mitigation Plan update follows procedures per guidance from FEMA. Upon completion of the Draft Hazard Mitigation Plan update, it is forwarded to RIEMA for review and comment. Upon return to the City, the recommended adjustments are made the Draft Plan is re-submitted to RIEMA, who will forward the revised draft to FEMA Region I for review and any additional recommendations for revision or correction. Finally, upon FEMA approval, the Plan is forwarded to the East Providence Planning Board, with request for a recommendation to the Council to adopt the Plan as the official Hazard Mitigation Plan for the City of East Providence.

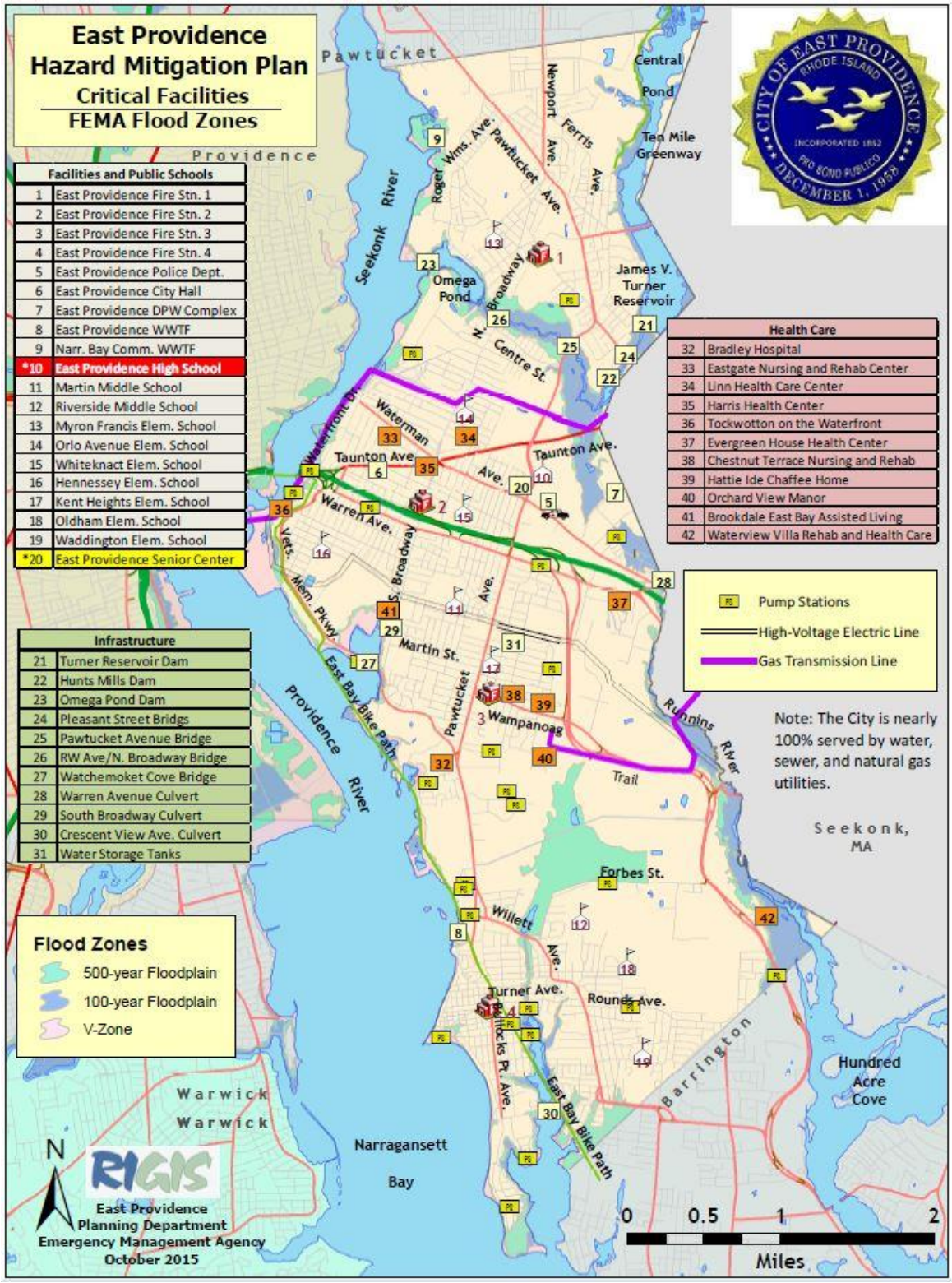
The completion of the formal FEMA approval and City adoption process aids in improving our status as a CRS jurisdiction, and assists the City in applying for available mitigation grant funding. Documentation of this process, including a timeline of plan submissions, revisions, and City Planning Board and Council activity, will be found in Appendix G along with evidence of FEMA plan approval and City Council plan adoption.

6.2 - Plan Implementation and Evaluation

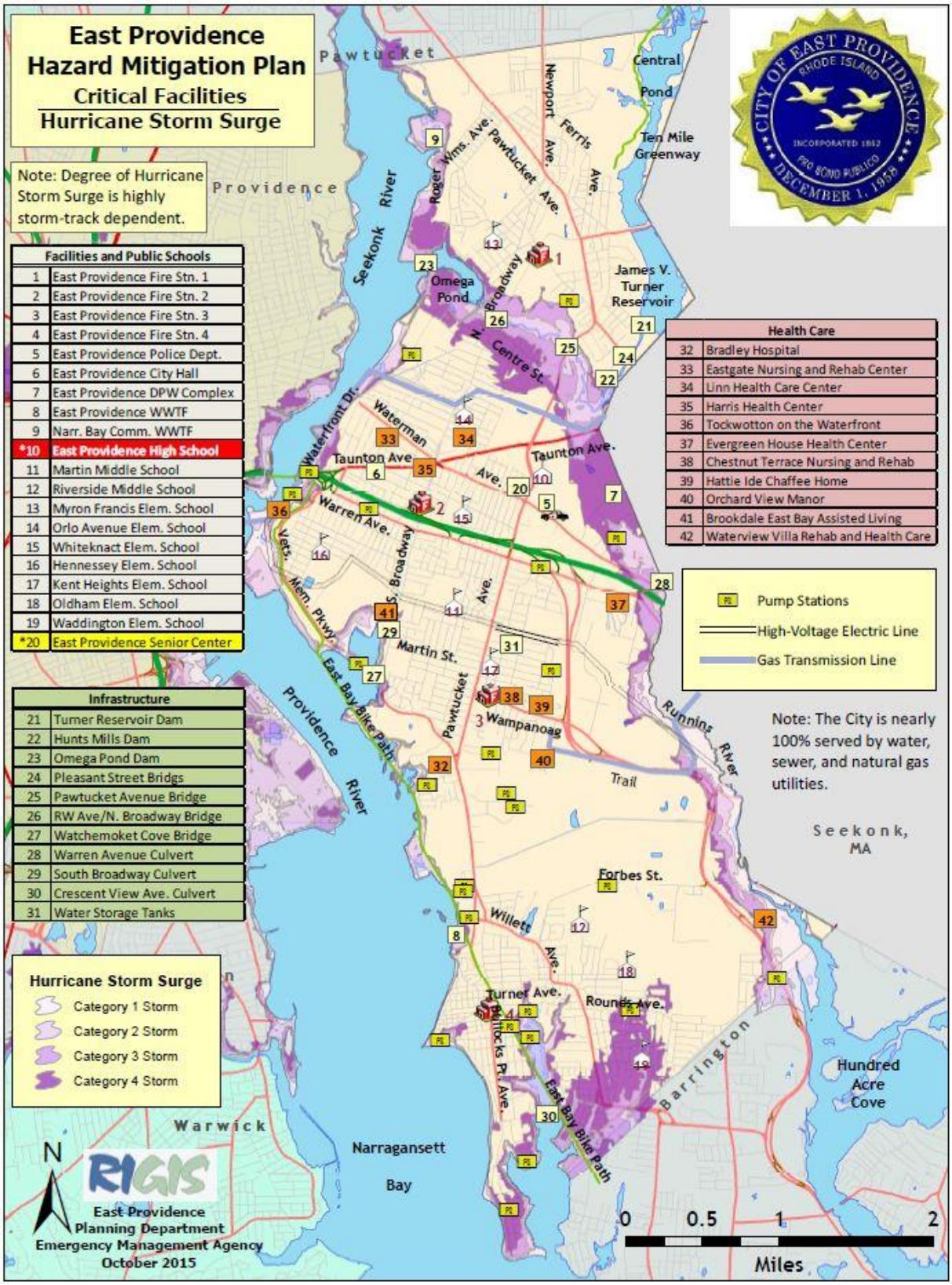
In accordance with common practice and to remain realistic with plan implementation expectations, relative time frames have been assigned to the mitigation strategies in Section 5 of this Plan update. These were assigned with consideration of the existing state of the City late in 2015. Immediate needs were prioritized for earlier implementation, with longer-term planning initiatives assigned a time frame further into the future. The concurrent development of this Plan update and the City's Comprehensive Plan update allowed for optimal integration of these planning mechanisms and strong coordination with other planners during this process.

Over time, priorities will shift based on factors including successful completion of projects, new natural hazard incidents and/or disasters, changes in City leadership, adjustments in the economy, changes in development, and more. East Providence Emergency Management will work with the Planning Department, City Management and Incident Command Staff, and others to track and update our mitigation strategies and overall action plan. As noted in Section 2, this Plan update will be made available to the public on hard copy in the Planning Department and at the City's libraries, and online via the City of East Providence's EMA webpage; available at http://www.eastprovidence.com/ema. Constituents are always invited to submit comments by e-mail or phone. Implementation progress on the action plan will be reported to City officials and to RIEMA annually. The City's EMA webpage also features information on upcoming meetings and plan updates, and is updated frequently for general Emergency Management information including agency activities, preparedness resources, and forecasts for impact weather events.

APPENDIX A. Critical Facilities Risk Mapping



Map A-1. East Providence Critical Facilities with Flood Zones



Map A-2. East Providence Critical Facilities with Hurricane Inundation Zones

APPENDIX B. Technical and Financial Assistance Resources

City Federal Aid Resource

East Providence Community Development Division
Community Development Block Grant Program
145 Taunton Avenue
East Providence, RI 02914
Phone: (401) 435-7500, Ext 11160
Contact: David Bachrach, Community Dev. Coordinator
http://www.eastprovidence.com/content/9457/9923/9991.aspx

State Resources

Coastal Resources Management Council
Stedman Government Center
4808 Tower Hill Road
Wakefield, RI 2879
Phone: (401) 783-3370
http://www.crmc.ri.gov

Department of Administration
Division of Planning
One Capitol Hill, Third Floor
Providence, Rhode Island 02908
Phone: (401) 222-7901
http://www.planning.ri.gov

Rhode Island Department of Emergency Management
235 Promenade Street
Providence, RI 02908-5767
401-222-6800
http://www.dem.ri.gov/

DEM: Division of Parks and Recreation
1100 Tower Hill Road
North Kingstown, RI 02852
Phone: (401) 667-6200
http://www.riparks.com/

Rhode Island Department of Transportation
Two Capitol Hill
Providence, RI 02903
Phone: (401) 222-2450
http://www.dot.ri.gov/

Public Utilities Commission
89 Jefferson Blvd.
Warwick, RI 02888
Phone: (401) 941-4500
http://www.ripuc.org/

Rhode Island Builders Association
450 Veterans Memorial Pkwy. #301
East Providence, RI 02914
Phone: (401) 438-7400
https://ribuilders.org/

State of Rhode Island Building Code Commission
One Capitol Hill, Second Floor
Providence, RI 2903
Phone: (401) 222-1129
http://www.ribcc.ri.gov/

Rhode Island Department of Business Regulations
1511 Pontiac Avenue
Cranston, RI 02920
Phone: (401) 462-9500
http://www.dbr.state.ri.us/

Rhode Island Emergency Management Agency
645 New London Avenue
Cranston, RI 02920
Phone: (401) 946-9996
http://www.riema.ri.gov/

Rhode Island State Fire Marshal's Office
1951 Smith Street
Providence, RI 02904
(401) 383-7717
http://www.fire-marshal.ri.gov/

Rhode Island National Flood Insurance Program
c/o RIEMA, 645 New London Avenue
Cranston, RI 02920
http://www.riema.ri.gov/
Phone: (401) 946-9996

Federal Resources

Department of Housing and Urban Development
Providence Field Office
33 Broad Street, 4th Floor
Providence, RI 02903
(401) 277-8300
http://portal.hud.gov/portal/page/portal/HUD/states/rhode_island

Department of the Interior
National Park Service
Rivers, Trails, and Conservation Assistance Program
Northeast Region Office
15 State Street
Boston, MA 02109
Phone: (617) 223-5164
http://www.nps.gov/orgs/rtca/index.htm

U.S. Economic Development Administration
Philadelphia (Northeast U.S.) Regional Office
The Curtis Center
601 Walnut St., Suite 140 South
Philadelphia, PA 19106-3233
(215) 597-4603
http://www.eda.gov

Federal Emergency Management Agency (FEMA)
Region I Office
99 High St.
Boston, MA 02110
Phone: (877) 336-2734
http://www.fema.gov/region-i-ct-me-ma-nh-ri-vt

Natural Resources Conservation Service
Rhode Island State Office/Service Center
60 Quaker Lane, Suite 40
Warwick, RI 02886-0111
Phone: (401) 828-1300, x 1
http://www.ri.nrcs.usda.gov/

U.S. Small Business Administration
Rhode Island District Office
380 Westminster Street, Room 511
Providence, RI 02903
(401) 528-4561
https://www.sba.gov/offices/district/ri/providence

NOAA- National Centers for Environmental Information
(Formerly the National Climate Data Center)
Center for Weather and Climate
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
http://www.ncdc.noaa.gov/

U.S. Army Corps of Engineers-
New England District
696 Virginia Road
Concord, MA 01742-2718
Phone: (978) 318-8111
http://www.nae.usace.army.mil/

U.S. Fish and Wildlife Service
New England Field Office
70 Commercial St., Suite 300
Concord, NH 03301-5087
(603) 223-2541
http://www.fws.gov/newengland/

Grants.gov
200 Independence Avenue, S.W.
HHS Building
Washington, DC 20201
(800) 518-4726
http://www.grants.gov
www.hhs.gov

FEMA Emergency Management Institute
16825 S. Seton Ave.
Emmitsburg, MD 21727
(301) 447-1000
http://www.training.fema.gov/

National Weather Service Forecast Office
Northeast River Forecast Center
Forecast Office
445 Myles Standish Boulevard
Taunton, MA 02780
Phone: (508) 823-2262
http://www.weather.gov/box/
http://www.weather.gov/nerfc/

Non-Governmental Organization

Northeast States Emergency Consortium
1 West Water Street
Wakefield, MA 01880
(781) 224-9876
http://nesec.org/

Appendix B (continued) – Technical and Financial Assistance Resources – Support Services

Federal Emergency Management Agency:

National Flood Insurance Program
All of Rhode Island's 39 municipalities participate in the NFIP. Flood insurance is made available to residents in exchange for community compliance with minimum floodplain management regulations. Communities participating in the NFIP must:

- Adopt the latest Flood Insurance Rate Maps;
- Require that all new construction or substantial improvement to existing structures in the flood hazard area be elevated or (if nonresidential) flood proofed to the identified flood level on the maps; and
- Require design techniques to minimize flood damage for structures being built in high hazard areas.

Coverage for land subsidence, sewer backup and water seepage is also available subject to the conditions outlined in the NFIP standard policy. Since homeowners' insurance does not cover flooding, a community's participation in the NFIP is vital to protecting property in the floodplain as well as being essential to ensure that federally backed mortgages and loans can be used to finance flood prone property.

If a community participating in NFIP's CRS program performs activities that include maintaining records for floodplain development, publicizing the flood hazard, improving data and floodplain management planning, then the flood insurance premiums paid by policyholders in the community will be reduced by 5 to 45 percent, depending on the number of mitigation activities performed from an approved list. Developing and maintaining this Hazard Mitigation Plan is among the activities that gain credit under the CRS.

For further information contact the State of Rhode Island Floodplain Manager at RIEMA, (401) 946-9996, or FEMA Region I at (877) 336-2734.

Flood Mitigation Assistance Program

Two programs that have been authorized under the National Flood Insurance Reform Act of 1994 include the Flood Mitigation Assistance (FMA) program and a provision for increased cost of compliance (ICC) coverage. FMA makes grants available on a pre-disaster basis for flood mitigation planning and activities, including acquisition, relocation and retrofitting of structures. FMA grants for mitigation projects will be available only to those communities with approved hazard mitigation plans. The program may fund up to 75 percent of the total cost of the proposed project, with a minimum of 25 percent of the cost coming from the community. A minimum of half the community share must be cash or "hard match." There are limits on the frequency of grants and the amount of funding that can be allocated to a state or community in any 5-year period. ICC coverage has recently been implemented for all new NFIP policies and renewals and is intended to be "mitigation insurance" to allow homeowners whose structures have been repeatedly or substantially damaged to cover the cost of elevation and design requirements for rebuilding with their flood insurance claim up to a maximum of $30,000. Each state has the discretion to award funds to communities or to state government agencies.

RIEMA receives varying amounts to award as grants from FEMA annually plus additional smaller amounts for planning and technical assistance. In order to be eligible to apply for these grants as a "sub-grantee," communities must have a FEMA-approved flood mitigation plan or a multi-hazard mitigation plan.

For further information contact the State of Rhode Island Hazard Mitigation Officer at RIEMA, (401) 946-9996.

Hazard Mitigation Grant Program (HMGP):

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

For further information contact the State of Rhode Island Hazard Mitigation Officer at RIEMA, (401) 946-9996 or FEMA Region 1 (877) 336-2734.

NOAA – National Weather Service and Northeast River Forecast Center (NERFC):

The National Weather Service (NWS) Forecast Office that serves most of southern New England, located in Taunton, MA, provides forecasts, warnings and local climate information. The NWS has provided customized meteorological support to RIEMA during times of hazardous RIEMA shares with municipalities via conference call. The Northeast River Forecast Center provides general hydrologic forecasts for the northeast region which extends into New York and Pennsylvania, and provides specific forecasts for some regional river gages. The City's Deputy EMA Director also provides meteorological support as conditions warrant and as requested by City staff.

For further information contact National Weather Service at (508) 823-2262.

NOAA – National Centers for Environmental Information:

This agency, formerly known as the NCDC, is the premier source for climate data and information. Their website provides public access to the nation's climate and historical weather data and information including climate reports, drought information, and climate datasets for thousands of locations.

American Red Cross (ARC):

The American Red Cross chapter of Rhode Island public education materials and conducts training programs and seminars. The agency provides shelter assistance to communities across the state on a regional basis and works with RIEMA in this capacity. The Red Cross also has supply emergency clean-up kits in flood disasters. East Providence High School has been approved as a Red Cross Regional Shelter for the upper East Bay area.

U.S. Army Corps of Engineers (USACE):

The Army Corps New England District manages major Corps engineering projects in the region and performs functions including:

- Environmental restoration and stewardship;
- Flood risk management;
- Natural resource and recreation management;
- Streambank and shoreline protection;
- Navigation improvements and maintenance;
- Disaster assistance;
- Regulatory/Permitting program; and
- Engineering and construction management support to other agencies.

The Army Corps worked extensively with the City, DEM, and engineering consultants on the design and construction of the three fish ladders along the Ten Mile River.

The ACOE Update Report for Rhode Island is an excellent source of information on the progress of Corps projects including mitigation activities in the state. This newsletter is available on-line at http://www.nae.usace.army.mil/Media/StateUpdateReports.aspx.

Rhode Island Department of Environmental Management:

Rhode Island DEM has produces and maintained the Rhode Island Stormwater Design and Installation Standards Manual. A central component of the manual is encouragement of the use of low impact development (LID) techniques as the primary strategy to control and reduce stormwater impacts. DEM's Stormwater Guidance website, http://www.dem.ri.gov/programs/benviron/water/permits/ripdes/stwater/t4guide/desman.htm, contains the latest version of the stormwater manual along with LID guidance documents, soil erosion and sediment control guidance, and permitting guidance.

DEM's Division of Planning and Development is responsible for functions ranging from land acquisition programs, open space and recreation grant funding, and much more. Information on these programs is available on-line at http://www.dem.ri.gov/programs/bpoladm/plandev/index.htm.

For general information on DEM programs, call (401) 222-6800 or visit http://www.dem.ri.gov/.

Rhode Island Emergency Management Agency:

In addition to administering Federal grants and performing a myriad of other functions as the state's emergency management agency, RIEMA has developed the extremely useful Rhode Island Floodplain Mapping Tool. This enables a quick close-up look at flood zones anywhere in Rhode Island and includes, in addition to flood zone map layers, very clear and up-to-date aerial photography. The City's floodplain program uses this resource extensively along with the FEMA flood maps in performing flood zone determinations. Access the floodplain mapping tool on the RIEMA homepage, http://www.riema.ri.gov/.

Rhode Island Coastal Resources Management Council:

CMRC is the regulatory management agency for the state's coastal zone. STORMTOOLS has been developed as part of the agency's Shoreline Change Special Area Management Plan. This program displays coastal flood zones statewide, the depth of flooding at a given locations from the 100-year flood, and maps out projected levels of sea level rise. A link to this product and a tutorial for its use is available at http://www.beachsamp.org/resources/stormtools/.

Rhode Island Department of Transportation (RIDOT):

In support of the DEM stormwater manual, RIDOT maintains extensive information on stormwater management on their Rhode Island Pollutant Discharge Elimination System (RIPDES) Program, which can be found at http://www.dem.ri.gov/programs/benviron/water/permits/ripdes/stwater/index.htm.

Northeast States Emergency Consortium (NESEC):

The NESEC is a FEMA-supported non-profit emergency management organization serving the six New England states plus New York and New Jersey. The Consortium offers free technical assistance on mapping and disaster modeling to interested communities across the Northeast and is a clearinghouse of information on hazards and hazard mitigation in the region. Their website also includes links to an impressive collection of national-scale real-time hazard maps including earthquake, hurricane, wildfire and lightning detection maps. Their hazards webpage can be found at http://nesec.org/northeast-hazards/.

NOAA Office for Coastal Management- "Digital Coast":

New for 2015 is this agency's "Coastal Flood Exposure Mapper." This mapping tool contains layers for flood zones, storm surge by hurricane, projected levels of sea level rise, selected population data by census block, and generalized land use. Link to this product at http://coast.noaa.gov/digitalcoast/tools/flood-exposure.

APPENDIX C. Evidence of Public Outreach

Public Meetings Summary – August 21, 2014 and October 20, 2015

These meetings, designed to educate attendees on natural hazard mitigation and gather public input, was conducted as a come-and-go information session. The City's flood maps, including new preliminary maps for a portion of the City, were also available for viewing. Attendance was low, but advice was requested by residents and offered by Staff regarding their properties' locations with respect to the floodplain, and also on retrofitting homes that are close to floodplains and/or experience basement flooding. The communication of hazard information and real-time City emergency information was a common theme among the attendees and also comes up in phone conversations with residents during business hours.

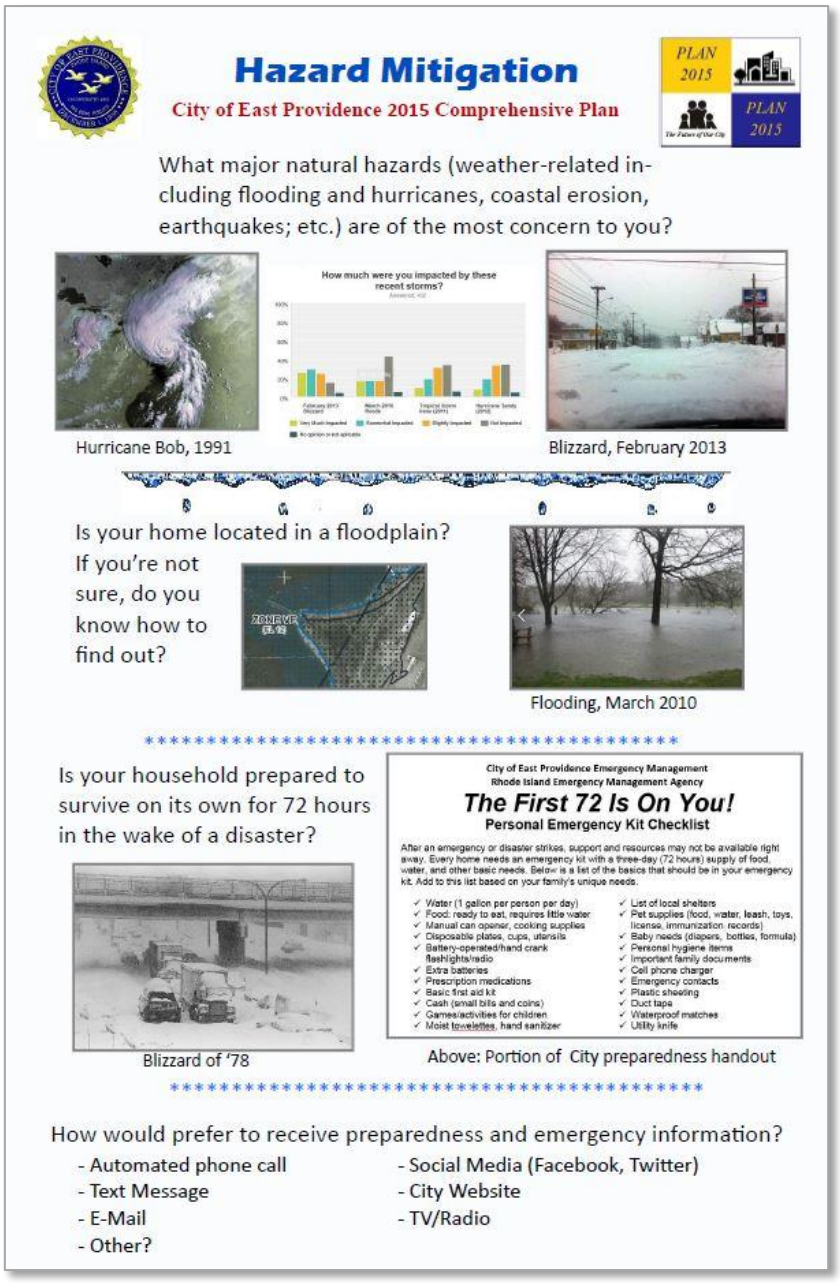


Figure A-1. Hazard Mitigation 24x36" poster board displayed at Comprehensive Plan and Hazard Mitigation plan meetings.

This process revealed that, while social media notices reach a growing constituency and our social media outreach has been very well received, the print media remains very relevant when it comes to getting information out to local residents. We will continue to utilize the local print media resources, as well as the web and social media in our messaging to the public.

August 21, 2014 Hazard Mitigation Plan Meeting Publicity – Print Media

AUGUST 2014
VOLUME 10, NO. 8
FREE
THE East Providence REPORTER™
Serving the Community and Businesses of East Providence

East Providence Hazard Mitigation Plan Public Meeting Announced

A Public Meeting will be held by the East Providence Planning Department / Emergency Management Agency on Thursday, August 21, 2014 at City Hall, Room A, 145 Taunton Avenue, to receive public input regarding the East Providence Hazard Mitigation Plan 2015 update. This will be a come-and-go meeting, with interested residents and business owners invited to stop by any time from 5:00 pm to 8:00 pm. The Hazard Mitigation Plan details natural hazards that are a threat to the City and outlines actions that the City can take to lessen these hazards. An approved Hazard Mitigation Plan is required in order for the City to be eligible for various FEMA grants, and for City participation in the National Flood Insurance Program.

The currently-valid 2010 Hazard Mitigation Plan is available for review and inspection in the Department of Planning, Room 201, City Hall, 145 Taunton Avenue, East Providence, RI (Mondays through Fridays 8:00 am to 4:00 pm), and is also posted on the Emergency Management page of the City's website, http://www.eastprovidence.com, under "City Departments Online.

The East Providence Emergency Management Agency (EMA), part of the City's Planning Department, plans and prepares for natural and manmade disasters. The agency educates the public, provides weather support for the City, and serves as the City's floodplain resource. City EMA works with closely with City officials, and other local, state and federal agencies including the RI Department of Health, RI Emergency Management Agency, and FEMA before, during and after emergencies.

The East Providence Emergency Management webpage can be found on the City's website, http://www.eastprovidence.com , under "City Departments online". Facebook users can find us on the "EastProvEMA" Facebook Page.

East Providence Emergency Operations Center Upgraded

The East Providence Emergency Management Agency is pleased to announce that a significant upgrade to the City's Emergency Operations Center (EOC) has been completed. The EOC is the City's operational headquarters during major weather events and other emergency incidents, and has been used to run operations during Tropical Storm Irene, Hurricane Sandy, and the February 2013 Blizzard, but computer and communications equipment has been in need of updating.

The EOC upgrade received funding support from the East Providence Police Department in combination with a grant from the Federal Emergency Management Agency (FEMA). The facility now has completely up-to-date computer and communications equipment and is ready to go when the next major weather event or incident occurs. East Providence Emergency Management is grateful to City Police, Fire, Information Technology and Planning Departments for their assistance with this worthwhile project, which will enhance the emergency operations capability in East Providence.

August 21, 2014 Hazard Mitigation Plan Meeting Publicity – Print Media (continued)

The East Providence Post

eastbayri.com

THURSDAY, AUGUST 14, 2014 VOL. 60, NO. 33 FREE

PAGE 3

East Providence hazard mitigation plan public meeting announced

Event is scheduled for August 21 in City Hall

A public meeting will be held by the East Providence Planning Department/Emergency Management Agency on Thursday, Aug. 21, at City Hall, Room A, 145 Taunton Ave., to receive public input regarding the East Providence Hazard Mitigation Plan 2015 update.

This will be a come-and-go meeting, with interested residents and business owners invited to stop by any time from 5 to 8 p.m. The Hazard Mitigation Plan details natural hazards that are a threat to the city and outlines actions that the city can take to lessen these hazards. An approved Hazard Mitigation Plan is required in order for the city to be eligible for various FEMA grants, and for city participation in the National Flood Insurance Program.

The currently-valid 2010 Hazard Mitigation Plan is available for review and inspection in the Department of Planning, Room 201, City Hall, Mondays through Fridays 8 a.m. to 4 p.m., and is also posted on the Emergency Management page of the city's website, eastprovidence.com, under "City Departments Online".

The city's FEMA floodplain maps for the Ten Mile River area that are up for review, will also be available for viewing and any questions at this meeting.

The East Providence Emergency Management Agency (EMA), part of the city's Planning Department, plans and prepares for natural and manmade diesasters. The agency educates the public, provides weather support for the city, and serves as the city's floodplain resource. City EMA works closely with city officials and other local, state and federal agencies including the R.I. Department of Health, R.I. Emergency Management Agency and FEMA to prepare for, respond to, and recover from emergencies.

Facebook users can find the EPEMA on the "EastProvEMA" Facebook Page.

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LEGAL NOTICE

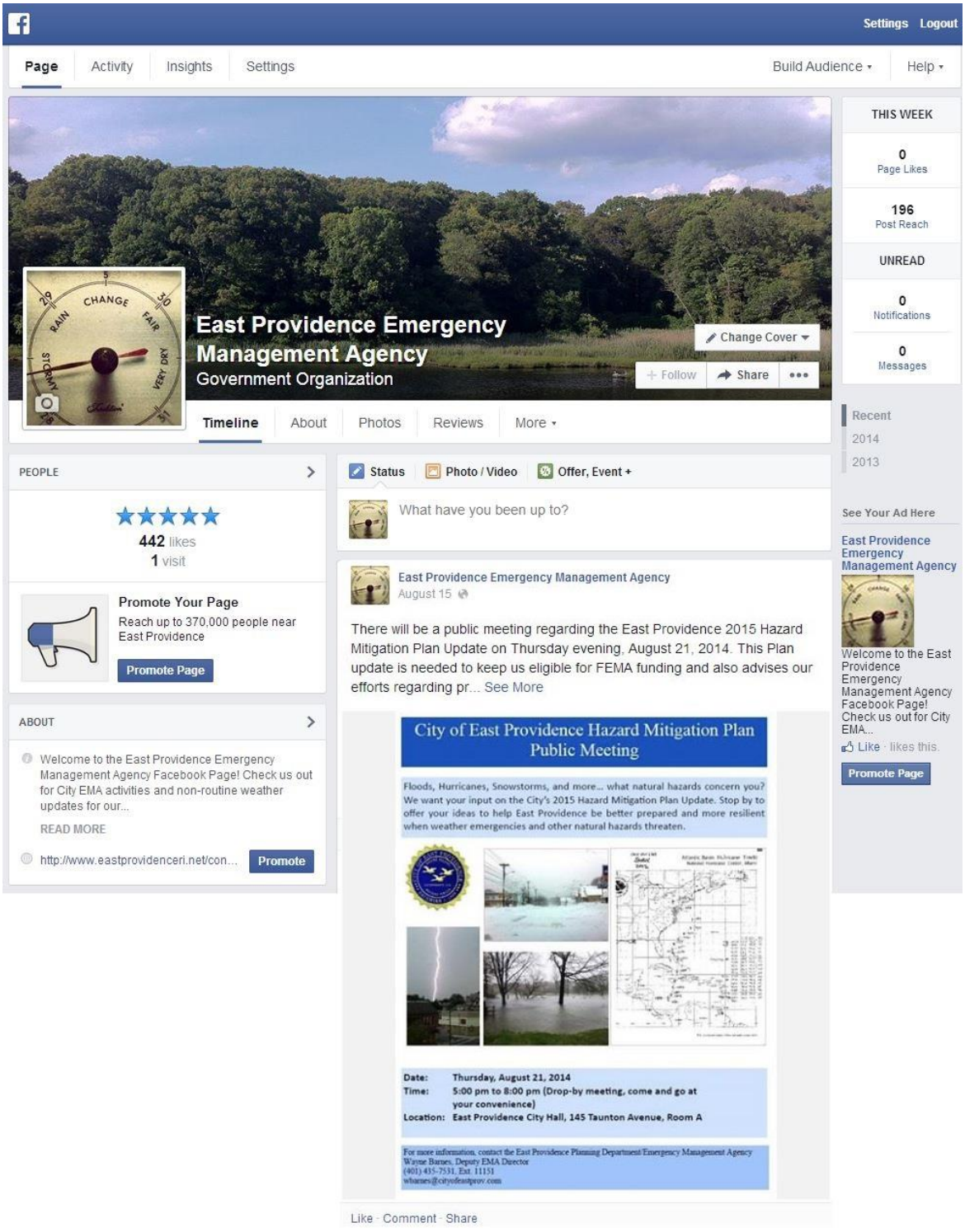
EMERGENCY MANAGEMENT AGENCY
PUBLIC MEETING
2015 Hazard Mitigation Plan Update

A Public Meeting will be held by the East Providence Planning Department/ Emergency Management Agency on Thursday, August 21, 2014 at City Hall, Room A, 145 Taunton Avenue, East Providence to receive public input regarding the East Providence Hazard Mitigation Plan 2015 update. This will be a come-and-go meeting with staff available from 5:00 to 8:00 pm. The Hazard Mitigation Plan details natural hazards that are a threat to the City and outlines actions that the City can take to lessen these hazards. An approved Hazard Mitigation Plan is required in order for the City to be eligible for various FEMA grants, and for City participation in the National Flood Insurahce Program.

The currently-valid 2010 Hazard Mitigation Plan is available for review and inspection in the Department of Planning, Room 201, City Hall, 145 Taunton Avenue, East Providence, RI (Mondays through Fridays 8:00 am to 4:00 pm), and is also posted on the Emergency Management page of the City's website, http://www.eastprovidence.com, under "City Departments Online".

"If communications assistance is needed or any other accommodations to ensure equal participation please contact the City Clerk's Office at 435-7590.

August 21, 2014 Hazard Mitigation Plan Meeting Publicity – Social Media



October 20, 2015 Hazard Mitigation Plan Meeting Publicity – Print Media

Planning holds Hazard Mitigation Plan, Flood Map public meeting

Seeking input regarding 2015 plan update

To The Post

A Public Meeting will be held by the East Providence Planning Department/Emergency Management Agency on Tuesday, Oct. 20, at City Hall, Room A, 145 Taunton Ave., to receive public input regarding the East Providence Hazard Mitigation Plan 2015 update.

This will be a come-and-go meeting, with interested residents and business owners invited to stop by any time from 5 to 7:15 p.m.

The Hazard Mitigation Plan details natural hazards that are a threat to the City and outlines actions that the City can take to lessen these hazards. An approved Hazard Mitigation Plan is required in order for the City to be eligible for various FEMA grants, and for City participation in the National Flood Insurance Program.

The currently-valid 2010 Hazard Mitigation Plan is available for review and inspection in the Department of Planning, Room 201, City Hall, Mondays through Fridays 8 a.m. to 4 p.m., and is also posted on the Emergency Management page of the City's website, eastprovidence.com, under "City Departments Online".

The City's FEMA Floodplain Maps, including newly updated maps for the Ten Mile River area that are now in effect, will also be available for viewing and any questions at this meeting.

The East Providence Emergency Management Agency (EMA), part of the City's Planning Department, plans and prepares for natural and manmade disasters. The agency educates the public, provides weather support for the City, and serves as the City's floodplain resource. City EMA works closely with City officials and other local, state and federal agencies including the RI Department of Health, RI Emergency Management Agency, and FEMA to prepare for, respond to, and recover from emergencies.

The East Providence Emergency Management webpage can be found on the City's website, eastprovidence.com, under "City Departments online." Facebook and Twitter users can find us at EastProvEMA.

City EMA provides floodplain information

The East Providence Emergency Management Agency, located in the Planning Department in Room 201 (second floor) of City Hall, reminds residents it provides information regarding FEMA flood zones and the National Flood Insurance Program.

Information can be found at the E.P. Emergency Management webpage eastprovidence.com/ema or the flood protection webpage at eastprovidence.com/flood. On these pages, property owners can find a wealth of information on the city's Flood Insurance Rate Map, the National Flood Insurance Program, local flood hazard areas, floodplain functions, flood safety tips and more.

The EMA office also responds to individual questions including whether property and/or building is in the floodplain, the local base flood elevation and if possible the depth of the local base flood where applicable. Also provided upon request is assistance to land owners with reading the FEMA flood maps, whether or not it is required to purchase flood insurance, how to acquire an elevation certificate for the property, ideas for protecting the property from flooding and recent history and type of flooding in your neighborhood.

Contact East Providence Emergency Management by phone at 401-435-7531, Ext. 11151, or by e-mailing wbarnes@cityofeastprov.com, at Facebook or Twitter at EastProvEMA.

Rec Department announces fall program schedule

The East Providence Recreation Department has announced its 2015 Fall Program Schedule. Events take place for the most part at the Rec Center located on 100 Bullocks Point Ave. Activities and center membership are limited to East Providence residents. Registration is currently. Register by calling 433-6360. Except where noted, programs begin the week of September 28. Fees apply where noted. Participants must obtain center membership: 1 year: Ages 6-17, $25; Age 18+, $60; Age 55+, $25.

PRE-SCHOOL

Dance: Ages 3-5 / September 30-December 9 Ballet: Wednesday, 4:30 - 5:15 p.m., $25 per child; Tap: Wednesday, 5:30 – 6:15 p.m., $25 per child

Stay and Play Time: Age 3-5 / Monday & Thursday 11 a.m. -noon / September 28 - December17 (no stay & play October12 or November 26) Open gym time for parents & preschoolers at the Rec Center. We supply some toys and balls (or you can bring your own) to play with in the gym. Parents must be in attendance and supervise their children.

YOUTH

LEGAL NOTICE

PLANNING DEPARTMENT
EMERGENCY MANAGEMENT AGENCY
PUBLIC MEETING
2015 Hazard Mitigation Plan & New Flood Maps

A Public Meeting will be held by the East Providence Planning Department/ Emergency Management Agency on Tuesday, October 20, 2015 at City Hall, Room A, 145 Taunton Avenue, East Providence to receive public input regarding the East Providence Hazard Mitigation Plan 2015 update. This will be a come-and-go meeting with staff available from 5:00 to 7:15 pm. The Hazard Mitigation Plan details natural hazards that are a threat to the City and outlines actions that the City can take to lessen these hazards. An approved Hazard Mitigation Plan is required in order for the City to be eligible for various FEMA grants, and for City participation in the National Flood Insurance Program. FEMA Flood Maps including new maps for the Ten Mile River area will also be available for viewing.

The currently-valid 2010 Hazard Mitigation Plan and all of the City's flood map panels are available for review and inspection in the Department of Planning, Room 201, City Hall, 145 Taunton Avenue, East Providence, RI (Mondays through Fridays 8:00 am to 4:00 pm). The Plan is posted on the Emergency Management page of the City's website, http://www.eastprovidence.com, found under the "Departments" header.

"If communications assistance is needed or any other accommodations to ensure equal participation please contact the City Clerk's Office at 435-7590.

October 15, 2015

October 20, 2015 Hazard Mitigation Plan Meeting Publicity – Print Media (continued)

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East Providence Hazard Mitigation Plan and Flood Map Public Meeting

Posted Wednesday, October 7, 2015 1:34 pm

A Public Meeting will be held by the East Providence Planning Department / Emergency Management Agency on Tuesday, October 20, 2015 at City Hall, Room A, 145 Taunton Avenue, to receive public input regarding the East Providence Hazard Mitigation Plan 2015 update. This will be a come-and-go meeting, with interested residents and business owners invited to stop by any time from 5:00 pm to 7:15 pm. The Hazard Mitigation Plan details natural hazards that are a threat to the City and outlines actions that the City can take to lessen these hazards. An approved Hazard Mitigation Plan is required in order for the City to be eligible for various FEMA grants, and for City participation in the National Flood Insurance Program.

The currently-valid 2010 Hazard Mitigation Plan is available for review and inspection in the Department of Planning, Room 201, City Hall, 145 Taunton Avenue, East Providence, RI (Mondays through Fridays 8:00 am to 4:00 pm), and is also posted on the Emergency Management page of the City's website, http://www.eastprovidence.com, under "City Departments Online".

The City's FEMA Floodplain Maps, including newly updated maps for the Ten Mile River area that are now in effect, will also be available for viewing and any questions at this meeting.

The East Providence Emergency Management Agency (EMA), part of the City's Planning Department, plans and prepares for natural and manmade disasters. The agency educates the public, provides weather support for the City, and serves as the City's floodplain resource. City EMA works closely with City officials and other local, state and federal agencies including the RI Department of Health, RI Emergency Management Agency, and FEMA to prepare for, respond to, and recover from emergencies.

The East Providence Emergency Management webpage can be found on the City's website, http://www.eastprovidence.com, under "City Departments online". Facebook and Twitter users can find us at EastProvEMA.

Find us on facebook. Follow us on Twitter

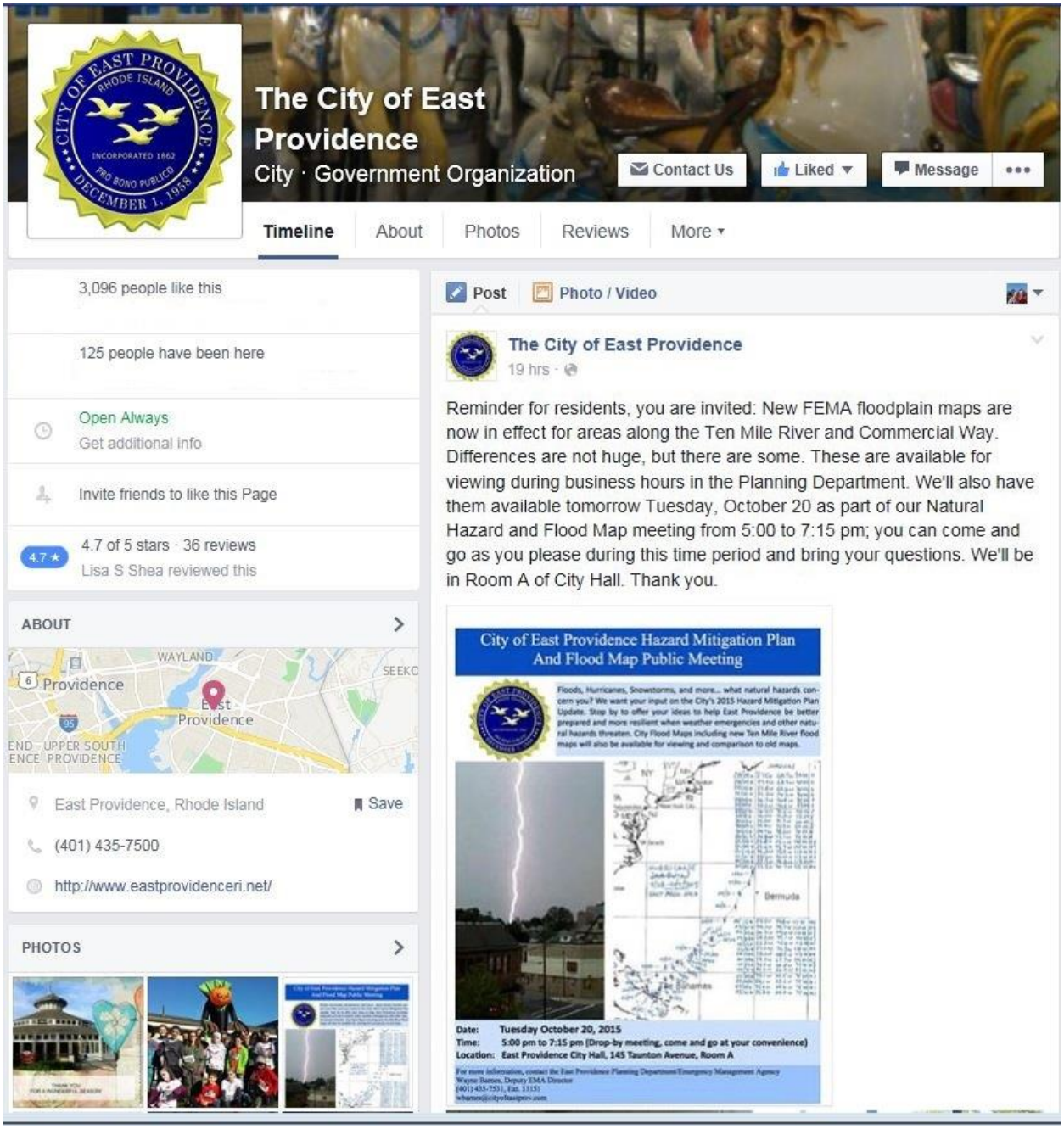
SHARE!

Great Halloween House in Riverside 2 days ago
Rumford's Tony Pirruccello-McClellan: at Moses Brown, "finding science in anything" Tuesday, September 29
EPLAC Welcomes All to First Meeting Sept. 30th Monday, September 28
Even Parents Have Fun on Townie Pride Night at Pierce! Saturday, September 26
Major Rift between Rose and EP School Committee: Schools HR Director - $600,000 or $72,000? Wednesday, September 23
More ...

October 20, 2015 Hazard Mitigation Plan Meeting Publicity- Social Media

October 20, 2015 Hazard Mitigation Plan Meeting Publicity – Social Media (continued)

(This notice also appeared on multiple occasions on the City's EMA Facebook webpage)



Hazard Mitigation Plan Public Meeting Sign-in Sheets – August 21, 2014

City of East Providence
Planning Department
Emergency Management Agency

Hazard Mitigation Plan – Public Meeting
August 21, 2014

Name	Address	E-Mail
Russell Richards	1046 Bullocks Pt Ave Riverside, RI 02915	RJRCPA2000 @aol.com
Tony Feola	School Dept	AFeola@epschools RI. com
Patricia Blenkiron	84 Algonquin Rd Rumford, RI	pblenkiron@cox.net

October 20, 2015

City of East Providence
Planning Department
Emergency Management Agency

Hazard Mitigation Plan – Public Meeting October 20, 2015

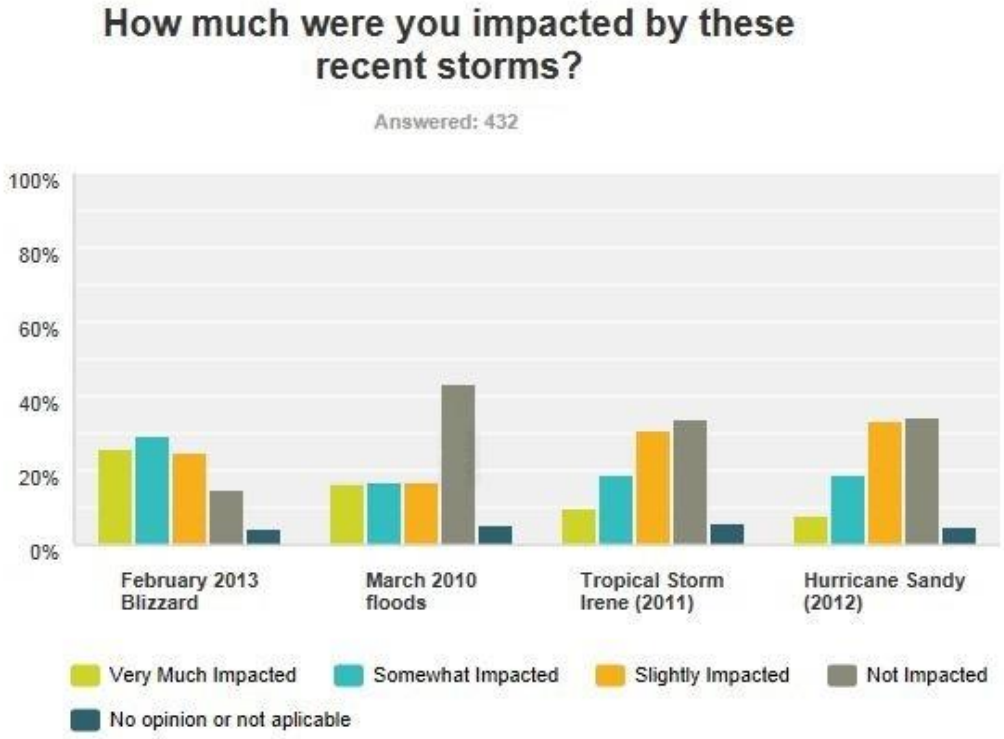
Constance Baker
101 Frederick St
Rumford

EDWARD WHEELER 58 TRYON AVE.
INTREST IN 33-39 REDLAND AVE.

Comprehensive Plan Survey

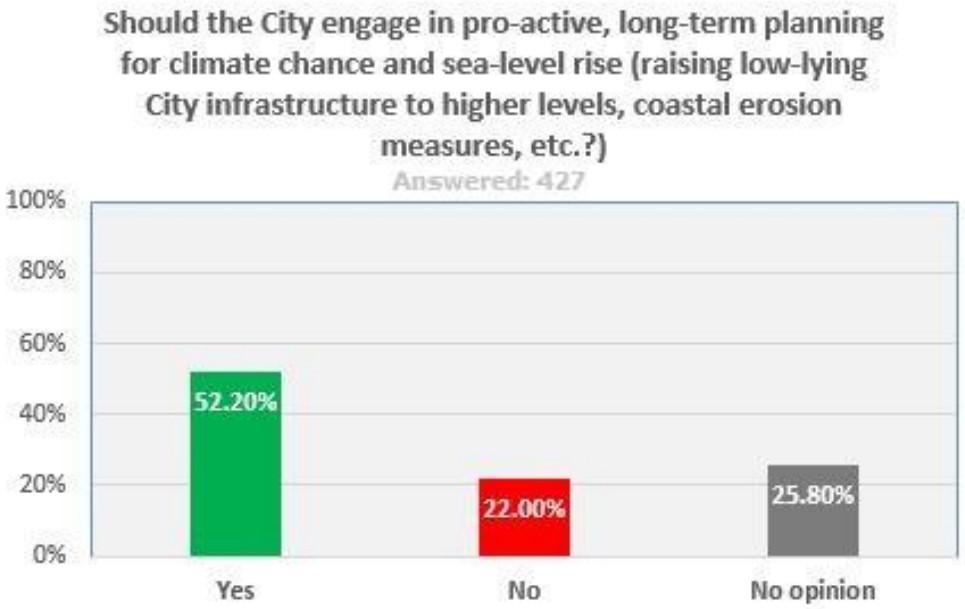
A community survey was generated as part of the process of updating the City's Comprehensive Plan. The survey was posted online, and also available in hardcopy form at facilities including the Library, City Hall, and the East Providence Senior Center. Included were two questions related to natural hazards.

Survey Question 1.



	Very Much Impacted	Somewhat Impacted	Slightly Impacted	Not Impacted	No opinion or not aplicable	Total
February 2013 Blizzard	25.76% 110	29.27% 125	25.06% 107	15.22% 65	4.68% 20	427
March 2010 floods	16.74% 72	17.21% 74	16.98% 73	43.49% 187	5.58% 24	430
Tropical Storm Irene (2011)	9.84% 42	19.20% 82	30.91% 132	34.19% 146	5.85% 25	427
Hurricane Sandy (2012)	8.16% 35	18.88% 81	33.33% 143	34.50% 148	5.13% 22	429

Survey Question 2.



APPENDIX D. City Emergency/Hazard Mitigation Committee Meeting Notes and Agendas

School Department Safety/Security Meeting, February 27, 2014 – Meeting Notes

School Safety and Hazard Mitigation Meeting

Minutes

February 27, 2014

In attendance: Julie Motta, Wayne Barnes, Kenneth Botelho, Anthony Feola

1. The district safety plan was discussed and it was explained that the schools are working to complete their customized versions of their individual school plans. Tony Feola will ensure that the district safety plan is shared electronically with Wayne Barnes, Captain Botelho, and Lt. Blinn via hard drive to maintain confidentiality. It was noted that many district administrators and crisis team members were trained or are in the process of being trained in NIMS and are attending FEMA onsite classes.
2. The current city Hazard Mitigation Plan is currently posted on the City Website under the EMA page. Public meetings to begin updates will begin this spring with hopes of having a completed updated version ready for fall of 2015. It requires re-certification by May of 2016. Wayne will work collaboratively with the school department to include schools in the updated plan. Additionally a public meeting to begin review of the City Comprehensive Plan will be held on March 12th. Tony Feola will attend on behalf of the School Department.
3. The step-by-step process for basic threat and hazard identification and risk assessment that district staff have been trained is was outlined and samples of the worksheets to complete this process were shared with participants.
4. It was agreed that we would reconvene as a working group to go through the process for various scenarios in April.
5. Captain Botelho was able to provide the district with hazard risks in the city that are in close proximity to our schools. We discussed using these existing hazards to complete a workshop where we used the risk assessment tools and worksheets to complete a risk assessment when we meet in April.
6. Wayne Barnes will draw up a mutual aid agreement/ MOU for all parties to be used interchangeably among all city departments.
7. Our first meeting was very successful and all members were happy with the collegial/ cooperative spirit in which we will continue to work collaboratively to keep our students and school employees safe! Thanks to everyone for their participation!!!

Emergency/Hazard Mitigation Committee Meeting, July 22, 2014 – Agenda

EOC / Emergency Committee Meeting – July 22, 2014, 2:00 pm, Fire Station 3

EOC Equipment review and training

- Request any room layout suggestions
- Is there a printer available in the EOC? How does it get hooked up?
- Receive smartboard Training. Is having smartboard in the training room okay?

Hurricane planning and preparedness with dire assumptions

- Suggest annual hurricane planning meeting
- Possible hurricane season/preparedness presentation
- Should there be a written hurricane operations plan?
    - Options would include annex to EOP or rewrite of hurricane portion of EOC

Continuity of Operations w/respect to hurricanes and other disasters (1 or 2 minutes)

- Creation of formal COO plan for the City? (templates available, would need much input)
- Status of Police and Fire COO for their departments / can City use as model?

Other topics

- Hazard Mitigation Plan – Request for command staff feedback on existing plan. Public mtg 8/21.
- Dept. of Health MEDS plan will need lots of support for 2014-15, will schedule meet with Dept. of Health personnel once this year's MEDS program is released (likely Sept. or Oct.)
- New FEMA flood maps- review schedule of upcoming process and milestones.
- Following grant applications are waiting for decisions which will likely come in the fall
    1. New City Hall generator
    2. City Hall and Garage camera systems
    3. Cyber-security study and improvements
    4. Minimal Hazard Mitigation Plan funding
- Status of Emergency Notification System- new procurement/bid process (Kelly)

Attendees:

Karin LaMarre- Fire Dept.
Wendy Michalek- Fire Dept.
Fire Lt. James Bellamy
Fire Battalion Chief Robert Jobin
Steve Coutu- DPW Director
Rob Walker-Highway Division
Fire Chief Oscar Elmasian
Police Chief Chistopher Parella
City Manager Paul Lemont
Planner/EMA Wayne Barnes

Emergency/Hazard Mitigation Committee Meeting, March 4, 2015 – Agenda

East ProvidenceEMA/RIEMA/FEMA Grant opportunity meeting
March 2015
Agenda

1. Progress on (and prospects for) City Hall Generator
2. Current/upcoming grant rounds and their purpose
3. Review of previously submitted projects
4. Potential for cot purchases through grant funding
5. Develop menu of needed projects/purchases ahead of future grant opportunities
6. Request for Hazard Mitigation Plan input
7. Update on February 2013 snowstorm reimbursements
8. Update on January 2015 Blizzard request for FEMA declaration

Paul Lemont, City Manager
Oscar Elmasian, Fire Chief
Christopher Parella, Police Chief
Steve Coutu, DPW Director
Kelly Ahrens, IT Director
Wayne Barnes, Senior Planner/EMA

Emergency/Hazard Mitigation Committee Meeting, September 14, 2015 – Agenda

City of East Providence
EOC / Emergency Committee Meeting – 9/14/2015, 2:00 pm
City Hall, Office of the City Manager

Paul Lemont, City Manager
Oscar Elmasian, Fire Chief
Christopher Parella, Police Chief
Steve Coutu, DPW Director
Bob Rock, Senior Center Director
Wayne Barnes, Senior Planner/EMA

Topics of discussion

Emergency planning ahead of storms

Spontaneous incident planning

State shelter plan comments

Hazard Mitigation Plan Update final input solicitation- Complete first draft due by 10/30

New flood maps for the Ten Mile River- October 2

RIEMA/ National Weather Service StormReady initiative

APPENDIX E. References

Abel, David, "On busy travel day, black ice led to massive pileup in Worcester". *Boston Globe*, December 2, 2013.

Beer,J., W. Mendo, R. Stellmacher, "The role of the sun in climate forcing" (abstract). Quaternary Science Reviews 19(2000): 403-415, Abstract: http://www.sciencedirect.com/science/article/pii/S0277379199000724

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City of East Providence Website- City Council http://www.eastprovidenceri.net/content/12101/11286/default.aspx

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Florida Commission on Hurricane Loss Prevention Methodology, http://www.sbafla.com/methodology/

National Fire Protection Association "NFPA Glossary of Terms 2013 Edition", http://www.nfpa.org/~/media/Files/Codes%20and%20standards/Glossary%20of%20terms/glossary_of_terms_2013.pdf

National Park Service "National Register of Historic Places Program: Research- Data Download", http://www.nps.gov/nr/research/data_downloads.htm#spreadsheets

NOAA Atlantic Oceanographic and Meteorological Laboratory- Physical Oceanography Division, http://www.aoml.noaa.gov/phod/index.php

NOAA- National Hurricane Center, http://www.nhc.noaa.gov/

NOAA- National Weather Service Advanced Hydrologic Prediction Service NOAA Narragansett Bay at Fox Point Tidal Gage, http://water.weather.gov/ahps2/index.php?wfo=box

NOAA- National Weather Service Forecast Office, Huntsville, AL, http://www.srh.noaa.gov/hun/

NOAA- National Weather Service Forecast Office, Taunton, MA, www.weather.gov/box

NOAA, "NOAA's El Nino Portal", http://www.elnino.noaa.gov/

NOAA- NCDC, "Storm Events Database", http://www.ncdc.noaa.gov/stormevents/
Rhode Island Coastal Resources Management Council CRMC, "Climate Change and Sea Level Rise Program" - Section 145.

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Penney, John, "1.5 Magnitude quake confirmed in Plainfield." *Norwich Bulletin*, February 24, 2015. Accessed August 19, 2015, http://www.norwichbulletin.com/article/20150224/NEWS/150229751/1994/NEWS?rssfeed=true

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APPENDIX F. Local Mitigation Plan Review Tool

LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: City of East Providence, RI	**Title of Plan: 2016 Local Hazard Mitigation Plan – A Multi Hazard Mitigation Strategy**	**Date of Plan: October 5, 2016**
Local Point of Contact: **Wayne Barnes**		**Address:**
Title: **Senior Planner/Deputy EMA Director**		**145 Taunton Avenue** **East Providence, RI 02914**
Agency: **East Providence Emergency Management Agency**		
Phone Number: **(401) 435-7500, Ext. 11151**		**E-Mail:** wbarnes@cityofeastprov.com

State Reviewer:	**Title:**	**Date:**

FEMA Reviewer:	**Title:**	**Date:**
Date Received in FEMA Region ***(insert #)***		
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved		

REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan (section and/or page number)**	**Met**	**Not Met**
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Sec. 2, pgs. 18-21 Sec. 6, Page 94 App. C, pgs. 103-112		
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Sec. 2.3, pg. 21 Sec. 2.4, pgs. 21-22 Sec. 6, pg. 94		
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Sec 2.2, pgs, 19-20 App. C, pgs 103-112		
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Sec. 4.3, pgs 74-78		
A5. Is there discussion of how the community(s) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Sec. 2.4c, pg. 22-23		
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Sec. 6, pg. 94		

ELEMENT A: REQUIRED REVISIONS

ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Sec. 3.2, pgs. 24-58		
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Sec. 3.2, pgs. 24-58		
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Sec. 3.2, pgs. 24-58 Sec. 3.3, pgs. 58-68		
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Sec. 3.4, pgs 68-70 Sec. 4.4, pg. 78		
ELEMENT B: REQUIRED REVISIONS			

ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Sec. 4-2, pgs 73-74		
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Sec. 1.3, pg. 15 Sec. 4.4, pg, 78		
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Sec. 3.4b, pgs. 70-72 Sec. 5.2, pgs. 85-93		
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Sec 5.2, pgs. 85-93		
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Sec 5.2, pgs. 85-93		
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Sec. 4.3, pgs. 74-78		
ELEMENT C: REQUIRED REVISIONS			

ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Sec. 2.4b, pg. 22		
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Sec. 5.1, pgs. 82-84		
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Sec. 6.2, pg. 94		
ELEMENT D: REQUIRED REVISIONS			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	(forthcoming in Appendix F)		
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	N/A, not a multi-jurisdictional plan.		
ELEMENT E: REQUIRED REVISIONS			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			
F1.			
F2.			
ELEMENT F: REQUIRED REVISIONS			

APPENDIX G. Plan Adoption Documentation

Book 26 Page 15

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

CITY OF EAST PROVIDENCE

RESOLUTION NO. 11

RESOLUTION ADOPTING THE 2017 CITY OF EAST PROVIDENCE, RHODE ISLAND LOCAL HAZARD MITIGATION PLAN

WHEREAS, the City of East Providence recognizes the threat that natural hazards pose to people and property within our City; and

WHEREAS, the City of East Providence, in accordance with the Disaster Mitigation Act of 2000, has prepared a multi-hazard mitigation plan hereby known as the City of East Providence, Rhode Island Local Hazard Mitigation Plan as required by the Federal Emergency Management Agency (FEMA); and

WHEREAS, the 2017 Local Hazard Mitigation Plan identifies mitigation goals and actions to reduce long-term risk to people and property in East Providence from the impacts of future natural hazards and disasters; and

WHEREAS, the Local Hazard Mitigation Plan shall include documentation that the plan has been formally adopted by the City Council indicating approval of the plan.

NOW, THEREFORE, BE IT RESOLVED that the City Council hereby adopts the 2017 City of East Providence, Rhode Island Local Hazard Mitigation Plan.

Adopted by the City Council: March 7, 2017

Attest:

City Clerk of East Providence, Rhode Island

Requested by: Deputy EMA Director

CITY OF EAST PROVIDENCE RHODE ISLAND INCORPORATED 1862 DECEMBER 1, 1958

A certified true copy 3/23/17 Date

Attest:

City Clerk of East Providence, Rhode Island