CITY OF PROVIDENCE
MULTI-HAZARD MITIGATION PLAN
2013

CITY OF PROVIDENCE
Angel Taveras, Mayor

February 20, 2013

Michael Solomon
President, Providence City Council
25 Dorrance Street
Providence, RI 02903

The Providence Emergency Management Agency (PEMA) is requesting that the City Council consider for adoption its *2013 Multi-Hazard Mitigation Plan*. The *2013 Multi-Hazard Mitigation Plan* is an update to the plan that was last adopted by the City Council in 2005. Adoption of this plan is a federal requirement for the City to be eligible for federal mitigation grants either has a result of a disaster or major mitigation planning project.

FEMA Region I has completed its review *2013 Multi-Hazard Mitigation Plan* and found it approvable pending adoption by the local government legislative authority, e.g. the City Council. With this approval, the jurisdiction meets the local mitigation planning requirements under 44 C.F.R. 201 pending FEMA's receipt of the City Council adoption documentation and an electronic copy of the final plan.

These items will then be provided to the State Hazard Mitigation Officer (SHMO) who will ensure they are forwarded to FEMA. Acceptable electronic formats include Word or PDF files and may be submitted on a CD or via email. Upon FEMA's receipt of these documents, a formal letter of approval will be issued, along with the final FEMA Checklist and Assessment of the *2013 Multi-Hazard Mitigation Plan*.

The FEMA letter of formal approval will confirm the Providence's eligibility to apply for federal mitigation grants administered by FEMA. If the plan is not adopted within one calendar year of FEMA's Approval Pending Adoption, the jurisdiction must update the entire plan and resubmit it for FEMA review.

PEMA requests that the plan be submitted to the appropriate City Council Committee for review and then to the full City Council with a recommendation for forma adoption.

Sincerely,

Peter Gaynor CEM
Director

PROVIDENCE EMERGENCY MANAGEMENT AGENCY + OFFICE OF HOMELAND SECURITY
591 Charles Street Providence, Rhode Island 02904
401 680 8000 ph | 401 680 8058 fax
www.providenceri.com

EFFECTIVE WITHOUT THE MAYOR'S SIGNATURE

THE CITY OF PROVIDENCE
STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

RESOLUTION OF THE CITY COUNCIL

No. 295

EFFECTIVE ~~Approved~~ June 17, 2013

WHEREAS, Emergency management and hazard mitigation plans preserve the health, safety and welfare of the citizens of Providence and their property; and

WHEREAS, The 2013 Multi-Hazard Mitigation Plan is an update to the Hazard Mitigation Plan last adopted by the City Council on April 26, 2005; and

WHEREAS, Adoption of this plan is a federal requirement for the City to be eligible for federal mitigation grants either as a result of a disaster or major mitigation planning project; and

WHEREAS, FEMA Region I has completed its review of the 2013 Multi-Hazard Mitigation Plan and approved it subject to approval by the City Council; and

WHEREAS, City Council approval will allow the city to meets its local mitigation planning requirements pursuant to 44 C.F.R. 201.

NOW, THEREFORE, BE IT RESOLVED, That the Providence City Council approves and adopts the 2013 Multi-Hazard Mitigation Plan.

IN CITY COUNCIL

JUN 0 6 2013

READ AND PASSED

PRES.

CLERK

Effective without the Mayor's Signature

Anna M. Stetson
City Clerk

Strategy for Reducing Risks From Natural & Human Caused Hazards in Providence, Rhode Island: *A Multi-Hazard Mitigation Plan*

Acknowledgements

Lincoln Chafee
Governor

RI Emergency Management Agency

Jamia McDonald
Executive Director

Authors

City of Providence Local Hazard Mitigation Committee
Maguire Group, Inc.

Cover
Ron Pino
Providence Police

Adopted by the Providence City Council
June, 6 2013

Approved by Mayor Angel Taveras

Additional Acknowledgements

Mitigation planning has been successfully initiated in Providence with the continuing support and resources provided by the Federal Emergency Management Agency via the Pre-Disaster Mitigation (PDM) grant. The guidance and assistance provided by the Rhode Island State Hazard Mitigation Committee is essential for implementing the strategy presented in this plan. Providence is also grateful for the efforts of the Department of Planning and Development, the Emergency Management Agency, and the Local Hazard Mitigation Committee in preparing this plan. The Providence Emergency Management Agency would also like to thank the community of Providence, especially city staff and those active community members who participated in the planning process.

Elected Officials

- Angel Taveras, Mayor

Providence City Council

- Michael Solomon, Council President – Ward 5
- Luis Aponte, Ward 10
- Michael Correia, Ward 6
- Terrence Hassett, Ward 12
- John Igliozzi, Ward 7
- Kevin Jackson, Ward 3
- Wilbur Jennings, Ward 8
- Carmen Castillo, Ward 9
- Sabina Matos, Ward 15
- Nicholas Narducci, Ward 4
- Bryan Principe, Ward 13
- David Salvatore, Ward 14
- David Sanchez, Ward 11
- Seth Yurdin, Ward 1
- Samuel Zurier, Ward 2

City Staff

- Steven Pare, Commissioner of Public Safety

Local Hazard Mitigation Committee

- Peter Gaynor - Director of Providence Emergency
- Management Agency
- Peter Marinucci – Deputy Director of Providence Emergency Management Agency
- Josh O'Neill – Recovery Coordinator Providence Emergency Management Agency
- Michael Dillon – Deputy Chief of Operations, Providence Fire Department
- Peter Lepage – Director of Special Projects, Providence Water
- David Everett – Principal Planner, Providence Department of Planning and Development
- William Bombard – Acting Director, Providence Department of Public Works
- Steve Curtis – Waterman Terminal Services, LLC
- Stephen Morin – Director of Environmental Health and Safety, Brown University
- Kerry Anderson – Providence Department of Inspection and Standards
- Peter Ginaitt – Lifespan
- Marybeth Groff – Citizen of Providence
- Susan Mayo – Environmental Health and Safety Manager, Johnson and Wales University
- John Kennedy – National Grid
- James Boyd – Coastal Policy Analyst, RI Coastal Resources Management Council
- Norm Menard – Liaison Officer, American Red Cross
- Jeffrey Emidy – Project Review Coordinator, RI Historical Preservation and Heritage Commission
- Janet Freedman – Coastal Geologist, RI Coastal Resources Management Council
- Marisa Albanese – Senior Coordinator, Community Investment & Economic Development NE, National Grid
- Richard Fisher – Director of Operating Rules and Safety, Providence & Worcester Railroad
- Glen Skalubinski – OS&D Incident Management, RSB Citizens
- Leo Pollock – Southside Community Land Trust

State Hazard Mitigation Committee

Dan Beardsley, RI League of Cities and Towns

Grover Fugate, CRMC

Paula Pallozzi, Department of Business Regulation

Terrance Gray, RI Department of Environmental Management

Michael Tondra, RI Department of Administration

Ronald Renaud, RI Department of Administration

Joseph Baker, RI Department of Transportation

Paul R. Annarummo, RI Department of Transportation

Phillip Kydd, RI Department of Transportation

Robert Smith, RI Department of Transportation

Steve Kavanagh, Office of the Governor

Vladimir Ibarra, Office of the Lt. Governor

Kevin Flynn, RI Department of Administration, Office of Planning

Peter Schaefer, RI League of Cities and Towns

Marilyn McNeil, RI Public Utilities Commission

Thomas Ahern, RI Public Utilities Commission

John E. Chartier, Office of the State Fire Marshal

Richard James, Office of the State Fire Marshal

Alan Dunham, National Weather Service

Andrew Kostrewa, RI Department of Administration

Catherine Sparks, RI Department of Environmental Management

Chris Albert, Senator Reed's Office

David Chopy, RI Department of Environmental Management

David Vallee, National Weather Service

Armand Randolph, RI Emergency Management Agency

Edward Fratto, NESEC

Jess Stimson, RI Emergency Management Agency

Theresa Murray, RI Emergency Management Agency

Jamia McDonald, Office of the Governor

Janet Freedman, CRMC

John Leyden, Building Commissioner's Office

John Kennelly, US Army Corps of Engineers

Kevin Carvalho, RI Department of Administration

Kevin Farmer, USDA NRCS

Lawrence Macedo, RI Emergency Management Agency

Michael Lewis, RI Department of Transportation

Paul McGreevy, Department of Business Regulation

Michelle Burnett, RI Emergency Management Agency

Nicole Belk, National Weather Service

Phoukham (Pooh) Vongkhamdy, USDA NRCS

Rayna Santoro, RI Department of Environmental Management

Kenneth Burke, RI Water Resources Board

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Section 1.0 – Introduction

The purpose of this report is to establish a plan to mitigate natural and manmade hazards in the City of Providence. This is the 2012 update to the City of Providence Hazard Mitigation Plan. Ideally located along the eastern seaboard of the United States, Providence prospered from its location and development as a transportation center, offering access to both water and overland routes. In 1940, the City enjoyed its highest population ever (253,504), as industries and businesses continued to migrate to Providence's active harbor and commercial areas. Today this network includes the major northeastern cities: Boston, Providence, New York, Philadelphia, Baltimore and Washington, D.C. This northeast corridor runs 600 miles wide, and Providence is well situated within it. Demand for a specialized commercial district in Providence increased around the turn of the nineteenth century and, as the downtown started to develop, shipping and manufacturing became the key industries around the downtown area, as residential development continued along its fringes. During this time the jewelry industry grew the most of the manufacturing trades, later establishing Providence as the jewelry capitol of the region. Providence's growth and transformation from a small shipping town to the major economic center of the most industrialized state in the nation was rapid. Providence grew in population from 15,000 people to 175,000 at the turn of the twentieth century, reaching its highest population ever (253,504) in 1940. From 1940 to 1980 the City saw a significant decrease in population as the "suburbanization" phenomenon negatively impacted most of the older cities throughout New England, reaching its lowest population in 1980. However, it has since enjoyed a much touted and celebrated renaissance. Between 1990 and 2000, the city's population increased by approximately eight percent, reversing a trend of population decline that had lasted several decades.[1]

One of the principal objectives of the initial plan was to create a plan that would help the City of Providence reduce or eliminate long-term risk to people and property from natural hazards. The City developed this plan update to reduce future losses to the City and its neighborhoods resulting from natural and manmade hazards. The plan was prepared pursuant to the requirements of the Disaster

[1] Population figures for Providence for the 20th Century are taken from the Rhode Island State Data Center. The website address is http://www.planning.ri.gov/census/ri2000.htm The Rhode Island State Data center provides a census table for population estimates for all Rhode Island towns/cities from 1790 -2000.

Mitigation Act of 2000 and to achieve eligibility for the Federal Emergency Management Agency (FEMA) hazard mitigation grant programs. This plan updates the City's 2005 Hazard Mitigation Plan and is renamed Multi-Hazard Mitigation Plan.

The Providence Emergency Management Agency (PEMA) provided the lead in soliciting the participation of City departments, State agencies, universities, non-profits, and other stakeholders to form the Hazard Mitigation Planning Committee undertaking a comprehensive planning process to update the previously approved hazard mitigation plan. This development was supported by consultant Maguire Group. Public input on community assets, preferred mitigation strategies, and the overall plan document was also solicited. As a result, this plan represents the work of citizens, elected and appointed officials, and other interested parties in the City of Providence.

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." Mitigation creates safer communities by reducing loss of life and property damage. Hazard mitigation planning is the process through which hazards that threaten communities are identified and profiled, likely impacts of those hazards are assessed, and mitigation strategies to lessen those impacts are identified, prioritized, and implemented. On average, each dollar spent on mitigation saves society an average of $4 in avoided future losses in addition to saving lives and preventing injuries.[2]

The federal Disaster Mitigation Act of 2000 (DMA2000) requires all local agencies in the country to adopt a federally approved Multi-Hazard Mitigation Plan in order to receive post-disaster mitigation funds. The DMA emphasizes planning for disasters before they occur. The Plan must inventory potential natural hazards that the City is most vulnerable to, assess the risk to Providence's citizens, buildings and critical facilities, and develop a mitigation plan to reduce the City's risk and allow a swift and organized recovery should a disaster occur.

This plan demonstrates the City's commitment to reducing risks from hazards and serves as a tool to help decision makers- direct and coordinate mitigation activities and resources, including local land use policies.

Local hazard mitigation plans now qualify communities for the following federal mitigation grant programs:

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)
- Severe Repetitive Loss (SRL)

[2] National Institute of Building Science Multi-Hazard Mitigation Council 2005

- Repetitive Flood Claim (RFC)

The first two of the grant programs listed above are authorized under the Stafford Act and the Disaster Mitigation Act of 2000 (DMA), while the last three are authorized under the National Flood Insurance Act and the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act. The HMGP is a state competitive grant program which is directly disaster- funded. Whereas the other programs, PDM, FMA, RFC, and SRL, are competitive and rely on specific pre-disaster grant funding sources, sharing several common elements. In 2008, FEMA combined the multi-hazard PDM program with the FMA, RFC, and SRL programs into a unified HMA program application cycle. The intent of this alignment is to enhance the quality and efficiency of grant awards on an allocation and competitive basis to state and local entities for worthwhile, cost-beneficial activities designed to reduce the risks of future damage in hazard-prone areas.

The Providence Hazard Mitigation Committee reviewed and incorporated several existing state, local, and academic plans and planning documents in the update of the Providence Hazard Mitigation Plan. The City of Providence Comprehensive Plan: "Providence Tomorrow: The Interim Comprehensive Plan" was reviewed as part of this plan update and its land use trends, data, and objectives are incorporated in several sections of this plan update. The Comprehensive Plan data helped to inform the decisions made by the local hazard mitigation committee scoring for the Hazard Identification and Risk Assessment section of this plan.

The Providence Hazard Mitigation Committee also reviewed the "Strategic Area Management Plan for the Metro Area (Metro Bay SAMP)" of the Coastal Resource Management Council (CRMC) in discussions and additions to this plan concerning the impact of Climate Change on the city and what can be expected over the next years and decades.

Finally, the Providence Hazard Mitigation Committee reviewed the Thesis Paper on the Port of Providence, written by Austin Becker who is currently a Ph. D candidate at Stanford University. His paper commented upon the importance of port activities to the local economy and was incorporated into this plan to inform how critical an asset our Port facilities are to our economic future. In addition to these well informed plans, Providence Emergency Management staff reviewed several internal plans in the process of drafting this plan such as the city Emergency Operations Plan, the city Recovery Plan, and the city Debris Management Plan.

1.1 Past Protection Measures

Subsequent to the floods of 1938 and 1954, a hurricane barrier was constructed at Fox Point where the Providence River empties into Narragansett Bay. This structure is equipped with large gates to prevent the inflow of hurricane tides and pumps to discharge the riverine flows south of the barrier. Appurtenant structures include gates at certain road underpasses, dikes, and the embankment of Interstate 95. These measures effectively eliminate the downtown area from hurricane- related flood hazards.

The Moshassuck River along Interstate 95 has improved riprap channel in many areas. Construction of State Route 146, north of the city and adjacent to the West River has resulted in an improved channel through this area. The resulting channel clearing on the West River near Charles Street aids in flood hazard reduction.

During floods (from storm events having a magnitude greater than 10-year occurrence), the West River overflows its banks in the vicinity of Charles Street and main line Amtrak railroad. This flow is channelized into the railroad right-of-way, where it flows south to below Smith Street. A culvert has been installed just below Smith Street to divert this flow from the tracks to Moshassuck River. The culvert is a drop inlet structure consisting of grating across the tracks which drops into a 19 foot-by-16-foot box culvert. The diverted flow then enters the Moshassuck River. The culvert is designed to act against the 100-year flood on the river. A crib wall on the western side of the tracks diverts flow onto the tracks and into the culvert rather than into the center area.

While these infrastructure improvements adjacent to the West River were supposed to alleviate flooding concerns, the recent historic floods of March 2010 have shown that there is still a great need for hazard mitigation measures along the West and Moshassuck rivers as Charles Street was severely inundated in the area of Wal-Mart and Home Depot and prone to flooding from minor rain events. There has been some speculation amongst public works officials that culvert maintenance and clearing of debris in the river would solve most of these flooding issues as clearing has not been conducted in several years. Further study of this corridor is needed by City of Providence officials.

On 19 February 2010, the ownership and operation of the Fox Point Hurricane Barrier was transferred from the City of Providence to the Army Corps of Engineers, New England District. The City currently has a Port Security Grant to integrate existing cameras on the Hurricane Barrier. City Department of Public Works and Emergency Management have been working with Army Corps of Engineers, Narragansett Bay Commission, Providence Water Supply Board and other entities to assure that Standard Operating Procedures (SOP's) are followed and coordinated amongst entities responsible for controlling water levels in the Bay and in the Providence River during high surge events such as a Hurricane.

Notification Systems

Reverse 911

Reverse 911 is a communication system that allows emergency services to quickly contact members of a community or organization with information. This system allows emergency services to do the "reverse" and inform the public of a known hazard. Reverse 911 is designed to provide map– or list-based communications with key audiences. Geographic calling zones are created based on immediate circumstances or ahead of time based on anticipated needs.

FLASHbrief

FLASHbrief is an instantaneous, Internet-based, mass alert notification system. It is specifically designed for municipal areas to relay both ADVISORY and EMERGENCY alerts to citizens' computers in a matter of

seconds. FLASHbrief's state of the art software securely harnesses the power of the Internet to bring a new level of emergency communication capability to residents of entire metropolitan populations.

Greater Providence Chamber of Commerce E-Alert

The Greater Providence Chamber of Commerce uses a business-based e-mail system E-Alert. Based on prior coordination with the Chamber approximately 2600 business can be reached in metropolitan Providence.

Rhode Island Broadcasters Association's (RIBA) Cancellation System

The Rhode Island Broadcasters Association's (RIBA) has a unified cancellation/delay notification system that transmits weather-related class cancellations throughout Rhode Island and bordering communities. The City submits notices through RIBA's secure automated telephone or web-based system. The data is then available in real-time to all participating radio and television stations as well as on their websites. The TV and radio stations broadcast this information as they have in years past. RIBA has modified its system to include more than just weather-related closings and they have initiated a program to send alert messages to cell phones, email addresses, or home phone numbers of individuals who "subscribe" on the websites of any of their member stations.

Amber Alert System

The AMBER Alert Program is a voluntary partnership between law-enforcement agencies, broadcasters, transportation agencies, and the wireless industry, to activate an urgent bulletin in the most serious child-abduction cases. The goal of an AMBER Alert is to instantly galvanize the entire community to assist in the search for and the safe recovery of the child.

Rhode Island Red Cross Emergency Notification System

The Rhode Island Red Cross Emergency Notification System (ENS) enables immediate information dissemination of updates, reminders and emergencies to Rhode Island Red Cross Volunteers via various contact methods. The system enables appointed personnel to quickly and easily contact one, several or all individuals via web or telephone interface and distributes notifications via multiple media, including telephones, cell phones, email, pager, text messaging. The system is capable of recorded voice and text-to-speech notifications, multilingual text-to-speech conversion, pre-defined messages, and recipient acknowledgement.

PEMA Emergency Notification System

The PEMA Notification System (ENS) enables immediate information dissemination of updates, reminders and emergencies to the Public Safety community via various contact methods. The system enables appointed personnel to quickly and easily contact one, several or all individuals via web or telephone interface and distributes notifications via multiple media, including telephones, cell phones,

email, pager, text messaging. The system is capable of recorded voice and text-to-speech notifications, multilingual text-to-speech conversion, pre-defined messages, and recipient acknowledgement.

Warning Systems

Emergency Alert System (EAS)

The EAS is a national public warning system that requires broadcasters, cable television systems, wireless cable systems, satellite digital audio radio service (SDARS) providers, and direct broadcast satellite (DBS) providers to provide the communications capability to the President to address the American public during a national emergency. The system also may be used by state and local authorities to deliver important emergency information, such as AMBER alerts and weather EMSTARS. When appropriate, Providence can send a short 30 second message directed to the residents of Providence. From the Emergency Operation Center in Providence, Emergency Management can send Civil Emergency Messages (**CEM**) to the National Weather Service (NWS), or the State Warning Point (SWP) via the State Warning System (SWS).

National Warning System (NAWAS)

NAWAS system used to convey warnings to United States-based Federal, State and local governments, as well as the military and civilian population. NAWAS has proven invaluable to local emergency managers responding to or coping with natural disasters. The Providence NAWAS site is located at the Department Telecommunications located on West Exchange Street, Providence, RI.

National Oceanic and Atmospheric Administration (NOAA) Weather Radio

NOAA Weather Radio All Hazards is a network of radio stations broadcasting continuous weather information directly from a nearby National Weather Service (NWS) office. It is operated by the NWS, an agency of the NOAA within the United States Department of Commerce. NOAA Weather Radio broadcasts National Weather Service warnings, watches, forecasts and other hazard information 24 hours a day. It also broadcasts alerts of non-weather emergencies such as national security, natural, environmental, and public through the Federal Communications Commission's (FCC) Emergency Alert System. Providence's NOAA Weather Radio transmitter is on 162.4 MHz. Tone activated receivers are owned by individual citizens as well.

Emergency Management State Radio System (EMSTARS)

The Rhode Island Emergency Management State Radio System (EMSTARS) is a Simplex (non-repeated) radio system that links local EOCs to the Rhode Island State EOC. This is an encrypted radio system that is located and kept secure in each EOC. It has been designed to afford communities a redundant mode of secure communications to the state EOC. EMSTARS is designed to be a base-to-base system only. There are no other talk groups on the VHF system. The Providence EMSTARS site is located at the Emergency Operations Center located on Charles Street, Providence, RI.

Port of Providence Emergency Siren Warning System

The siren system is intended to alert workers and residents who are outside their residence or place of work that may not be able to receive a traditional notification. Examples of emergencies where the sirens would likely be activated include a Chemical Spill, Hostile Intruder or Severe Weather Emergency. Each of the four strategically placed sirens emits a tone of 125 decibels, loud enough to cover a diameter of 5,400 feet. The activation will consist of an alert tone followed by a specific voice message regarding the nature of the emergency. This system operates on the City's legacy VHF Radio system.

Providence Metro Port Area Chemical Biological Radiological Nuclear Detection System

The purpose of Providence Metro Port Area Chemical Biological Radiological Nuclear Detection System is to provide continuous 24x7 MDA of the CBRN environment at, in and adjacent to the Port of Providence. Phase I detectors include Chemical Warfare Agent (CWA) and Toxic Industrial Chemical Detection (TIC). There are three (3) sensor suites for wide area CWA/TIC monitoring. These sensors will offer Chemical protection system to include early warning and decision support. The system will be compatible with the currently operational RI Common Operating Picture (- RICOP), and will integrate visual verification to sensor alerts for instant situational awareness. The system will integrate remote sensor data, produce dispersion models, send out alerts and initiate protective responses. The goal will be to substantially reduce the time it takes for the operator to understand and respond to a CBRN release.

Shelters

Sheltering Overview

Population: The 2006 Census estimate shows the City of Providence had a population of 175,255. Of that 175,255, it is anticipated that approximately 17,500+ will evacuate and 157,755 will remain. Of the evacuating 17,500, it is estimated that 33% (or 5,800 residents) will seek some sort of short-term shelter in the City of Providence. These statistics are based on the number of residents that would be affected by the predicted Category 3 hurricane storm surge from the Providence Port traveling up the Providence and Seekonk Rivers and inundating the 100-year flood plain in the City of Providence.

The City of Providence uses a co-sheltering strategy that brings together the general population. Which includes individuals with non-medical special needs and unattended children in each facility. The proper agencies will be present at each facility to provide their services; these include the Rhode Island Chapter of the American Red Cross (ARC-RI), Aramark, Salvation Army, Child and Family Services (CFSA) for unattended children, and other special needs services.[1]

[1] Providence Shelter data and Red Cross standards taken from City of Providence all Hazard Gap Analysis Plan September 9, 2010 (not available for public distribution). The numbers associated with the tables were derived using FEMA's Gap Analysis Tool.

Table 1 - Shelter Capacity Roll-up

American Red Cross Hurricane Certified Shelters

Shelter Name	Square Footage	Short Term (20 Sq Ft / Person)	Long Term (40 Sq Ft / Person)
Springfield Middle School	15,000	750	375
Levington Complex	8,000	400	200
B. Jae Clanton Elementary	7,000	350	175
Mount Pleasant High	10,000	500	250
Hope High	10,000	500	250
Anthony Carnevale Jr Elementary	2,000	100	50
Providence Career & Technical Academy	15,840	792	396
Neutaconkanut Recreational Center	11,000	550	275
SUB-TOTAL	**74,840**	**3,942 Spaces**	**1,921 Spaces**
Spaces Required for Short Term:		**5,800**	
Spaces Required for Long Term:			**2,600**
Shortage (-) / Overage (+):		**(-) 2,058**	**(-) 679**

City Shelters
(in addition to above shelters)

Shelter Name	Square Footage	Short Term (20 Sq Ft / Person)	Long Term (40 Sq Ft / Person)
Samuel W. Bridgham Elementary	2,000	100	50
Robert Bailey Elementary	2,000	100	50
Pleasant View Elementary	2,000	100	50
George J. West Elementary	3,000	150	75
Gilbert Stuart Middle	3,000	150	75
Dr. Martin Luther King. Jr. Elementary	2,000	100	50
SUB-TOTAL	**10,000**	**700 Spaces**	**350 Spaces**
TOTAL	**84,840**	**4,642 Spaces**	**2,271 Spaces**
Total Shortage (-) / Overage (+): Short Term:		**(-) 1,358**	
Total Shortage (-) / Overage (+): Long Term:			**(-) 329**

Notes: Per American Red Cross (ARC) standards 10% of the overall State population will need sheltering. Providence estimates 17,500 people will be displaced with one third (5,800) needing short-term sheltering. Depending on severity, sheltering requirement could range between 4,000 to 5,800 people. Providence

totals are based on the most severe scenario for 5,800 people. Although PEMA claims eight (8) total non-ARC Shelters, our calculations are based on (6) locations (the remaining two (2) are privately owned).

General Population Spaces

Requirements

The general population shelter spaces required is generated based on to the national average of evacuation populations seeking shelter, which is 10% (17,500).

Of those seeking evacuation a large portion of the populations will find refugee with family or, friends or be able to afford temporary shelter. The remainder of the population, those with limited or no resources, is estimated to be 5,800. Therefore, approximately 5,800 shelter spaces are estimated to be required for the evacuation population.[4]

Capability

The City of Providence's capability to accommodate 5,800 people sheltering should be adequate. PEMA has a clearly outlined a plan to accommodate most aspects of emergency sheltering. There are 4,652 shelter spaces among 8 shelters as designated by the National American Red Cross (ARC) standards for Certified Hurricane Shelters; however there are 8 other facilities (6 publically owned; 2 privately owned) designated as public general population shelters.

2.0 Goals and Objectives

It is the goal of this plan to preserve and enhance the quality of life, property and resources for the citizens of Providence by:

a) Identifying areas at risk from natural and human-caused hazards, and

b) Implementing priority hazard mitigation actions in order to protect the City's built environment, people, historic, cultural, economic, and natural resources.

An important benefit of hazard mitigation is that money spent today on preventive measures can significantly reduce the cost of post-disaster cleanup tomorrow. Pre-disaster planning can reduce the cost of disasters because it helps to safeguard areas. By planning ahead, Providence will minimize the economic and social disruption that can result from floods, blizzards, or hurricanes (destruction of property, loss or interruption of jobs, and the loss of businesses).

[4] Providence Shelter data and Red Cross standards taken from City of Providence all Hazard Gap Analysis Plan September 9, 2010 (not available for public distribution). The numbers associated with the tables were derived using FEMA's Gap Analysis Tool.

2.1 Benefits of Completing a Hazard Mitigation Plan

Municipal officials in Providence assessed the risks to the City and developed mitigation actions that address a mix of structural and non-structural initiatives (e.g., educational programs, preventing construction in high-hazard areas, enforcing regulations) to minimize the effects of future hazards (e.g. building code enforcement, retrofitting existing structures, and removal of vulnerable structures). By creating this plan, Providence has established an ongoing process that will make hazard mitigation a routine part of municipal government.

Formal adoption and implementation of this hazard mitigation plan will help Providence gain credit points under the Federal Emergency Management Agency's (FEMA) Community Rating System (CRS) program, which provides discounts on the National Flood Insurance Program (NFIP) flood insurance premiums for residents of communities that voluntarily participate in this program. In that regard, the City intends to become a CRS member. As a result of adopting this Plan, the City will be eligible for credit under the Community Rating System (CRS). Up to 210 points are provided if this plan conforms to the guidelines for a floodplain management plan (FMP). In addition, the adoption of this mitigation plan increases Providence's eligibility for federal grants for hazard mitigation which include FEMA's pre-disaster Flood Mitigation Assistance (FMA) program and FEMA's post-disaster Hazard Mitigation Grant Program (HMGP). The thought and planning that went into this plan and its implementation will help protect and safeguard the City in the long run. The preventative measures, if carried out, will also save money because there will be less damage in the future.

3.0 Process Description

3.1 Planning Process

Providence initiated hazard mitigation planning in 1997 at the recommendation of the Rhode Island Emergency Management Agency (RIEMA). Organized under the direction of the emergency management director, the Local Hazard Mitigation Committee (LHMC) was formed to create the original plan. The LHMC consisted of the Director of the Providence Emergency Management Agency, a representative from the Public Works Department, two representatives from Planning and Development, a representative from Inspection and Standards, and a representative from the Fire Department. The committee met monthly to discuss the plan and identify mitigation projects beneficial to Providence. With the help of RIEMA and URI Coastal Resources Center, the plan was formalized and documented. Resources consulted include planning, engineering and property data and documents from the Department of Planning and Development, Fire and Police Departments, Public Works Department, Emergency Management Director, City Tax Assessor, US Army Corps of Engineers, Federal Emergency Management Agency (FEMA), and state reports.

The plan was brought before the public as part of the City Plan Commission's and City Council's public hearing processes. The City Council first reviewed the plan and referred it to the City Plan Commission on October 7, 1999. The City Plan Commission reviewed the plan on October 18, 1999, held a public

hearing on November 29, 1999, and approved the plan on February 23, 2000. The City Council then held its first reading on March 3, 2000 at which time the plan was read and passed. The final City Council hearing was held on March 16, 2000 at which time the plan was read and passed. The Mayor then approved the plan on March 23, 2000. (See Appendix D for approval history)

After local approval, the plan was delivered to RIEMA for state review and assessment and ultimately passed on to FEMA, Region 1 for review. FEMA's Local Hazard Mitigation Plan Review was completed in October 2002 and the plan was returned to Providence for updating. During the interim, the original plan was reviewed as projects were implemented but no amendments or updates to the plan were completed. The LHMC incorporated the theme of hazard mitigation into each of the nine elements in the comprehensive plan.

In response to comments received from FEMA, the City's Emergency Management Agency Director (in conjunction with the LHMC) elected to update and reformat portions of the original plan to meet FEMA requirements. The updated plan was resubmitted to RIEMA and FEMA for review and approval.

The 2010-2011 Planning process allowed for academia, non-profits, and other interested parties to be involved and bring their ideas to the table for incorporation into this plan update. Both Brown University and Johnson and Wales University were represented on the Hazard Mitigation Planning Committee (see member list below) and the Southside Community Land Trust. Neighboring communities were given a chance to comment on drafts of the Providence Hazard Mitigation Plan Update, as it was displayed on the city website for a comment period of 30 days, and all hazard mitigation committee meeting were advertised on the Secretary of State's open meeting calendar.

For the 2011 update planning process, the Providence Hazard Mitigation Planning Committee reviewed and updated each of the sections of the previously approved plan, including improving organization and formatting and adding substantially more in-depth information specific to the City. Since writing the 2005 plan, the City of Providence has experienced numerous changes and progression, therefore each section of the plan was updated in order to have the most updated and relevant information. The entire plan was reviewed to account for recent events such as Presidential Disaster Declaration DR-1894, the March 2010 Rhode Island Floods. We also included institution specific annexes for Healthcare Hospital Cluster in South Providence and for Johnson and Wales University so that we would frame the most up to date information from those facilities that are pertinent for mitigation planning.

The Hazard Mitigation Planning Committee was formed by the Providence Emergency Management Agency and included:

- Peter Gaynor - Director of Providence Emergency Management Agency
- Peter Marinucci – Deputy Director of Providence Emergency Management Agency
- Josh O'Neill – Recovery Coordinator Providence Emergency Management Agency

- Michael Dillon – Deputy Chief of Operations, Providence Fire Department
- Paul Titzmann – Director of Special Projects, Providence Water
- David Everett – Principal Planner, Providence Department of Planning and Development
- William Bombard – City Engineer, Providence Department of Public Works
- Steve Curtis – Waterson Terminal Services, LLC
- Stephen Morin – Director of Environmental Health and Safety, Brown University
- Kerry Anderson – Providence Department of Inspection and Standards
- Peter Ginaitt – Lifespan
- Marybeth Groff – Citizen of Providence
- Susan Mayo – Environmental Health and Safety Manager, Johnson and Wales University
- John Kennedy – National Grid
- James Boyd – Coastal Policy Analyst, RI Coastal Resources Management Council
- Norm Menard – Liason Officer, American Red Cross
- Jeffrey Emidy – Project Review Coordinator, RI Historical Preservation and Heritage Commission
- Janet Freedman – Coastal Geologist, RI Coastal Resources Management Council
- Marisa Albanese – Senior Coordinator, Community Investment & Economic Development NE, National Grid
- Richard Fisher – Director of Operating Rules and Safety, Providence & Worcester Railroad
- Glen Skalubinski – OS&D Incident Management, RSB Citizens
- Leo Pollock – Southside Community Land Trust

The City of Providence contracted with The Maguire Group to assist in updating the City's Hazard Mitigation Plan by facilitating the hazard mitigation planning process and developing the plan document. The Providence Emergency Management Agency and Maguire worked together to convene the Planning Committee to guide the planning process and make key decisions.

3.1.1 Public Involvement

The City of Providence and the participating departments and agencies are committed to the continued involvement of the public in the hazard mitigation process. Copies of the Providence Multi-Hazard Mitigation Plan will be kept and made available for review at the following locations:

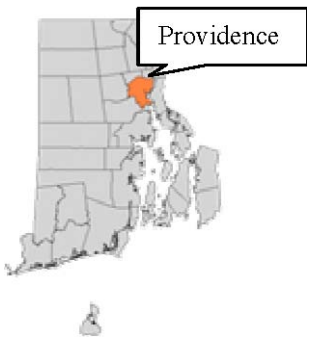
- Providence Department of Planning and Development
- Providence Emergency Management Agency
- Providence City Hall
- A downloadable copy of the plan will be available on the City's Website

A notice regarding the existence and location of copies of the Mitigation Plan will be publicized annually in the *Providence Journal* and posted on the Providence web site. This announcement will follow the Steering Committee's annual review effort (first quarter of each year).

The public will have an opportunity to comment on the plan at a public meeting following the organizational meeting of the Steering Committee which will be held as a part of the annual planning evaluation process and the 5-year plan update. The purpose of this meeting will be to provide the public an opportunity to express concerns, opinions, and ideas about the mitigation plan.

For the 2011 update, the City posted all meetings on the City's website to give the public an opportunity to attend. A private citizen attended the first meeting. Draft copies of the plan were available for comment on the City's website for 30 days staring on April 11th. A draft copy was also put in the public library during this time. There were no public comments on the plan.

3.2 Geography & Hazards



Providence, the capital of Rhode Island, is located in Providence County in the northeastern part of the state and is bordered by the communities of Pawtucket, North Providence, Johnston, and Cranston. Providence is located at the head of Narragansett Bay along three rivers, the Woonasquatucket, the Seekonk and the Providence River.

Industrial and residential flood plain development has occurred extensively throughout Providence. South of Glenbridge Avenue to the Providence River the Woonasquatucket River flood plain is heavily developed with a mixture of industrial and residential development. North of Glenbridge Avenue, development on the Woonasquatucket River is generally confined to residential housing. The Moshassuck River flood plain is heavily developed with industries and residences land from below the North Burial Ground to the confluence with the Woonasquatucket River. The areas surrounding the West River flood plain and the Upper Canada Pond Brook are generally in residential land use. The portion of the flood plain in Providence affected by the Pocasset River

consists generally of industrial development. The coastline along the Providence River is heavily developed with industrial facilities, as is the lower portion of the Seekonk River. The Woonasquatucket River rises in North Smithfield and enters Providence from the west through the Town of Johnston. Along its course, it passes through many reservoirs and old mill ponds.

The Moshassuck River rises in Lincoln and continues south into Providence where it joins with the Woonasquatucket River to form the Providence River. Adjacent to the North Burial Ground and Interstate 95, the Moshassuck River enters a 0.5 mile- long culvert which terminates just north of the confluence of the West River. The West River enters the city from the northwest and is also characterized by several old mill ponds with heavy industrial development. Upper Canada Pond Brook enters Providence in the north from its headwaters in North Providence. The portion of this stream within Providence is dominated by Upper Canada Pond. The Pocasset River flows from Johnston through the southwestern corner of Providence at the Johnston-Cranston corporate limits.

Providence Harbor and the Providence River form the northern end of Narragansett Bay, ending at the Fox Point Hurricane Barrier. The Seekonk River branches from the Providence River and is tidally affected throughout its length in Providence.

The City of Providence identified risks, assessed the degree of vulnerability of those areas “at risk” (e.g.; structures, population, and natural resources), and examined possible impacts from natural disasters (e.g.; loss of life, environmental damage, inconvenience to residents). Risk includes the characteristics of the hazard and takes into account the magnitude, duration, distribution, area affected, frequency, and probability of an event.

Severe weather (Nor’easter) and hurricanes are two of the major hazards affecting Rhode Island and Providence. They can result in flooding and high winds causing damage to residential homes, businesses, historic buildings, dams, bridges, and other critical infrastructure.

Wind events are quite normal in Southern New England and happen regularly each year. In the winter months the area is susceptible to high winds from Nor’easters and winter storms. Spring and summer seasons usually bring a number of severe thunderstorms to the region. During the late summer and fall seasons the area is at-risk from hurricanes. The region has been directly affected by six hurricanes over the last 75 years.

Earthquakes in New England are a greater risk than most people realize. There have been 31 recorded earthquakes in the state over the last 220 years. Rhode Island can feel the effects of an earthquake occurring in the Northeast Region. Rhode Island has experienced several minor earthquakes in the last few years, but no extensive damage has occurred. According to the Rhode Island Emergency Management Agency (RIEMA), experts believe that earthquakes are likely to strike the eastern half of the country within the next 50 years. The US Geological Survey (USGS) estimates that there is a 40 to 60 percent chance of experiencing an earthquake of magnitude 6.0 or greater on the Richter Scale (1 to 10) in the central or eastern United States within the next 30 years.

The 2011 Hazard Mitigation Committee Identified the following list of Natural and Manmade Hazards as every possible hazard that could occur in Providence, Rhode Island. This list was further refined by the local hazard mitigation planning committee in section 3.3.2 below to show a more workable list that could be entered into FEMA's Calculated Priority Risk Index (CPRI). Table 2 is a completely exhaustive list of hazards that could affect Providence without any relation risk or probability scoring. Table's 3 and 4 take the most likely hazard from Table 2 based on probability, severity and risk using the CPRI.

Table 2 - Hazard Identification List	
Natural Hazards	
Geological Hazards	Earthquake, tsunami, volcano, landslide, mudslide, subsidence, glacier, iceberg, etc.
Meteorological Hazards	Flood, flash flood, seiche, storm surge, drought, fire (forest, range, urban, wild land, urban interface), snow, ice, hail, sleet, avalanche, windstorm, tropical cyclone, hurricane, tornado, water spout, dust or sand storm, extreme temperature (heat, cold), lightning strikes, famine, geomagnetic storm, etc.
Biological Hazards	Diseases that impact humans or animals such as plague, smallpox, anthrax, West Nile virus, foot and mouth disease, severe acute respiratory syndrome (also known as SARS), pandemic disease, bovine spongiform encephalopathy (also known as mad cow disease), etc.
Man-Made Events	
Accidental	HAZMAT (e.g., explosive, flammable liquid, flammable gas, flammable solid, oxidizer, poison, radiological, corrosive) spill or release; explosion or fire; transportation accident; building or structure collapse; energy, power, or utility failure; fuel or resource shortage; air or water pollution or contamination; dam, levee, or other water control structure failure; financial issues including economic depression, inflation, financial system collapse; communication system interruption; misinformation; etc.
Intentional	Terrorism (CBRNE and cyber), sabotage, civil disturbance, public unrest, mass hysteria, riot, enemy attack, war, insurrection, strike or labor dispute, disinformation, criminal activity (vandalism, arson, theft, fraud, embezzlement, data theft), electromagnetic pulse, physical or information security breach, workplace violence, product defect or contamination, harassment, discrimination, etc.
Technologically Caused Events Affecting the following	
Central computer, mainframe, software, or application (internal and external)	
Ancillary support equipment	
Telecommunications	
Energy, power, or utility	

3.3 Risk and Vulnerability Assessment

3.3.1. History of Hazards in Providence

The City also has a history of natural disasters, primarily caused by severe flooding and high winds from major storms and hurricanes with historical storm data dating back to the 1600s. On September 22-23, 1815 Providence experienced its first recorded major hurricane. There is little information from that time, but the damages included thirty-five ships that were tossed into buildings and into each other. About 500 homes and small buildings were destroyed, but amazingly there were only two recorded fatalities, both at India Point. In Market Square, the water rose to almost twelve feet above the mean high water mark. The storm was dubbed the Great Gale.[1]

This past century, two major hurricanes, as well as a few minor ones, have struck Providence. The most devastating floods of this century were the result of hurricane tidal surges and accompanying rainfall. On September 21, 1938, a hurricane struck the Connecticut-Rhode Island coastline just hours before the expected high tide in Providence. Peak winds of over 120 miles an hour blowing up Narragansett Bay created a tidal surge that inundated the downtown commercial area of Providence with over 10 feet of water. In August 1954, Hurricane Carol also caused a severe tidal surge (References 2 and 3). The 1938 and 1954 storms had recurrence intervals of 100 and 50 years, respectively.

Riverine flooding also occurs in Providence. In March 1968, the riverine flow of record occurred in both the Woonasquatucket and Moshassuck Rivers. Extensive flooding occurred in the Woonasquatucket River near Erickson Place, Valley Street, Amherst Street, and Eagle Street. The recurrence interval for this flood on the Woonasquatucket River at the U.S. Geological Survey (USGS) gauging station in Centerdale was estimated to be 35 years. Flooding on the Moshassuck River occurred near Canal and Mill streets below the USGS gauge and along Interstate 95. Gauge records showed this flood to be a 38-year event on the Moshassuck River. Flooding resulting from this storm was also extensive on the West River. Areas adjacent to Charles Street and Branch Avenue/Route 146 were extensively flooded.[2]

3.3.2. Hazard Identification and Risk Assessment

Vulnerability indicates what is likely to be damaged by the identified hazards and how severe that damage could be. With help from the Maguire Group, Providence mapped high risk areas in the city (see maps in Appendix F). These maps indicate the flood zones, areas of historic flooding (not marked on the FEMA Flood Insurance Rate Map), evacuation routes, dams, bridges, and American Red Cross–approved shelters.

The 2011 LHMC met regularly to update projects and develop actions that would help to meet Providence's mitigation goals. Organization of projects and actions was accomplished by thoroughly reviewing the hazards and identifying areas in the city which are at risk. Vulnerable areas have been prioritized and ordered as such. A few members of the LHMC were asked to provide input for the

[1] Conley, Patrick T., Campbell, Paul, *Providence, A Pictorial History*, The Donning Company, 1982.
[2] Flood Insurance Study, Federal Emergency Management Agency, for Providence, March 11, 1985, p. 2

following risk assessment. They reviewed the maps included with this plan update as well as the information provided in the previous draft of the hazard mitigation plan to inform their decisions. FEMA's Calculated Priority Risk Index (CPRI) Tool was used to develop the scoring included below. The Risk Assessment results and methodology are as follows:

RISK ASSESSMENT METHODOLOGY

Each identified hazard is rated in each of the following categories; their ratings are then used to calculate the relative threat each hazard poses to the City of Providence.

Probability: The frequency that the hazard has occurred in the past and the probability that it will occur in the future.

0 = Not Applicable (NA)

1= Occurred once or no times in the past, one chance of happening in 50 year period or more

2= Occurred 5 or fewer times in the past or at least one chance of happening in a 20 year period

3= Occurred more than 5 times in the past or one or more chances of happening in 5 year period

Human Impact: Possibility of injury, illness, or death.

0= Not Applicable (NA)

1=Injuries are treatable with first aid

2=Injuries/illnesses treatable with medical care, injuries do not result in permanent disability, or disfigurement

3=Injuries lead to permanent disability, disfigurement and/or death

Property Damage: Physical loses and damages.

0=Not Applicable (NA)

1= Isolated, minimal property damage, or no damage at all

2=Sporadic damage to buildings and facilities

3=Widespread, critical damage to building and infrastructure

Business Impact: The interruption of services.

0=Not Applicable (NA

1= No interruption to daily business

2= Employees/owners/customers unable to reach facility/ place of business

3= Significant damage to facilities requiring temporary or permanent shutdown of facility

Preparedness: The amount of preplanning or preparedness activities undertaken by the City of Providence for a certain hazard

0=Not Applicable (NA)

1= No planning, training, or other preparedness activities exist or have taken place

2= Elements of planning or preparedness exist but no formal plan in writing

3=A formal plan has been created, mitigation and preparedness activities have been initiated

CALCULATION OF RISK

Each rating is entered into the following equation, which calculates the risk in the form of a percentage. The risk (relative threat of a hazard) increases with the percentage. **Risk%** = ((Probability)/3*((Human Impact+ Property Impact+ Business Impact+ Preparedness)/12))*100

Table 3 - Hazard Risk Assessment Rubric

Natural Hazards

Event	Probability	Severity= (Magnitude – Preparedness)				Risk
		Human Impact	**Property Impact**	**Business Impact**	**Preparedness**	
	Likelihood this will occur	*Possibility of death, injury, or illness*	*Physical loses and damages*	*Interruption of Services*	*Preplanning*	*Relative Threat*
Score	*0=NA 1= Low 2= Moderate 3= High*	*0=NA 1= Low 2= Moderate 3= High*	*0=NA 1= Low 2= Moderate 3= High*	*0=NA 1= Low 2= Moderate 3= High*	*0=NA 1= Low 2= Moderate 3= High*	*0-100%*
Hurricane	3	2	3	3	2	83%
Flooding	3	3	3	3	1	83%
Winter Storm	3	1	2	2	2	58%
Nor'easter	3	1	2	2	2	58%
Communicable Disease	3	3	0	2	2	67%
Extreme Temperatures	3	2	2	1	2	50%
High Winds	3	1	1	1	2	42%
Ice Storm	2	1	2	2	1	33%
Earthquakes	2	1	1	1	1	22%
Drought	2	1	1	1	1	22%
Severe Thunderstorm	3	0	1	1	0	17%
Tornado	1	1	2	1	1	14%
AVERAGE SCORE	2.8	1.1	1.3	1.3	1.6	41%

***Threat Increases with percentage*

Table 4 - Hazard Risk Assessment Rubric

Man-Made Hazards

Event	Probability	Severity= (Magnitude - Preparedness)				Risk
		Human Impact	**Property Impact**	**Business Impact**	**Preparedness**	
	Likelihood this will occur	*Possibility of death, injury, or illness*	*Physical loses and damages*	*Interruption of Services*	*Preplanning*	*Relative Threat*
Score	*0=NA 1= Low 2= Moderate 3= High*	*0=NA 1= Low 2= Moderate 3= High*	*0=NA 1= Low 2= Moderate 3= High*	*0=NA 1= Low 2= Moderate 3= High*	*0=NA 1= Low 2= Moderate 3= High*	*0-100%*
Fire	3	2	1	1	3	58%
Mass Casualty Incident	2	3	2	2	1	44%
Utility Failure	3	1	1	1	2	42%
Dam Inundation	2	1	2	1	3	39%
Hazardous Material Release	2	1	2	2	1	33%
Terrorism- Nuclear	1	3	3	3	1	28%
Special/VIP Events	3	0	0	1	2	25%
Terrorism-Explosive	1	3	2	3	1	25%
Terrorism-Chemical	1	2	2	3	1	22%
Terrorism-Radiological	1	3	2	2	1	22%
Terrorism-Biological	1	2	1	1	1	14%
Civil Disobedience	1	1	1	1	1	11%
AVERAGE SCORE	1.7	1.8	1.5	1.7	1.4	29%

***Threat Increases with percentage*

3.3.3. Profiling Hazards

After updating the Risk Assessment, the 2011 Hazard Mitigation Committee decided to only profile the Natural Hazards that had a 50% or higher threat after scoring. Those hazards are included in detail below.

The climate of Providence is typical of the North Temperate Zone, with a mean annual temperature of approximately 50 degrees Fahrenheit. The mean annual precipitation is 39.4 inches, including an average snowfall approximating 40 inches, though snowfall can occur in appreciably larger amounts. The topography is variable, consisting of hills, lowlands, and swamps. Relief ranges from a high of 250 feet at Neutaconkanut Hill Park along the western corporate limits to a low of sea level at the eastern corporate limits.

A. Hurricane

Identifying Hurricane Hazards

"A 'tropical cyclone' is the scientific term for a closed meteorological circulation that develops over tropical waters. These large-scale non-frontal low-pressure systems occur throughout the world over zones referred to as 'tropical cyclone basins.'"[7] In the northeast they are known as hurricanes.

Hurricanes begin as tropical depressions in their formative stages. If the sustained velocity of the winds exceeds 39 mph it becomes a tropical storm. Once the tropical depression becomes a tropical storm it is considered a threat and it is given a name. When the winds exceed 74 mph, the system then becomes a hurricane. Most tropical depressions begin off of the coast of Africa near the Cape Verde islands or near the Caribbean as the sea surface temperature is above 81 degrees Fahrenheit in the summer months which assists in system formation. Tropical storms and hurricanes then will travel a path that may take them up the east coast thus impacting Rhode Island and the City of Providence.

While there is a low probability that the City will be significantly impacted by a hurricane in the next five years, one direct hit on the State of Rhode Island could be catastrophic for all of the cities and towns. The City was impacted by a hurricane several times throughout the past century, all of which are referenced in Table 8.

Below is the Saffir-Simpson scale which was "developed in the early 1970s by Herbert Saffir, a consulting engineer in Coral Gables, Florida, and Dr. Robert Simpson, then director of the National Hurricane Center. The scale is based primarily on wind speeds and includes estimates of barometric pressure and

[7] Neumann, C.J., et al. Tropical Cyclones of the North Atlantic Ocean, 1871-1986 (Washington, D.C.: U.S. Department of Commerce, NOAA, 1987).

storm surge associated with each of the five categories. It is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall."[1]

Table 5 - Saffir-Simpson Hurricane Scale					
Category	**Central Pressure**		**Winds**		**Damage**
	Millibars	Inches	(mph)	(kts)	
1	>980	>28.9	74-95	64-82	Minimal
2	965-979	28.5 - 28.9	96-110	83-95	Moderate
3	945-964	27.9 - 28.5	111-130	96-113	Extensive
4	920-944	27.2 - 27.9	131-155	114-135	Extreme
5	<920	<27.2	155+	>135	Catastrophic

Wind damage is a concern with hurricanes and tropical storms. Wind pressure, not wind speed is what causes wind damage. There are three different types of wind pressure: positive, negative, and internal.

As referenced in the State Hazard Mitigation Plan of 2008 on page 52:

- *Positive wind pressure* is what one feels when the wind is blowing in one's face. It is the direct pressure from the force of the wind that pushes inward against walls, doors and windows.
- *Negative wind pressure* occurs on the sides and roof of buildings. It is the same pressure that causes an airplane wing to rise. This negative pressure is also known as lift. Negative pressure causes buildings to lose all or a portion of their roofs and side walls, and pulls storm shutters off the leeward side of a building.
- *Interior pressure* increases dramatically when a building loses a door or window on its windward side. The roof feels tremendous internal pressures pushing up from inside of the building together with the negative wind pressure lifting the roof from the outside.

It is windborne debris that causes most of the damage; flying objects such as tree limbs, outdoor furniture, signs, roofs, gravel, etc.

[1] http://www.weather.com/encyclopedia/charts/tropical/saffirscale.html

Profiling Hurricane Hazards

Location

The entire city of Providence is vulnerable to hurricanes. The location of the City of Providence at the head of three rivers and the State of Rhode Island being situated along the Atlantic coast has left the city susceptible to hurricanes. The rain and winds that make up a hurricane have damaged the city in the past and continue to pose a threat. The Fox Point Hurricane Barrier has significantly reduced the risk of flooding, but a powerful hurricane remains the natural hazard that poses the highest risk to the City of Providence.

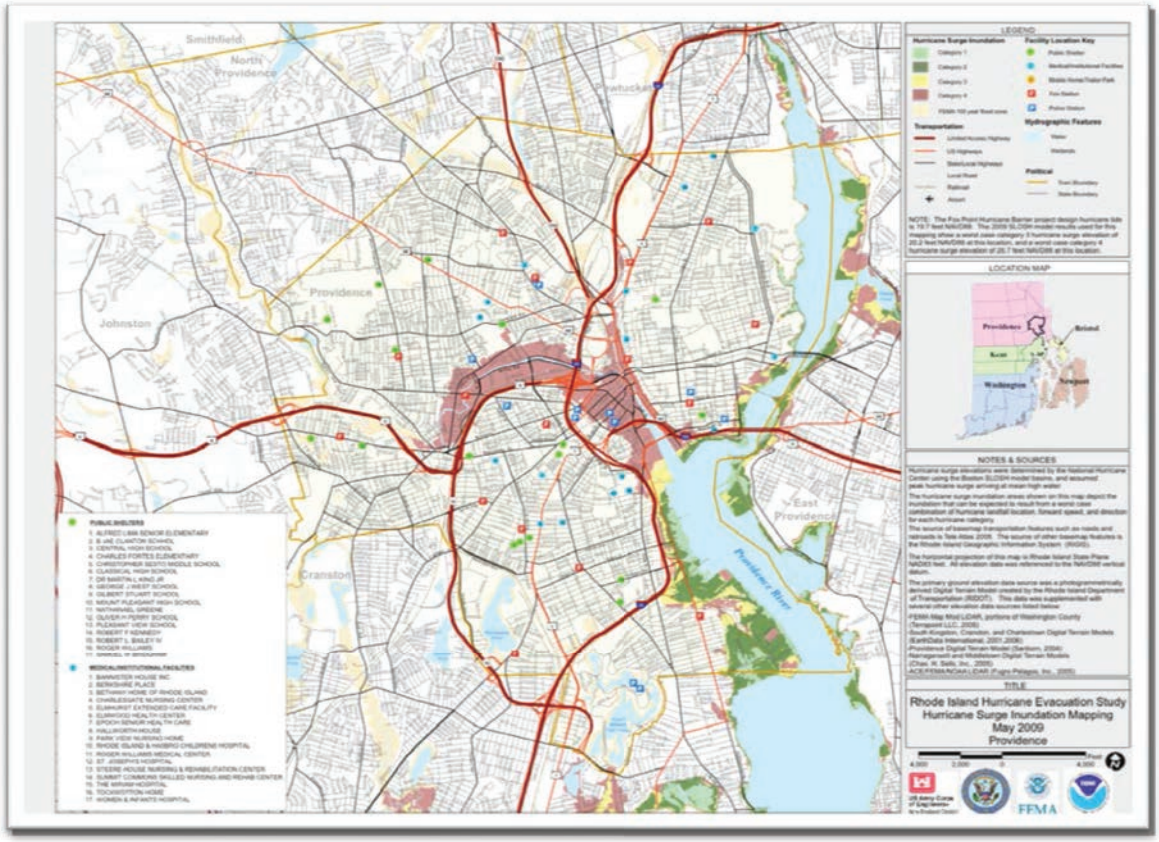
Timing & Duration

Hurricane season is between June 1 and November 1 each year. Peak times for the City of Providence and the State of Rhode Island are in August and September when the Atlantic Ocean waters are at their warmest. Statistically the peak of the season is September 10. The severity and speed of a hurricane will determine how long the inclement weather will affect the City. The amount of time a hurricane or tropical storm will affect the City depends on its size in diameter and the forward speed. Historically these storms increase their forward speed as they approach northern latitudes. To calculate the duration of a storm, divide the forward speed of the storm into its diameter, the total is the amount of time that the city will be impacted by the storm. Weather forecasting typically allows a few days advanced warning of the onset of a hurricane that will affect Providence.

Severity

The following ***Hurricane Surge Map*** indicates the severity of a Hurricane impacting the City of Providence:

Figure 1



Frequency

FEMA considers hurricanes in New England a low-frequency, high-impact event. Though they do not occur often, when they do, they leave their mark.

Intense Historic Hurricanes Strikes in New England

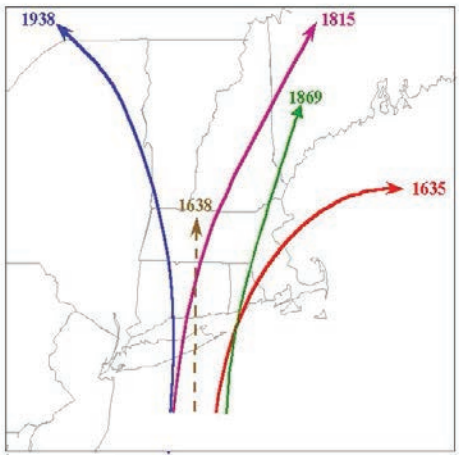


Figure2

Previous Occurrences

Although Rhode Island has not been hit by intense hurricanes (Category 4 or 5) as seen in other parts of the East Coast, we have had our share of major hurricanes that have caused extensive damage to the State. In the sixteen year period from 1938 to 1954, Rhode Island experienced three major hurricanes that caused a tremendous amount of damage and resulted in almost 300 deaths across the State. The great un-named hurricane of 1938 devastated Rhode Island, causing $100 million dollars in property damage and taking 262 lives. Hurricane Carol in August of

1954 caused similar damage dollar wise, but thankfully only resulted in the loss of 19 lives. Even though Rhode Island has not had hurricanes as severe as this in the last 50 years, we have had several that have resulted in several million dollars in property damage, mostly due to the fact that people like to live near the water and are naïve to the fact that even a small hurricane can wreak havoc on lives and property. The wind and rain that precede a hurricane can cause severe damage even to those communities that are further inland. Therefore, the threat of a hurricane to this community and the resulting wind and rain damage needs to be considered.

Table 6 - Significant Hurricanes in Rhode Island

Date	Name	Category	Winds	Property Damage (Millions)	Deaths
September 21, 1938	**N/A**	**3**	**95**	**100**	**262**
September 14, 1944	**N/A**	**3**	**82**	**2**	**0**
August 31, 1954	**Carol**	**3**	**110**	**90**	**19**
September 11, 1954	**Edna**	**3**	**40**	**.1**	**0**
September 12, 1960	**Donna**	**2**	**58**	**2.4**	**0**
September 27, 1985	**Gloria**	**2**	**81**	**19.8**	**1**
August 19, 1991	**Bob**	**2**	**63**	**115**	**0**

Source: 1998 Journal Bulletin: Rhode Island almanac, 112th Annual Edition and Rhode Island Hurricanes and Tropical Storms: A Fifty-Six Year Summary, National Weather Service Office, Providence, RI

Probability of Future Events

According to a forecaster at the National Weather Service, there is less than a 10-15% chance of a hurricane impacting the City of Providence in any given year. Hurricanes and tropical storms are frequent in the Atlantic. However, if they begin a northerly track up the east coast, they tend to curve eastward back out to sea.

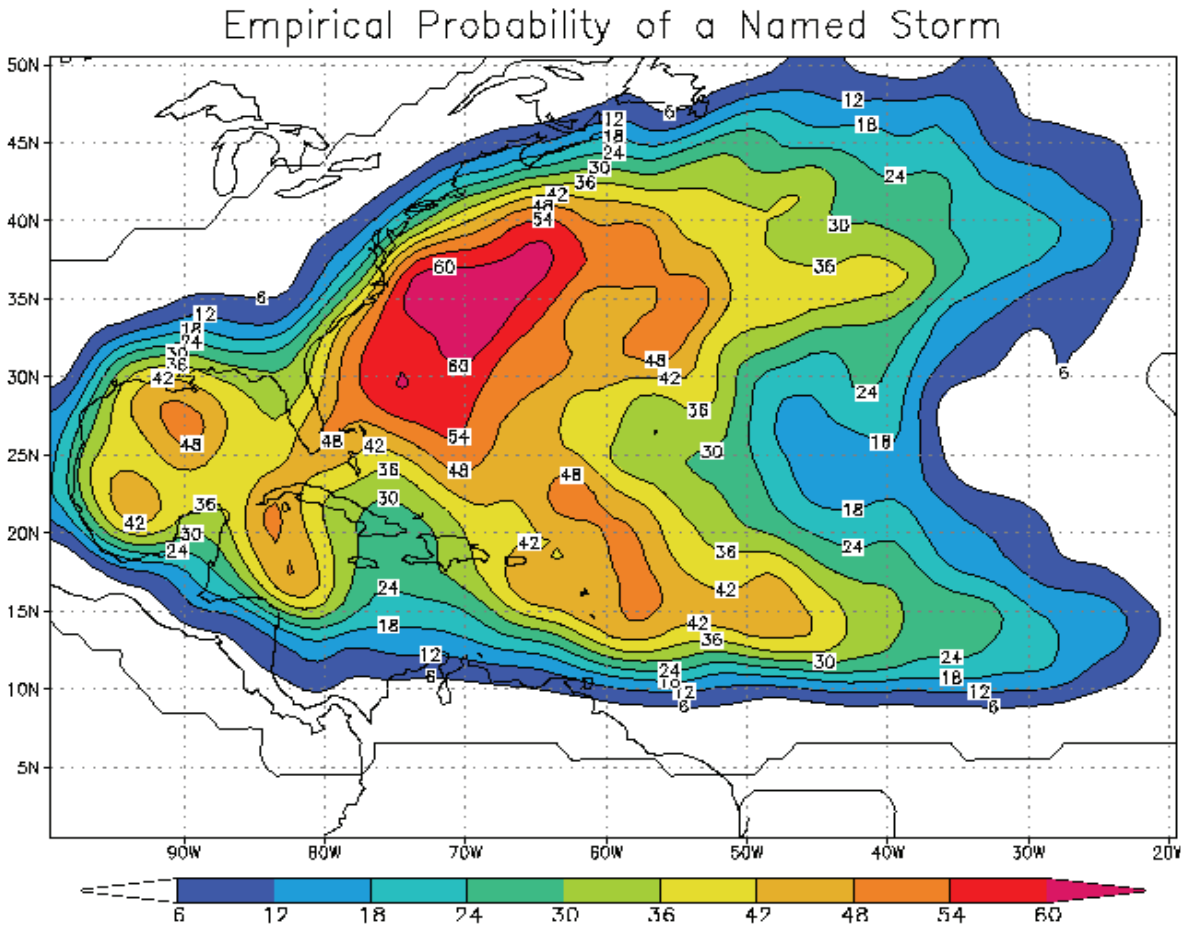


Figure 3 - Map of Empirical Probability of a Named Storm, The Atlantic Oceanographic and Meteorological Laboratory, 2007

Assessing Hurricane Vulnerabilities

Due to a typically mild climate, Providence is vulnerable to hurricanes and tropical storms. Strong winds and rain can damage infrastructure, isolate citizens and limit access to essential services. Although storms may cause some structural damage, the main vulnerabilities to a hurricane are systems and populations that may not be able to withstand temporary isolation or limited transportation.

The majority of the buildings in Providence will be able to withstand the impacts of a hurricane or tropical storm. However, the vulnerability to such a storm varies by the location and the type of structure. Taller buildings are more vulnerable to lightning. Some rooftops may blow off in a hurricane, severely damaging the buildings.

Hurricanes and tropical storms impact the natural environment by increasing storm water runoff, as well as increasing flooding and tree displacement. Such alteration of the natural environment will impact fish and wildlife habitat. However, these are natural processes; absent prolonged climate changes, animals

and their ecosystems are resilient to temporary changes in weather. However, hurricanes and tropical storms may have an impact on species and habitats that are already stressed. For example, increased runoff could increase the saturation rate of soils, thus increasing the likelihood of downed trees in high wind.

Roads in Providence are vulnerable to hurricanes and tropical storms. Excess precipitation and, downed trees and power lines are likely to limit access and isolate citizens, but are unlikely to cause major permanent damage to the transportation network. Heavy rain and wind may make roads impassible or limit visibility to the extent that driving is not safe.

Water supply and sewer facilities may be vulnerable to hurricanes and tropical storms with massive rainwater that quickly accumulates. Storm water drains and culverts may overflow during a heavy rain event and cause flooding.

Power outages and limited accessibility may force businesses to temporarily shut down. These unexpected closures can result in large financial losses. Loss of power can cause large product losses for food service businesses. Since businesses operate within an inter-connected system, the closure of one may have large impacts on other businesses in the area. Smaller businesses may not be able to recover from the loss of business or damages caused by a hurricane or tropical storm.

Hurricanes and tropical storms can leave residents completely isolated and without access to emergency assistance. Road closures may prevent residents that require significant medical care from access to necessities.

Storm Surge

Of additional concern to the City of Providence is Hurricane Storm Surge. Storm surge is an abnormal rise of water generated by a storm, over and above the predicted astronomical tides. Providence sits at the top of Narragansett Bay. If a Hurricane where to make landfall west of Providence, the wind generated on the eastern side of the storm could create serious surge elevations up the Bay that would all funnel at the head of the bay towards Providence and East Providence. The Fox Point Hurricane Barrier was built for this very reason. The Hurricane Barrier protects the central business district and high rise buildings of downtown Providence from the effects of coastal surge from a Hurricane event. The Hurricane surge map shown above details the areas of the coast that would be affected by different categories of hurricane impact.

The Fox Point Hurricane Barrier would hold out to roughly the surge likely to be generated from a Category 4 Hurricane impact in New England. The design storm for the Hurricane Barrier is a water elevation of 22.18 feet above mean low low water (mllw). The top of the Hurricane Barrier is 26.68 feet above mllw. For comparison, the Hurricane of 1938 had a water elevation of 17.52 feet above mllw. While this protects large areas of the city, India Point Park as well as The Port would be affected by surges from any category of Hurricane. The city is aware that these types of storm surge events can occur during any season and can be associated with winter storms as well as hurricanes.

In July 2011 Providence Emergency Management Agency created a "Fox Point Hurricane Barrier Coordination Guidebook" for all organizations that would be involved in implementing Hurricane Barrier actions during an event. This guide details the roles and responsibilities for various agencies in control of the hurricane barrier's various component parts such as river gates, street gates, dikes, and release valves. Businesses in the Port have their own evacuation plans in the event of a hurricane and the City of Providence has a Hurricane plan for evacuations of India Point Park and adjacent neighborhoods as shown on the Hurricane surge map.

B. Flood

Identifying Flood Hazards

A flood is a temporary inundation with water of normally dry land. Flooding can be caused by a body of water such as a river overflowing its banks or by a rapid accumulation of surface-water runoff.[9] Built structures can become flooded by groundwater seepage when the water table rises or the surrounding ground becomes saturated.

Flood damage can range from minimal localized damage to complete destruction of built structures. The velocity and volume of water present a risk in a flood event. Additionally, contaminants in the water pose a secondary threat.[10] Flood water may contain gasoline or other hazardous chemicals as well as debris. Consequently, flooding can present both immediate concerns and secondary effects.

FEMA requires municipalities to plan for the 100-year flood. The 100-year floodplain is an area that has a 1% chance of flooding in any given year.[11]

Profiling Flood Hazards

Location

Flooding in Providence can be the result of hurricanes, nor'easters, winter storms and dam failures. With 11 dams within the City limits and the frequent storms that hit the city, flooding poses its most significant threat in the form of property damage and disruption of infrastructure. The Fox Point Hurricane Barrier has significantly reduced the flooding caused by hurricanes and protected the low lying areas of the City. The City of Providence repetitive loss areas include Branch Avenue (mostly industrial properties), Charles Street (industrial properties and one residential apartment), Governor

[9] National Flood Insurance Program, "Flooding and Risks: What Causes Flooding," Federal Emergency Management Agency, http://www.floodsmart.gov/floodsmart/pages/flooding_flood_risk/what_causes_flooding.jsp.

[10] Federal Emergency Management Agency and American Red Cross, *Repairing Your Flooded Home*, (Washington DC: FEMA Publications, 1992), 15.

[11] Susan Bolton, JL Clark, Bob Freitag, and Frank Westurland, *Getting Wet: Benefiting from Flooding in the 21st Century*, (Draft, 2009).

Street (commercial property), India Street (industrial property), Melrose Street (industrial property near Roger Williams Park), Manton Avenue and Valley Street.

Timing & Duration

Flooding most frequently occurs in the six- month period from October through March. In the winter and early spring, there is less vegetation to soak up the precipitation and there is typically more rainfall. The duration of a flooding event may be limited to a few hours or may extend for several days or even weeks.

Severity

With 9 functioning dams within the City limits and the frequent storms that hit the city, flooding poses its most significant threat in the form of property damage and disruption of infrastructure. The Fox Point Hurricane Barrier has significantly reduced the flooding caused by hurricanes and protected the low laying areas of the City.

Frequency

The City of Providence experiences urban flooding frequently throughout the year. Flooding most frequently occurs from October through March.

Previous Occurrences

According to NOAA, in March 2001 minor to moderate flooding occurred along the Blackstone and Pawtuxet Rivers as a result of melting snow and heavy rainfall. Damage was estimated at three million dollars, and affected nearly 1,400 homes and 37 businesses. The Blackstone River at Woonsocket crested at 11.65 feet at 225 am on the 23rd (flood stage is 9 feet). The Pawtuxet River at Cranston crested at 11.36 feet at 615 pm on the 22nd (flood stage is 9 feet).

On March 21st, 2005 the Pawtuxet River at Cranston Low pressure tracking south of New England brought 3 to 4 inches to much of Rhode Island, resulting in significant urban and poor drainage flooding. In Providence County, flooding was reported in the Olneyville section of Providence including routes 6 and 10. There was over $50,000 of property damage reported in Providence County.

On October 15th, 2005 a low pressure system interacted with a plume of tropical moisture resulting in excessive rain and flooding across Rhode Island. Between 2.5 and 4.5 inches of rain fell during this event. Many roads were closed region wide; and approximately 500 evacuations occurred. These evacuations were concentrated mainly along the Pawtuxet, Pocasset, Woonasquatucket, and Blackstone Rivers. Along the Blackstone River, evacuations occurred in Woonsocket and Central Falls. In Providence, the fire department rescued people from their flooded cars on Charles Street and Branch Avenue near the Woonasquatucket River. This event caused $1.6 million in property damage in the State of Rhode Island.

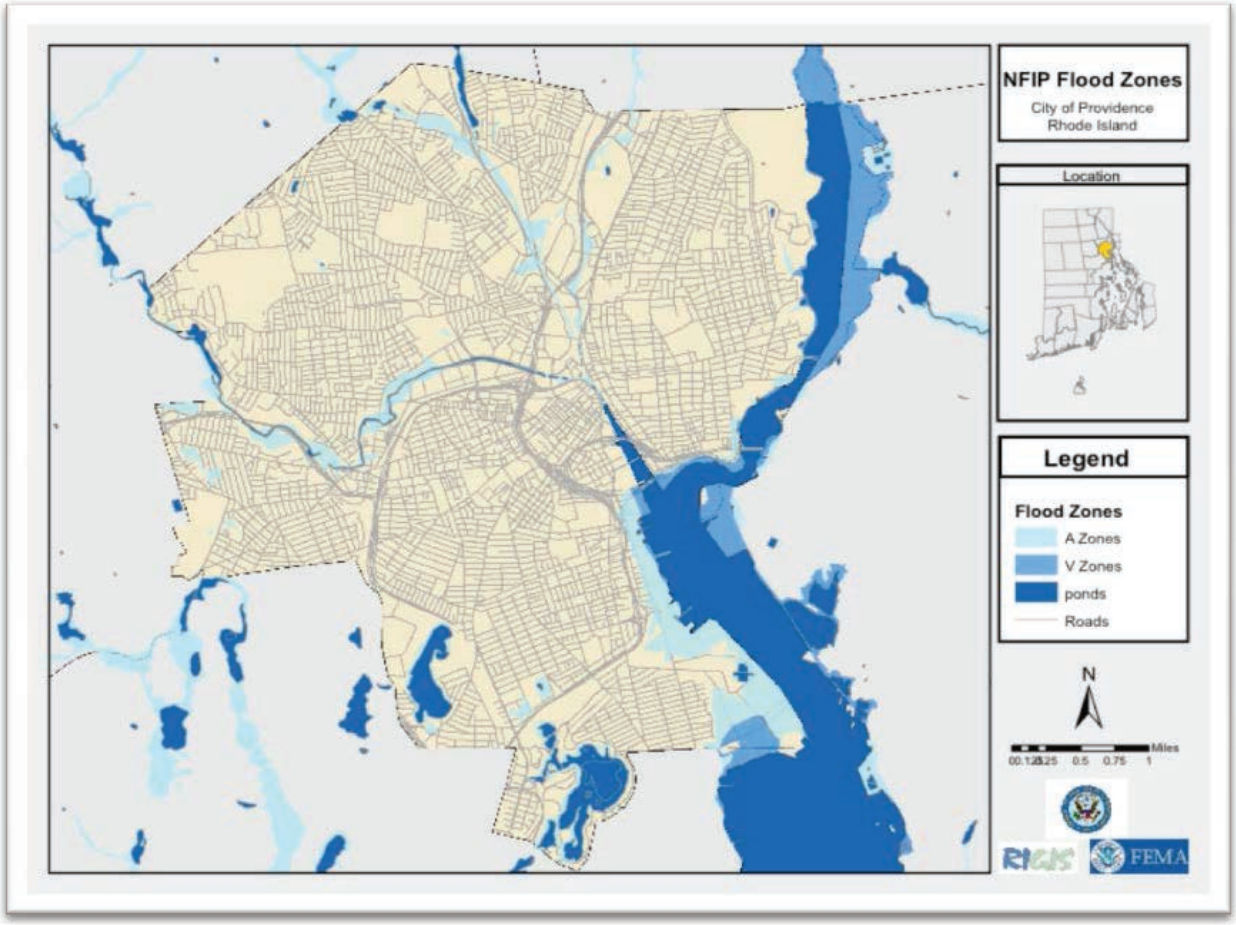


Figure 4: NFIP Flood Zones, Rhode Island Geographic Information System

MARCH 2010 FLOOD EVENT

Disaster Operations

PEMA's role in disaster operations is to coordinate response assets through the Emergency Operations Center (EOC), maintain situational awareness and communications functionality and interoperability, as well as assist in damage assessments to ascertain financial impacts from the incident and begin estimating recovery needs. Recent disaster operations include the March 2010 flooding event. The City of Providence had hundreds homes affected by flood damage throughout the city. There were 264 homeowners and renters who received some form of financial assistance through FEMA' s Individual Assistance program for a total of $383,809 through the Presidential Disaster Declaration. After the evacuation of the families in the affected area PEMA opened a shelter from March 30 to April 2, 2010, accommodating approximately 60 individuals.[12]

[12] FEMA Individual Assistance figures were; back in 2010; immediately available on the federal website www.fema.gov by clicking the state, then the particular Disaster Number, and a table of Public Assistance and

Stafford Act Emergency Declarations

A Presidential Disaster Declaration was issued March 29, 2010 for most counties in Rhode Island due to the record breaking rainfall the State received from April 12 to March 12 of 2010. The Stafford Act is a 1988 amended version of the Disaster Relief Act of 1974 (Pub.L. 93-288). It created the system in place today by which a presidential disaster declaration of an emergency triggers financial and physical assistance through the Federal Emergency Management Agency (FEMA). The Act gives FEMA the responsibility for coordinating government-wide relief efforts. The Disaster Declaration for Providence County opened the way for the City of Providence to receive FEMA financial aid through the Public Assistance Program.

Damages

The March Floods caused extensive flooding and washouts of sections of roads and bridges in several areas of the City. Extensive local flooding occurred along Valley Street, the Atwells Avenue Bridge, and Douglas Avenue. All these road and bridge structures are on the Federal Aid Highway System, which means that during a presidentially declared disaster, damage to these structures falls under the Federal Highway Administration's (FHWA) Emergency Relief Program.

However, through FEMA's Public Assistance Program the City has received federal re-imbursement for overtime costs for emergency workers during the flood incident period as well as costs for debris removal associated with work performed by the Public Works Department.

PEMA staff is currently working with Planning Department Staff on Community Development Block Grant funding (CDBG) for a floodplain study of several of the areas where flooding is a recurring problem as well as possible dredging, silt removal, culvert maintenance and replacement, and wetland restoration. A total of $8,935,237 is available statewide for this CDBG allocation.

Current Status

As of September 28, 2010, the City of Providence has five FEMA project worksheets approved for a total of $237,310.65. This amount represents the 90% Federal Cost Share on emergency work project worksheets for the Police Department, Fire Department, School Department, Department of Public Works and Providence Water. The City also has several permanent work projects worksheets submitted

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Individual Assistance figures were available for access. Since FEMA redesigned their federal website in 2012, these figures are no longer linked through the map that has state by state federal disaster declaration information. The State of Rhode Island Emergency Management Agency (RIEMA) was also periodically sending revised spreadsheet via email to city and town officials with updates on numbers of PA and IA dollars expended.

to FEMA at this time. Permanent work is reimbursed by FEMA on a quarterly basis as the work progresses. The permanent work is estimated to be as follows:[13]

- Providence Schools Category E for $972,646
- Providence Water Category C and E for $64,528

The City of Providence has had two projects approved through the Federal Highway Administration's (FHWA) Emergency relief Program. The estimated costs to be funded by FHWA are as follows:

- Atwells Avenue Bridge for $1,300,000
- Douglas Avenue Culvert at Geneva Pond for $4,000,000

Summary of Atwells Avenue Bridge Situation from RIDOT

The following is a quick summary of some of the history and status of the project:

- Suffered damage from the March Flood
- The bridge is owned and maintained by the City of Providence but Atwells Avenue is on the Federal Aid System; therefore the flood repair will be funded by FHWA and not FEMA
- RIDOT agrees to administer the project for the City of Providence
- Federal Highway Administration concurred that the most prudent solution was to replace the superstructure
- RIDOT has advanced the design of the project to the 30% stage
- The significant issues that have been identified at this time are:
    - The existing trusses are historic
    - The bridge carries gas, water, telephone, sewer, and electric
    - The bridge crosses the Woonasquatucket River and environmental and permits are necessary
- The schedule is now being driven by the utility, historic, and environmental permitting requirements
- Advertising for construction bids is anticipated for late summer/early Fall of 2011 and is dependent on obtaining the necessary cultural and environmental permits
- Based on concern about keeping the sidewalks closed for a prolonged period of time, RIDOT is going to evaluate the feasibility of repairing at least one sidewalk. RIDOT sent out an inspection team in November 2010 to evaluate the sidewalk trusses and sidewalk floor system.

Probability of Future Events

[13] Data on City of Providence project worksheets eligible under FEMA Public Assistance were compiled by Josh O'Neill, Providence Emergency Management Agency (PEMA) working with Providence City Department Directors and local FEMA project specialists assigned to the City of Providence in 2010.

Reports from the Intergovernmental Panel on Climate Change[14] confirm that the region's climate is changing and that the impacts will be far reaching. The City of Providence can expect an increase of flooding from severe storm events in the future.

While changes in overall annual precipitation are not projected to be significant, the timing and character of precipitation is projected to change. Winters will bring more rain and less snow. Summers will generally tend to be dryer, increasing susceptibility to flash floods as a secondary hazard to severe summer rainstorms. In addition, the probability of secondary hazards will increase, including saturated soil hazards such as falling trees.

Assessing Flood Vulnerabilities

Most of the existing structures in the flood zone are older buildings, which have not been brought up to current floodplain standards.

The 100-year flood (also referred to as a base flood) is an event that has a 1% chance of happening in any given year and is the storm event used to determine the flood zones, which have specific zoning and building requirements throughout the city and state. The risk of experiencing a flood of this magnitude increases with the length of time considered.

Due to the City's low mean sea level elevation of +6.20 feet and the Providence River's mean sea level of +3.50 feet, Providence has been vulnerable to extensive flood damage. As noted earlier, the City suffered extensive damage from the hurricanes of 1938 and 1954 when, in each instance, water depths of up to eight feet were experienced in the City's commercial area. Damage from the 1938 hurricane amounted to $16.3 million approximately $225 million in today's dollars. Damage from Hurricane Carol amounted to $25.1 million about $134 million in today's dollars. In July 1961 construction began on the Fox Point Hurricane Barrier and was completed in January 1966 at a cost of $16 million. Since the barrier was completed, it has prevented flood damages estimated at $2.4 million. The Fox Point Hurricane Barrier is located immediately south of the New England Power Company Plant, about 0.2 miles north of Fox Point and one mile south of downtown Providence. The barrier provides protection against tidal flooding from hurricanes and other coastal storms for about 280 acres of downtown Providence. The Army Corp of Engineers operates and maintains the Barrier, which is tested four times a year and is not likely to fail for mechanical reasons. The protected area includes the commercial and industrial center, transportation facilities, public utilities, and many homes.

Flood insurance policy holders in Providence have suffered 104 repetitive losses within 17 properties, the third highest in the State.[15] A repetitive flood loss is significant damage to an insured structure which has sustained a minimum of two events since 1978 that NFIP has paid greater than or equal to $1,000. The repetitive loss areas are marked on the GIS map. These areas include Branch Avenue (most

[14] http://www.ipcc.ch/

were industrial properties), Charles Street (industrial properties and one residential apartment), Governor Street (commercial property), India Street (industrial property), Melrose Street (industrial property near Roger Williams Park), Manton Avenue, and Valley Street.

Providence has a good rate of compliance with flood insurance policies, which makes a disaster less costly. As seen in Table 8, the Federal Emergency Management Agency estimated that there was over $121,949,100 worth of property in Providence insured by the National Flood Insurance Program as of as of 01/11/2011.

Table 7 - Summary of National Flood Insurance Program Activity in Providence[16]

Total # of Policies	Total Premium	Value of Property Covered	Policies in V-Zone*	Policies in A-Zone*	# of Claims since 1978	Value of Claims since 1978	Repetitive Flood Losses
452	$553,281	$121,949,100	3	177	322	$9,317,074	104

* V-zone refers to the Velocity zone, where waves greater than 2.9 feet are possible during the 100-year flood. A-zones are the other areas within the 100-year flood zone with less than 2.9-foot waves. (FEMA, April 1999).

The City's topography and location along three rivers at the head of Narragansett Bay makes it vulnerable to storms and flooding. Floodplain areas are shown on Maps in Appendix F. These areas are subject to riverine flooding and the accumulation of water in depressed areas due to sustained heavy rainfall and/or melting snow.

Map Modernization

According to FEMA, Map Modernization is responding to National Flood Insurance Program (NFIP) requirements and feedback provided by Federal, State, and local Program stakeholders.

- Flood hazard conditions are dynamic, and many NFIP maps may not reflect recent development and/or natural changes in the environment.

[16] Updated National Flood Insurance Program Data for Providence was derived from the State Floodplain Managers at Rhode Island Emergency Management (RIEMA) throughout 2011-2012 period. The effective Flood Insurance Study is now July 30, 2012 which is the revised Preliminary Date for the Preliminary Coastal maps panels issued in 2012 to certain communities undergoing coastal map panel revisions. The new hard copies and electronic copies of the preliminary maps are located at both the emergency management office and the department of planning and development in Providence.

- Updated NFIP maps can take advantage of revised data and improved technologies for identifying flood hazards.
- Up-to-date maps support a flood insurance program that is more closely aligned with actual risk, encourage wise community-based floodplain management, and improve citizens' flood hazard awareness.
- Local communities and various stakeholders desired more timely updates of flood maps and easier access to the flood hazard data used to create the maps.

Map Modernization is a cornerstone for helping community officials and citizens be better prepared for flood-related disasters. Providence County Digital Flood Insurance Rate Maps became effective March 2nd, 2009. Map modernization continues to be an ongoing process in the City of Providence, as maps are updated from 2010 to 2105 they will be incorporated into the plan.[17]

C. Winter Storms and Nor'easters

Identifying Winter Storm and Nor'easter Hazards

Winter storms often spawn other natural hazards, such as extreme winds and coastal flooding which can lead to erosion. One such occurrence was the Blizzard of 1978, when heavy snowfall paralyzed the interstate roads and made movement through the City almost impossible, except for emergency vehicles. The weight of accumulated snow or ice can damage infrastructure and even cause buildings to collapse. Heavy accumulation of snow and ice and strong winds can also damage utility and power lines.

Flat roofed houses face a more serious structural risk from heavy snow. Ice jam formation depends on weather and physical conditions in river channels. Conditions similar to a flash flood occur when there is a rapid rise of water at the jam and this extends upstream, or when unusually warm weather follows a heavy snowstorm. Ice jams are most likely to occur where the channel's slope naturally decreases, where culverts freeze solid and at natural channel constrictions such as bends and bridges, and along Shallow river reaches where channels may freeze solid. Snow melting has caused road flooding in the low lying areas that were mentioned under the flood risk section. FEMA's experience has shown that no area can fully prepare for severe winter

[17] Updated National Flood Insurance Program Data for Providence was derived from the State Floodplain Managers at Rhode Island Emergency Management (RIEMA) throughout 2011-2012 period. The effective Flood Insurance Study is now July 30, 2012 which is the revised Preliminary Date for the Preliminary Coastal maps panels issued in 2012 to certain communities undergoing coastal map panel revisions. The new hard copies and electronic copies of the preliminary maps are located at both the emergency management office and the department of planning and development in Providence.

storms. However, recorded snow level (depth) data can give insight to probability and frequency of occurrence of severe winter storms.

Profiling Winter Storm and Nor'easter Hazards

Location

Winter storms pose a significant threat to the entire City of Providence. Even though winter storms only occur a few months out of the year, they are consistently a problem for the City.

Timing & Duration

Winter storms and Nor'easters typically occur between November and March and can last anywhere from a few hours to a few days.

Severity

Heavy snow can immobilize a region and paralyze a city, stranding commuters, closing airports, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can cause roofs to collapse and knock down trees and power lines. Homes may be isolated for days. The cost of snow removal, repairing damages, and the loss of business can have severe economic impact on cities and towns. Accompanying the snowfall are extremely cold temperatures, wind, and ice.

Frequency

The City of Providence accumulates approximately 40 inches of snowfall each year and has faced winter storm related emergencies in the past. The frequency of these events and their potential to shutdown the City makes winter storms a high risk hazard.

Previous Occurrences

The City has experienced many winter storms and nor'easters over the years. In the 2010 – 2011 winter season the City experienced a storm at the end of December 2010, and another winter storm just two weeks later in January 2011 when over 15 inches of snow fell in a 15 hour period of time.

Table 8 – Precipitation in Inches for the City of Providence

Year	Total Precipitation	Total Snow Accumulation
2010	57.72	25.6
2009	55.01	50.9
2008	58.12	37.0
2007	47.65	31.9

Source: Rhode Island Department of Environmental Management,
Courtesy of Lenny Guiliano, Senior Air Quality Specialist/Meteorologist, 2010

Probability of Future Events

Due to the climate and location of the City of Providence, winter storms and Nor'easters have a high probability of occurring on a yearly basis.

Assessing Winter Storm and Nor'easter Vulnerabilities

The majority of the building stock in Providence will be able to withstand the impacts of a snow, wind or ice storm. However, the vulnerability to such a storm varies by the location and the type of structure. Buildings located on hilltops are more vulnerable to lightning and those located on steep slopes are vulnerable to landslides. Flat-roofed buildings and other structures that accumulate snow may be susceptible to collapse under heavy snow.

Winter Storms and nor'easters impact the natural environment by increasing storm water runoff, as well as increasing flooding and tree displacement. Such alteration of the natural environment will impact fish and wildlife habitat. However, these are natural processes; absent prolonged climate changes, animals and their ecosystems are resilient to temporary changes in weather. However, severe storms may have an impact on species and habitats that are already stressed. For example, increased runoff could increase the saturation rate of soils, thus increasing the likelihood of downed trees in high wind. Sand on roadways to provide friction on icy surfaces may create sedimentation problems in local streams and rivers, thereby affecting salmon habitat.

Roads in Providence are vulnerable to winter storms and Nor'easters. Excess precipitation is likely to limit access and isolate citizens, but it is unlikely to cause major permanent damage to the transportation network. Heavy rain, ice or snow may make roads impassable or limit visibility to the extent that driving is not safe. Water supply and sewer facilities may be vulnerable to winter storms and nor'easters with massive rainwater that quickly accumulates. Storm water drains and culverts may overflow during a heavy rain event and cause flooding.

Power outages and limited accessibility may force businesses to temporarily shut down. These unexpected closures can result in large financial losses. Loss of power can cause large product losses for food service businesses. Since businesses operate within an inter-connected system, the closure of one may have large impacts on other businesses in the area. Smaller businesses may not be able to recover from the loss of business or damages caused by a severe storm.

Winter Storms and Nor'easters can leave residents completely isolated and without access to emergency assistance. Road closures may prevent residents that require significant medical care from access to necessities.

D. Communicable Diseases (Pandemic)

Identifying Communicable Disease Hazards

The Centers for Disease Control and Prevention (CDC) defines an influenza pandemic as: "...a global outbreak of disease that occurs when a new influenza A virus appears or 'emerges' in the human population, causes serious illness, and then spreads easily from person to person worldwide. Pandemics are different from seasonal outbreaks or 'epidemics' of influenza. Seasonal outbreaks are caused by subtypes of influenza viruses that are already in existence among people, whereas pandemic outbreaks are caused by new subtypes or by subtypes that have never circulated among people or that have not circulated among people for a long time."

The State Pandemic Flu Plan states that pandemics have several characteristics that make them different than most other hazards.

- Pandemics last much longer than most public health emergencies and may include "waves" of activity separated by three to twelve months.

- Attrition among health-care workers and first responders is high because they cannot avoid exposure. Many become ill. Others must care for sick family members or for children home from school or day care.

- Resources become limited depending on the severity of the pandemic and related disruptions in basic services. When a novel strain of influenza emerges, 25% to 35% of the population may develop clinical disease. Case fatality may approach three percent as was witnessed during 1918.

One of other challenge that is faced during a pandemic is that antiviral or vaccines are not readily available in the early stages of the pandemic. It takes approximately six to nine months to produce a new vaccine or antiviral. Also, current antivirals may become ineffective against a particular strain of influenza.

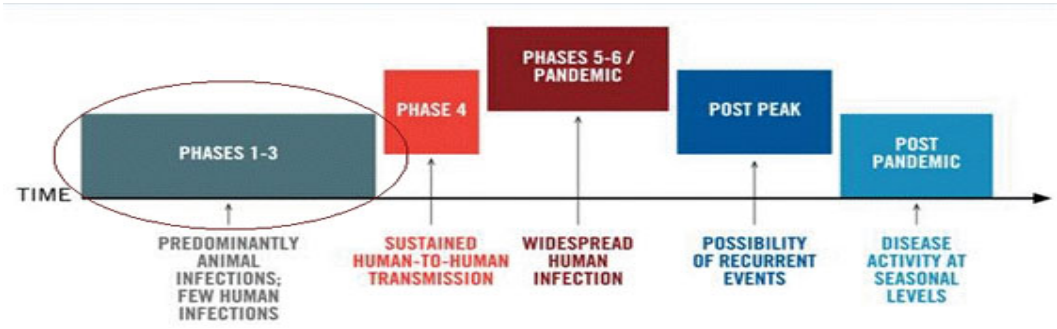


Figure 5 – Cycle of a Pandemic

The World Health Organization defines a pandemic in six phases. Figure 4 illustrates the cycle of a pandemic Table 9 defines the different phases.[18]

Table 9 - Phases of Pandemic	
Phase	**Definition**
1	No viruses circulating among animals have been reported to cause infections in humans
2	An animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans, and is therefore considered a potential pandemic threat.
3	An animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of disease in people, but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks. Limited human-to-human transmission may occur under some circumstances, for example, when there is close contact between an infected person and an unprotected caregiver. However, limited transmission under such restricted circumstances does not indicate that the virus has gained the level of transmissibility among humans necessary to cause a pandemic.
4	Characterized by verified human-to-human transmission of an animal or human-animal influenza reassortant virus able to cause "community-level outbreaks." The ability to cause sustained disease outbreaks in a community marks a significant upwards shift in the risk for a pandemic. Any country that suspects or has verified such an event should urgently consult with WHO so that the situation can be jointly assessed and a decision made by the affected country if implementation of a rapid pandemic containment operation is warranted. Phase 4 indicates a significant increase in risk of a pandemic but does not necessarily mean that a pandemic is a forgone conclusion.
5	Characterized by human-to-human spread of the virus into at least two countries in one WHO region. While most countries will not be affected at this stage, the declaration of Phase 5 is a strong signal that a pandemic is imminent and that the time to finalize the organization, communication, and implementation of the planned mitigation measures is short.
6	Characterized by community level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in Phase 5. Designation of this phase will indicate that a global pandemic is under way.

Profiling Communicable Diseases Hazards

Location

The entire City of Providence would be affected by a pandemic outbreak. It is estimated that the clinical disease attack rate will be 30% in the overall population. Illness rates will be highest among school-aged children, at approximately 40%, and decline with age. It is estimated that among working adults, 20% will become ill during a community outbreak.[19]

[18] "Global Alert and Response," World Health Organization, http://www.who.int/csr/disease/avian_influenza /phase/en/index.html, 2011.

[19] Pandemic Flu Plan. Rhode Island Department of Health, 2006.

Timing & Duration

The timing of pandemics varies, however, planning assumptions indicate that they would consist of at least two waves and each wave would be approximately two months in duration. Each wave of activity is separated by three to twelve months.

Severity

It is estimated that 30% of the population would be affected with a potential for a 3% fatality rate. Table 10 illustrates how the State of Rhode Island would be impacted by a pandemic with the assumption that a vaccine or anti-viral would be ineffective.

Table 10 - Influenza in Rhode Island – A Pandemic Model[20]

	Average Flu Season Estimate	***Moderate Severity Flu Pandemic Estimate***	***Severe Flu Pandemic Estimate***
Model	**Average Year**	**Like 1957-58, 1967-68**	**Like 1918**
Impacts			
Illnesses	125,000	250,000	300,000
Outpatient Visits	25,000	100,000	150,000
Hospitalizations	670	3,027	34,650
ICU Care	50	425	5,197
Mechanical Ventilation	25	227	2,599
Deaths	120	731	6,661
Economic Impact		$400 Million	Severe

Frequency

Previous Occurrences

There have been four major pandemics in the last century in the United States.

- 1918-19, "Spanish flu," [A (H1N1)], caused the highest number of known influenza deaths. More than 500,000 people died in the U.S., and up to 50 million people may have died worldwide. Nearly half of those who died were young, healthy adults. The 1918-19 virus appears to have had an avian origin.

- 1957-58, "Asian flu," [A (H2N2)], caused about 70,000 deaths in the U.S. First detected in China in February 1957, the Asian flu had spread to the U.S. by June 1957.

[20] Pandemic Flu Plan. Rhode Island Department of Health, 2006.

- 1968-69, "Hong Kong flu," [A (H3N2)], caused about 34,000 deaths in the U.S. This virus was first detected in Hong Kong in early 1968 and spread to the U.S. later that year. The 1957-58 and 1968-69 pandemics were caused by viruses containing genes from a human influenza virus and an avian influenza virus.

- 2009 – 2010, "H1N1 flu," [A(H1N1)], caused approximately 18,000 deaths worldwide. This virus had a swine origin and was initially found in Mexico and the U.S.

Probability of Future Events

It cannot be determined when a pandemic may occur. However, it is certain that this is still a hazard that will recur. Pandemics are considered a low-probability with a high-impact.

Assessing Communicable Diseases Vulnerabilities

Pandemics tend to spread and affect populations that live or are in close proximity to one another. For example, an outbreak could occur in a nursing home or a school because- more germs are spread. During a pandemic, public gatherings are kept to a minimum to prevent the spread of influenza.

Pandemics have a higher fatality rate in very young children and the elderly. School-age children will have a higher rate of illness due to the close proximity of children to one another in schools. Influenza is spread through bodily fluids such as sneezing and coughing and children are more likely to cough or sneeze into their hand and touch someone else prior to washing their hands.

E. Extreme Temperatures

Identifying Extreme Temperatures Hazards

A heat wave occurs when a system of high atmospheric pressure moves into an area. In such a high-pressure system, air from upper levels of our atmosphere is pulled toward the ground, where it becomes compressed and increases in temperature.

This high concentration of pressure makes it difficult for other weather systems to move into the area, which is why a heat wave can last for several days or weeks. The longer the system stays in an area, the hotter the area becomes. The high-pressure inhibits winds, making them faint to nonexistent. Because the high-pressure system also prevents clouds from entering the region, sunlight can become punishing, heating up the system even more. The combination of all of these factors come together to create the exceptionally hot temperatures we call a heat wave.

Typically a heat wave lasts two or more days and has a significant effect on human health and/or infrastructure. Heat waves have caused thousands of deaths due to hyperthermia, and cause catastrophic crop failures, melt tarmacs, cause roads to crumble, and can cause the ground around houses can to dry out leaving homes much more vulnerable to subsidence.

While it is hard to quantify the exact total numbers of deaths from heat waves, about 170 Americans succumb to the demands of summer heat. Its annual fatality potential is matched by no other natural hazard. In a 40-year period from 1936 to 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the disastrous heat wave of 1980, more than 1,250 people died as a result of extreme heat.

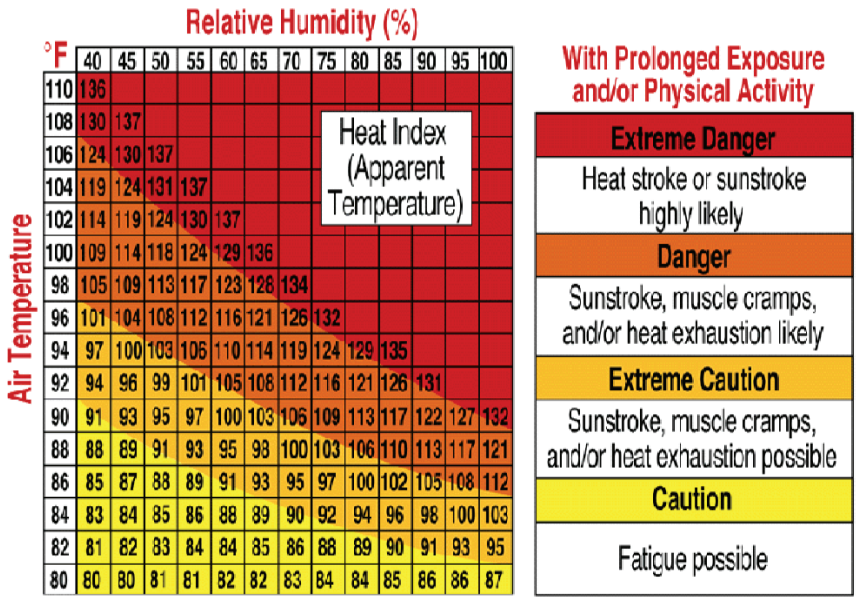


Figure 6

The National Weather Service (NWS) provides alerts when Heat Indices approach hazardous levels. Figure 4 provides the alert procedures for the National Weather Service. In the event of an extreme heat advisory, The National Weather Service does the following:

• Include HI values and city forecasts;

• Issue special weather statements including who is most at risk, safety rules for reducing risk, and the extent of the hazard and HI values;

• Provide assistance to State/Local health officials in preparing Civil Emergency Messages in severe heat waves.

Profiling Extreme Temperatures Hazards

Location

Extreme Heat would affect the entire City of Providence.

Timing & Duration

A heat wave typically lasts for two or more days and usually occurs anywhere between June and August.

Severity

Temperatures that hover 10 degrees or more above the average high temperature for a region, and last for several weeks, constitute an extreme heat event.

Frequency

Table 11 – City of Populations in Year 2000 and Excessive Heat Events (EHE) attributable excess mortality rate for different time periods					
CITY	**2000 Population (in 100,000s)**	**EHE excess Mortality Rate for the Period of 1975-1995**	**EHE excess Mortality Rate for the Period of 1975-2004**	**Average Number of EHE Days: 1975-1995**	**Average Number of EHE Days 1975-2004**
Providence, RI	1.7	22.9	22.0	6.5	6.5

Table 12 – Changes in EHE, attributable excess mortality rates and EHE days				
CITY	**Reduction in EHE attributable Excess mortality rates per 100,000 (1975–1995 rate—1975–2004 rate)**	**Reduction in mortality rate as a percentage of 1975–1995 baseline rate**	**Reduction in average number of EHE days per year as a percentage of 1975– 1995 baseline rate**	**Percentage reduction in mortality rate Minus percentage reduction in the average number of EHE days**
Providence, RI	0.95	4	1	3

These tables are from "An Evaluation of the progress in heat related human mortality in major U.S. Cities", Laurence S. Kalkstein • Scott Greene • David M. Mills • Jason Samenow, Received: 26 August 2009 / Accepted: 30 April 2010
_ Springer Science+Business Media B.V. 2010

Table 13 – Estimates of heat-attributable deaths per summer and mortality rates in the City of Providence (Source: EPA, "Excessive Heat Events Guide Book", EPA-43-B-06-005, June 2006)				
CITY	**Standard Metropolitan Statistical Area (SMSA) Deaths1**	**(Estimated average summertime heat attributable deaths from 1990 population) Deaths2**	**Mortality Rate1 (Estimated average summertime heat attributable deaths from 1990 population)**	**Mortality Rate2 (Estimated heat attributable deaths per 100,000,**
Providence, RI	47	N/A	4.14	N/A

Previous Occurrences

Table 14 – Previous Heat Waves in Rhode Island	
Year	**Description**
2010	The weather pattern for July 2010 was dominated by the North Atlantic High over much of the eastern and southern United States, causing a heat wave to blanket the State of Rhode Island. July temperatures averaged warmer than normal along most of the country east of the Mississippi River. July 2010 ranked as the warmest July between 1895 and 2010 in Rhode Island.
2008	June of 2008 saw a heat wave lasting three days with temperatures soaring above 95 degrees, breaking records set the previous year.
2007	In August 2007, a heat wave gripped Rhode Island sending temperatures above 90 degrees and lasting 2 days.
1999	The summer of 1999 saw a devastating heat wave and drought in the eastern United States. Rainfall shortages resulted in the worst drought on record for Maryland, Delaware, New Jersey, and Rhode Island.

In July 2010, the City of Providence recorded several days of record breaking heat of up to 108 degrees with a Heat Index of up to 120 degrees. The extreme heat caused over 20,000 homes to have power outages. The City opened up two cooling centers and the Red Cross handed out water and popsicles. The City issued the following precautions during the heat wave:

- Do not leave children or pets in cars unattended because the temperatures in closed cars will far exceed the outdoor temperature.
- Dress for the heat. Wear lightweight, light-colored clothing. Light colors will reflect away some of the sun's energy. It is also a good idea to wear a hat.
- Drink water. Carry water or juice with you and drink continuously, even if you do not feel thirsty. Avoid alcohol and caffeine, which dehydrate the body.
- Eat small meals and eat more often. Avoid foods that are high in protein which increases metabolic heat.
- Slow down. Avoid strenuous activity. If you must do strenuous activity, do it during the coolest part of the day, which is usually in the morning between 4:00 a.m. and 7:00 a.m.
- Stay indoors when possible.
- Check on your neighbors who are most at risk, especially the elderly and small children.
- Take regular breaks when engaged in physical activity on warm days. Take time out to find a cool place. If you recognize that you or someone else are showing the signals of a heat-related illness, stop activity and find a cool place. Remember, have fun, but stay cool!
- In an emergency situation, residents should always call 911.

Probability of Future Events

At this time, it is impossible to stop an Extreme Heat event. With rising averages of temperatures world-wide, mitigation activities should be tailored towards protecting lives and preventing injury from an Extreme Heat event.

Assessing Extreme Temperatures Vulnerabilities

Extreme heat can cause roads to buckle and crumble. The excessive use of A/C units put the power grid in jeopardy causing wide spread power outages. This Put critical infrastructure at risk of failure including traffic controls, telecommunications and police and medical services.

Natural

Various sectors of the agriculture community are affected by extreme heat. Livestock, such as rabbits and poultry, are severely impacted by heat waves. Millions of birds have been lost during heat waves.

Milk production and cattle reproduction also decreases during heat waves. In terms of crop impacts, it is unclear what the impacts are of very high temperatures for a few days, versus above average summer temperatures versus drought. We do know that a high temperature at the wrong time inhibits crop yields. Wheat, rice, maize, potato, and soybean crop yields can all be significantly reduced by extreme high temperatures at key development stages.

In the event of a heat wave, some crop growth may be impacted if the heat occurs during the plant's early development stages. If a drought accompanies a heat wave, water shortages will impact crop and other vegetation growth. Extreme high temperatures may also increase the likelihood of wildfires. Heat waves can increase temperatures in streams and rivers, which could lead to changes in migration timing, reduce growth rates and reduce available oxygen for local fish species.

Systems

There are several impacts on transportation documented in case studies. Highways and roads are damaged by excessive heat. Asphalt roads soften. Concrete roads have been known to "explode," lifting 3 to 4-foot pieces of concrete. During the 1980 heat wave hundreds of miles of highways buckled (NOAA, 1980). Stress is placed on automobile cooling systems, diesel trucks and railroad locomotives. This leads to an increase in mechanical failures. Train rails develop sun kinks and distort. Extremely high temperatures will increase water usage. The water supply is vulnerable to overuse during a heat wave. High temperatures can soften of asphalt or buckle concrete. Such damage to the roadways would lead to regional transportation problems.[21]

Populations

Residents of Providence living without A/C units, or the means to stay hydrated and cool are vulnerable to dehydration, injury or even death in the event of a heat wave. Damaged roadways along with sagging and downed power lines will further restrict mobility. People living in areas that are accessed only by one road may also become isolated in a severe storm. Heat-related illnesses include fatigue, dehydration, heat exhaustion and heat stroke. In a normal year, about 175 Americans die from the summer heat.[22]

Hazard Specific

Heat waves will affect individuals who work or spend a lot of time outside during the hot weather. People without access to cooling devices such as air conditioning may be more vulnerable during a heat wave.

[21] Cooperative Institute for Research in the Atmosphere, "Impacts of Temperature Extremes"

[22] National Weather Service, "Heat Wave: A Major Summer Killer," National Oceanic and Atmospheric Administration (NOAA), http://www.nws.noaa.gov/om/brochures/heat_wave.shtml.

F. Man-made Hazards

A positive aspect of the natural hazards is that those hazards that pose the highest risk to the City are predictable and storm-tracking technology has the ability to warn cities of possible danger and give them time to prepare. Unfortunately man-made hazards are very unpredictable. The City of Providence realizes the profiling of man-made hazards is not a requirement OF FEMA or the Rhode Island Emergency Management Agency. The high risk that large-scale fires and mass casualty incidents possess reflect their potential to be deadly, destructive, and unpredictable. Often these hazards take the form of isolated incidents but can significantly impact the individuals and operations of the City; because of this the City has decided to take a proactive step in being prepared for man-made hazards in addition to natural hazards.

Ever since the September 11, 2001 attacks all cities must be prepared for the unfortunate reality of terrorism. Terrorism did not rank as a "high risk" hazard in this assessment largely because it has not occurred in Providence in the past and it is nearly impossible to predict if it will occur in the future. Despite the low ranking, the Providence Emergency Management Agency identifies terrorism as a special hazard because the impact of a terrorist attack could be extremely damaging to the City in many different ways.

While this assessment should not be considered scientific, quantifying the risk of different hazards gives city planners more definite facts rather than mere speculation. Providence Emergency Management Agency will use this assessment as a guidance document as it moves forward in its Hazard Mitigation Program. Providence is an extremely important city to the State of Rhode Island and the New England region as a whole. It is imperative that the City of Providence is prepared for the hazards it will face in the future to ensure not only the safety of its inhabitants and continuity of City operation but to continue to promote the prosperity of the State and Region.

In order to be prepared for any hazard, the City of Providence has decided to include Man-made Hazards in the 2011 update. These include:

- Fire/Conflagration
- Mass Casualty Incident
- Utility Failure
- Dam Inundation
- Hazardous Material Release
- Terrorism-Nuclear
- Special/VIP Events
- Terrorism-Explosive
- Terrorism Chemical
- Terrorism-Radiological
- Terrorism Biological
- Civil Disobedience

Fire/Conflagration

In the 19th century and, on occasion, in the 20th century cities suffered from conflagrations. The most famous of these is the Chicago Fire of 1871, but Boston, Baltimore, New York, and San Francisco all suffered conflagrations in the 19th century or early 20th century. A conflagration is defined as a fire that outstrips the capabilities of the local fire department and water supply to control and involves multiple buildings. The fire control strategy then becomes finding a natural break to stop the fire and letting it burn out much the same as a wild fire.

The City of Providence housing stock consists of approximately 35,000 wood frame buildings that were built between 1865 and 1940. These structures are mostly 3 story structures of balloon construction which enables fire to rapidly spread between floors because fire is not stopped in the walls. In addition the spacing between structures is less than twenty feet allowing fire spread by radiation and convection to adjacent structures. Multiple building fires have occurred over the years due to these factors. Conflagrations have occurred in Providence over the years, 19 buildings burned in 1953, eight buildings in 1989, and six in 1995.

The main factor in limiting the damage was an excellent water supply system and the rapid response of the fire department. Natural occurrences such as high winds would contribute to fire spread and human-caused factors such as a firefighters strike or an interruption in the water supply would allow conflagration to remain a hazard to the city for the foreseeable future.

Each year more than 4,000 Americans die and more than 25,000 are injured in fires, many of which can be prevented. Direct property loss due to fires is estimated at $8.6 billion annually. The threat of a large-scale fire in Providence is always high. As a major City with a long history, some properties throughout the City are older and more susceptible to fire. Much of the City consists of multiple family dwellings built in close proximity to each other making fires particularly destructive. With 23 nursing homes and 6 colleges/ universities within the City, a fire at one of these facilities would pose a serious life safety and property damage threat. Fires are a possibility year round and there is no way of knowing where, when, or how they will start. As a result of these factors fire is the most significant human-caused hazard that the City of Providence faces.

Hazardous Material Release

Industries and businesses located throughout Providence manufacture, store, transport, and/or use extremely hazardous substances. Potentially dangerous materials are manufactured, stored, or transported through the City of Providence. These materials do not present a threat in their controlled environment; however, an accidental release could result in hazardous situations. As of the publishing of this document, approximately 54 facilities within Providence have reported as using extremely hazardous substances.

Extremely hazardous substances are being transported through the City of Providence and have the potential for hazardous material incidents. The transportation routes for these chemicals are Route I-95, I-195, and Routes 1, 1A, 2, 5, 6, 7, 10, and 44. Especially vulnerable is the proximity of Rhode Island Hospital, located at 564 Eddy Street, to these roads as well as the Port of Providence.

City government is responsible for safety measures and precautions that may be required for public protection until a hazardous situation has been corrected and the material is again in controlled environment.

State and Federal government is responsible for providing needed services and resources which are unavailable to, or not within, the capabilities of local government.

Hazard Mitigation Liquefied Natural Gas and Liquefied Petroleum Gas

The City of Providence contains two extremely hazardous occupancies that store Liquefied Natural Gas (LNG) and Liquefied Petroleum Gas (LPG). The LNG facility is located on Terminal Road and contains 600,000 barrels of LNG. LNG is a cryogenic gas that is cooled to -260 degrees F for storage. It is primarily methane with a flammable range between 5 and 15% in air. When it is used the temperature is raised and the liquefied gas expands 600 times and is transported to homes and businesses via the gas main system as a gas for commercial use. The tank is filled during the summer months for winter use by trucks coming from the LNG facility in Everett, Massachusetts. The tank is diked to contain a liquid leak equal to one and a half times the capacity of the tank. The hazard is that should such a leak occur the liquid would eventually heat up and migrate from the diked area until it contacted an ignition source where it would ignite and flash back to the diked area igniting the rest of the pool causing an extremely intense fire beyond the capabilities of any municipal fire force.

The Liquefied Petroleum Gas (LPG) facility is located approximately one mile south of the LNG facility also on Terminal Road. The LPG facility contains 400,000 barrels of LPG. LPG is a gas cooled to -44 degrees F. It has an expansion ratio of 270 to 1 and is mainly propane. The flammable range is 2-9% in air. The LPG facility is approximately 500 feet from the largest chemical storage company in the City. LPG is used commercially for heating and is distributed under pressure via truck. LPG is brought to the City via ship. The facility receives approximately 12 deliveries annually. The main hazard of propane is that it is heavier than air. Should a leak occur, the gas will seek an ignition source and flash back to the container.

Both of these hazards present the potential for cascading events. The LPG or LNG tank fire may ignite the other container. The LPG tank would undoubtedly expose the chemical facility to heat that would compromise the containers located there.

Terrorism – Improvised Explosive Device –

Due to the unpredictability of a terrorist event in City of Providence or the surrounding region and the potential devastation it could cause, terrorism has been identified as a “special hazard.” The City of

Providence was recently included in a regional evaluation that identified possible terrorist targets. The information gathered from that evaluation has been extremely helpful in quantifying the risk that the City faces from terrorist events.

The threat of terrorism faced within the United States is a result of differing ideologies, particularly from Islamist fundamentalists. The planned activity of Islamic fundamentalists is to threaten the very existence of democracy in established countries or emerging nations. The methods used to carry out these threats are indiscriminate based on the tactic of random placement of IEDs. Groups, like al Qaeda, recognize no common bond with people who have different beliefs.

The threat faced begins within an adversary's motives and intent to do harm. It becomes a "credible" threat if and when the adversary has the "capability" of doing the intended harm, and if the target has the vulnerability that will facilitate the harmful contact. Specific to IED attacks, "capability" would include possessing (1) knowledge to build, place, and function an explosive device, and (2) access to materials needed to construct the device, (possibly to manufacture the explosive itself). Components consistent with IED threat capabilities include financial support, physical support networks, size of cell with direct operational responsibility, amounts of constituent materials reasonably accessed for the device, gadgeteering skills in construction, technical expertise, and tactical proficiency. If the adversary possesses all the necessary capabilities to carry out the intended threat, they then become limited only by their imagination.

A major part of recognizing the threat is having a detailed knowledge and understanding of past events and targets involved. Emphasis on past IED events show that targets are both symbolic locations that represent United States interests and sovereignty, as well as locations of tactical importance. The World Trade Center attacks, the USS Cole, the embassy bombings in Kenya and Tanzania, and numerous attacks on hotels/residences owned by United States companies that are regularly frequented by business officials and the individuals who do business with the United States are such targets. Also, a recent conspiracy involving Jihadists was uncovered in planning to attack shopping malls in the area of responsibility (AOR). Although the participants in the conspiracy were taken into custody before any acts were committed, this recent conspiracy is a clear indication that potential targets exist within the AOR and an organized attack is a real possibility.

Specific to the City of Providence, the following locations have been identified as potential terrorist targets:

T.F. Green State Airport

T. F. Green State Airport is a public airport located in Warwick, six miles south of Providence, in Kent County, Rhode Island, Dedicated in 1931, the airport was named for former Rhode Island governor and longtime senator Theodore F. Green. Completely rebuilt in 1996, the renovated main terminal was named for former Rhode Island governor Bruce Sundlun. T.F. Green was the first state-owned airport in the United States.

T F. Green State Airport covers an area of 1,111 acres at an elevation of 55 feet above mean sea level. It has two asphalt paved runways; 5/23 is 7,166 by 150 feet and 16/34 is 6,081 by 150 feet.

T.F. Green Airport has a terminal with two concourses, North and South. The South Concourse has eight gates, and the North Concourse has 14 gates. MassPort promotes T.F. Green as an alternative to Boston's Logan International Airport, as delays and wait time in the Rhode Island airport are often minimal. This airport is owned by the State of Rhode Island and is operated by the Rhode Island Airport Corporation.

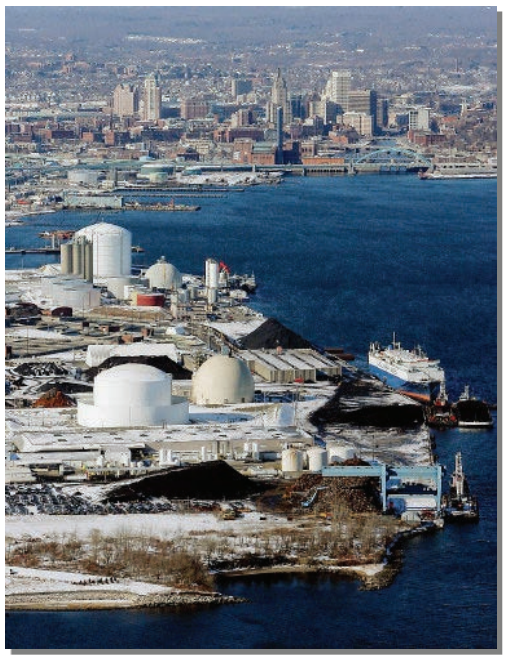
In April 2008, T.F. Green Airport had 108,392 aircraft operations, an average of 296 per day (45% scheduled commercial, 30% air taxi, 25% general aviation, and <1% military) with 72 aircrafts based at this airport (76% single-engine, 6% multi-engine, 17% jet and 1% helicopter). The T.F. Green Airport is serviced by eight different commercial passenger carriers.[23]

Port of Providence

The Port of Providence or "ProvPort" is one of America's most strategically located port facilities. Currently operated by Waterson Terminal Services, it is located at the convergence of Narragansett Bay and the Providence River. The ProvPort campus is more than 105 acres, and the facility offers in excess of one mile of linear berthing, capable of working six vessels at any one time. As one of New England's only deep water operations, ProvPort has an on-dock rail with three rail spurs, 20 acres of open lay

[23] http://en.wikipedia.org/wiki/T._F._Green_Airport

down area, 300,000+ square feet of enclosed warehouse facilities, adjacent to pier face and on-dock rail lines, fixed and mobile cranes available.



ProvPort provides both domestic and international bulk, break bulk, and project cargo clients. Providence and East Providence are key entry points for gasoline used in the region. Tankers arriving at those ports provide fuel for Rhode Island, as well as Southeastern Massachusetts, Cape Cod, and northern Connecticut.

In 2008, cargo exceeded 3.1 million tons, making it the second busiest port in New England, after Boston. ProvPort is a critical economic engine for New England, with an estimated $200 million total economic impact on the region. The port is host to more than a dozen of America's most respected companies. Combined, the activities at ProvPort provide more than $60 million in direct business revenues and $16 million in revenue to local and state government.

The port is the main entry for the bulk of home heating fuel and motor fuels for the New England region. Additionally, a major Liquefied Natural Gas storage and transfer facility is present; 8.5 million gallons of liquid ethanol is transported through the Blackstone Valley via cargo trains each year and blended at the port terminals for distribution.

The port is in very close proximity to the City of Providence to the north, East Providence to the east, and Cranston to the west.

The level of hazardous materials stored and transported through the port makes this site an appealing target. It has high potential to cause massive citywide and regional disruption by fire or explosion.[24]

[24] Fogarty, Raymond, et al. "ProvPort, The ReNEWable Port – A Benefit Cost Analysis." 20 Aug 2010. http://provport.com/tiger_docs/Bryant_BenefitCost082010FINAL.pdf

Rhode Island Convention and Entertainment Complex

This high occupancy sports and entertainment facility consists of three separate component venues; the Rhode Island Convention Center, Veteran's Memorial Auditorium, and the Dunkin' Donuts Center. The facility is host to notable conventions, exhibits, concerts, and sporting events. The Dunkin' Donuts Center has a 13,000 seat capacity at 31,000 square feet, and is host to local hockey as well as college basketball teams. The Convention Center has 100,000 square feet of exhibit space, a 20,000 square foot ballroom, and 23 additional meeting rooms. Veteran's Memorial Auditorium is host to the Rhode Island Philharmonic Orchestra, Providence Singers, and Festival Ballet of Providence. The complex is near to numerous lodging locations, as well as parking areas.

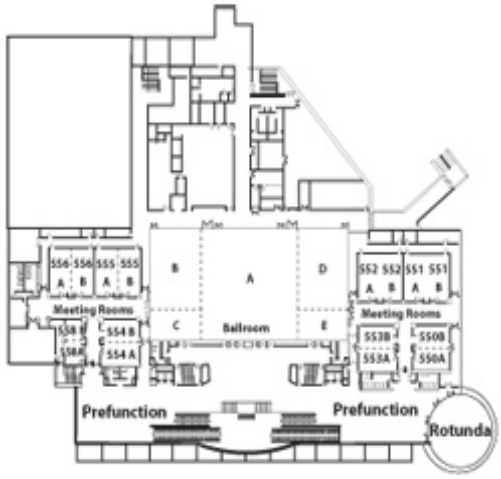


Figure 7

TARGET TYPE: Event Based / Large Population Gathering

STRATEGIC VALUE: Human Toll, Economic Losses
ATTACK MECHANISM: Large Device

This venue is routine host to large capacity crowds and major events, making it well suited for a high-impact IED attack. Because of its vulnerabilities, security at this complex is reasonably high, making entry into the facility with IEDs difficult. In order to overcome this security obstacle, criminals/terrorists could pre-position a vehicle-sized device.

However, sizable quantities of high explosives may be difficult to obtain. As such, incendiary materials could be used to enhance potential of available explosives. Additionally, because of the exterior security of the venue, criminals/terrorists might use a "false flag," such as an ambulance with a short timing trigger, for such an attack.

3.3.4. Climate Change

As a result of extensive research done by the Intergovernmental Panel on Climate Change[25], we know that Rhode Island's climate is changing, and the impacts of these projected changes will be far reaching. Although our state is working to significantly reduce its contributions to climate change, some changes cannot (or will not) be prevented. For the City of Providence expected changes include:

- Hotter, drier summers
- Wetter winters with increasing rainfall and rain intensity

[25] http://www.ipcc.ch/

- Increases in weather extremes
- Secondary hazards include increased chance of wildland/urban interface fires, heat waves, insect infestation, drought, potable water shortages, flooding, erosion and landslides.
- Sea level rise which increases tidal events during storms

The CRMC Metro Bay Region Special Area Management Plan (SAMP) was written and adopted in 2006. This plan was developed by the Rhode Island Coastal Resources Management Council (CRMC). The Metro Bay Region includes the City of Providence, Cranston, Pawtucket and East Providence and has served as an urban working waterfront of international and national significance for over 200 years. The Plan was created partly to identify specific issues and findings of fact and proposed solutions to natural hazard threats. Information below is provided from this plan. The Hazards chapter of the SAMP, adopted in 2009, is focused primarily on hurricanes, floods, and sea level rise in relation to coastal management issues. The objective of this chapter is to advise the communities, state and local government, and the public on the relevant coastal hazard issues in the Metro Bay Region and propose recommendations to effectively address and mitigate those hazards. Rhode Island's coastal communities and the Metro Bay SAMP region in particular, are faced with the challenges of proactive planning for anticipated sea level rise and damage resulting from hurricanes and other storm events.

The CRMC amended its coastal program in January of 2008 with Section 145 – Climate Change and Sea-level Rise which anticipates 3 to 5 feet of sea level rise by 2100. This range of increased sea level rise was determined from the best available scientific sources. In a recent paper published in *Science* this past September by Pfeffer et al., (2008), the authors refine earlier findings for predicted sea-level rise and project heights of between 0.8 and 2.0 meters (2.6 – 6.6 feet) by the end of this century. These new findings confirm and are consistent with the figures adopted by CRMC. Obviously, these increased elevations of mean sea level will have dramatic effects on Rhode Island's shoreline, physically affecting coastal infrastructure, residential and commercial buildings, and coastal habitats, especially salt marshes. Further, the economic consequences from flood and storm damage will negatively impact our local and state economies.

Our region has experienced numerous hurricane events in the past and will experience more in the future. The last two major hurricanes to strike Rhode Island were in 1938 and 1954. Since that time, significant development has occurred and new projects are currently planned within the flood hazard areas of the Metro Bay SAMP region. These projects are and will be susceptible to increased risks of flooding and storm damage as a result of sea level rise. Additionally, coastal flooding risks and storm-induced damage will be felt farther inland as sea levels rise and flood zones expand inland. This Metro Bay SAMP chapter details the hazard issues of concern and defines a series of recommendations to

minimize the risk from hurricane damage and flooding, both now and in the future, as a result of climate change and sea level rise.[26]

Recommended policy and regulation changes include:

- Develop standards and regulations to address sea level rise and climate change (statewide)
- Adopt freeboard standards that will increase the required first floor elevation above the base flood elevation for new or substantially improved structures in high hazard areas (statewide)
- Implement the Coastal A-zone policy and coordinated implementation approach, where structures within A-zones subject to wave activity of 1.5 to 3 feet are designed to V-zone standards (statewide)
- Develop a review procedure for proposals that include filling in Coastal A-zone and V-zones (Metro Bay), tracking CLOMA-F and LOMA-F to assure that fill is not used as structural support in existing and potential V zones.

In the northeastern United States, signs of our planet's changing climate have become increasingly apparent. Over the past 30 years, average winter temperatures in the region have risen 3.8 degrees Fahrenheit (Union of Concerned Scientists, 2006). The Northeast has experienced the largest increase in extreme precipitation events in the country. New England as a whole has experienced a 61 percent increase in such storm events over the past 59 years, while Rhode Island in particular has witnessed an 88 percent rise over the same period- .[27] Additionally, data from the Newport tide gauge (1930-2006) suggests a relative rate of sea level rise equal to 10.2 inches (± 0.75 inches) over the last century in Rhode Island, with the last 19 years (1989-2007) showing an even higher average rate of sea level rise: approximately 0.157 inches per year (National Oceanic and Atmospheric Administration.[28] If this linear trend continues, Newport's sea level in 2100 will be 15 inches higher than today. However, most model predictions are non-linear; these models anticipate sea levels to be approximately 1.6 to 4.6 feet higher by 2100. Higher sea levels will mean that coastal flood zones will move inland, encroaching on areas that currently are not in high risk flood zones.

Scientists expect the Northeast climate to warm approximately 0.5˚F every ten years over the next several decades. This rate is more than three times faster than the warming experienced during the twentieth century. In Rhode Island, scientists project that average annual temperatures will be 1.9˚F higher by the 2020s when compared with the 1970-1999 average and 2.9˚F higher by the 2040s.

[26] The empirical support for the climate change discussion in this section is taken primarily from data derived from the United Nation Intergovernmental Panel On Climate Change (IPCC) Fourth Assessment Report from 2007 on Climate Change Impacts, as well as the Strategic Area Management Plan for the Metro Area (Metro Bay SAMP)" of the Coastal Resource Management Council (CRMC).

[27] Madsen and Figdor, 2007

[28] NOAA1, 2007

Changes in total precipitation are not projected to be significant over that time period; however, patterns of precipitation will change. Winters will bring more rain and less snow.

These projections are based on calculations that take into account human contributions to the accumulation of greenhouse gasses. Being man-made, these projections could be tempered, should efforts be made at reducing greenhouse contributions. While such efforts could slow warming, the impacts would continue for some time. The City of Providence will take a closer look into the impacts of Climate Change on the City in the next plan update when there is more data available.

3.3.5. Potential Losses to the Local Economy

Since property taxes account for over half of the City's revenues, it is imperative that the community and its residents take precautions to protect their investment. According to the City's Finance Department, the average budget for the city is over $600 million per year and the local Tax Assessor reports that approximately $134 million comes from real estate taxes.

3.3.6. Development Trends

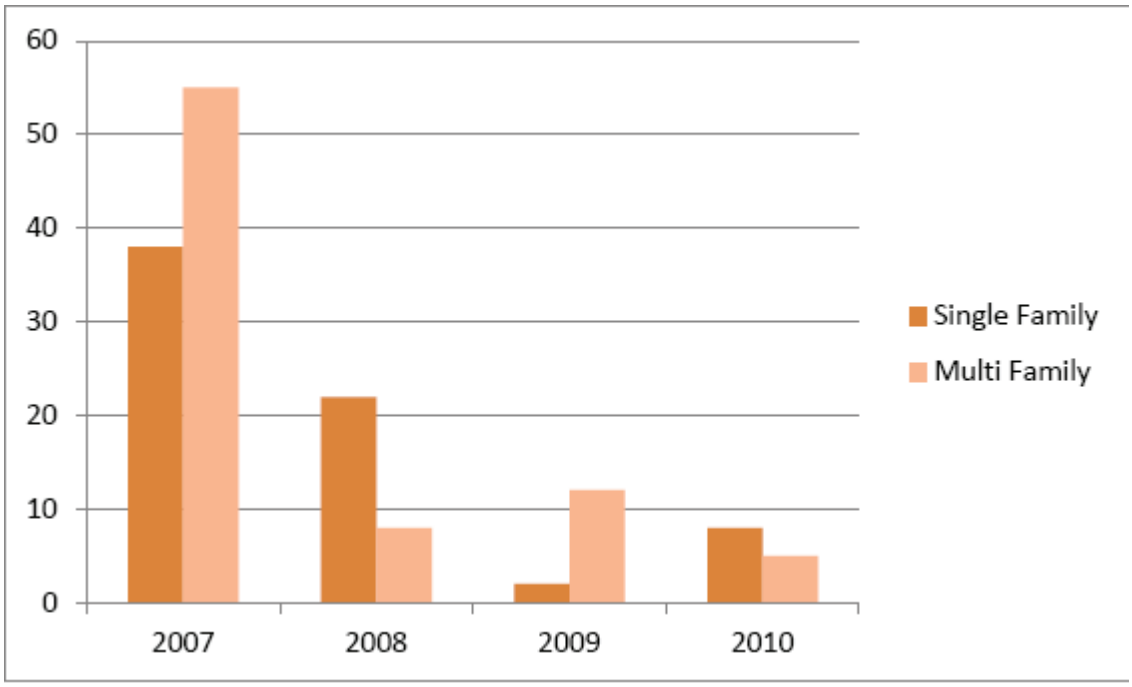
Providence Tomorrow: The Comprehensive Plan for the City of Providence began a revision process in 2011 to incorporate the neighborhood plans that were created from 2007 to 2010 and the planning process that occurred during those years. The Comprehensive Plan update also includes pertinent date on housing, jobs, development, and other socio-economic statistic updates for Providence since the 2006 Plan update. The period from 2007 to 2011 in Providence was marked by a dramatic slowdown in development and a rise in unemployment due to the national economic recession begun in 2007 during the collapse of the national real estate housing bubble.

Building permits for both single and multi-family dwellings dropped precipitously from 2007 to 2010. In 2007, 55 permits for multi-family dwellings were issued, along with 38 for single family dwellings.[29] In 2010, five permits were issued for multi-family dwellings, with eight permits being issued for single family units. One measure of housing, condominium sales, showed a sharp decline in sales over the six year period of 2006 to 2011, dropping 63% from 172 sales in 2006 to only 64 sales in 2011.[30]

[29] Providence Tomorrow: The Comprehensive Plan 2011. (page 203)

[30] Rhode Island Realtors Association 2011.

Figure 8. Residential Building Permits Issued



Source: City of Providence, Department of Inspection and Standards, 2011

Table 15 – Residential Condo Sales 2006-2011

Year	Rhode Island	Providence (not E. Side)	East Side
2006	883	142	172
2007	806	154	167
2008	210	114	117
2009	203	107	103
2010	144	88	80
2011	1,133	80	64

Source: Rhode Island Realtors Association, 2011

According to the US Census, the population of Providence grew by two and one half percent between 2000 and 2010, from 173,618 to 178,042. During this same time period, the state population increased by only less than one half of one percent. This marked the third straight decade of population growth following four decades of decline from the peak population of 253,504 in 1940. Between 2003 and 2006 there was a development boom consisting largely of medium- to- high density residential projects in downtown Providence and in surrounding neighborhoods. This included both new construction and the conversion of existing buildings into residential units. Many of these projects are located within the downtown flood zone which receives some protection from storm surge due to the Hurricane Barrier,

but is an area that is still vulnerable to urban flash flooding. Since that time economic decline has resulted in a precipitous decline in development projects in downtown.

Although recent development has seen a sharp drop, the relocation of Interstate 195 in Providence provides opportunity for future development thanks to the availability of 44 acres of right-of-way that was formerly part of the highway system. The City of Providence's largest planned land use changes in the near term are focused on the development potential of this newly available land. The City has undertaken The Providence Downtown-Knowledge District Development Framework Plan which will identify a preferred development scenario for an area of 360 acres that includes the current Jewelry District, the hospital district in Upper South Providence and the I-195 Redevelopment District Parcels. Much of this land is being planned for uses such as research, office, healthcare, and education with Brown University and Johnson and Wales University playing a large role with planned building expansions in this area.

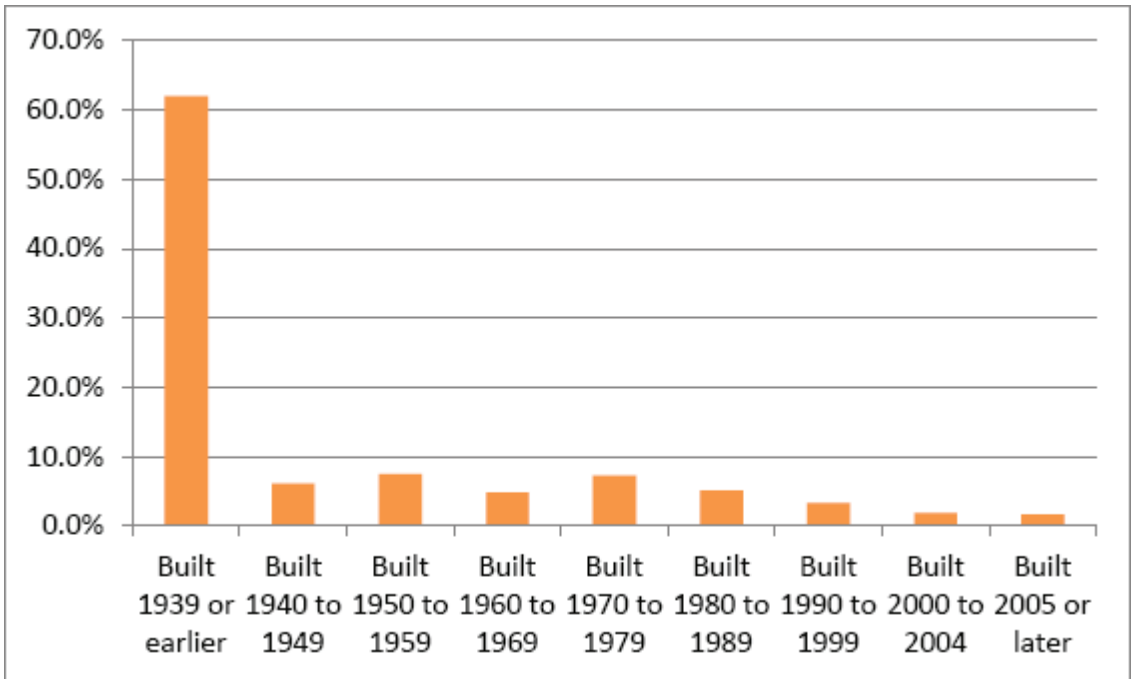
Table 16 – Summary of Land Use Changes, Providence, 1961 - 2004

	1961 (acres)	1969 (acres)	1975 (acres)	1986 (acres)	2004**	Percent of Total in 2004	Percent Change 1961-2004
Residential	3,611	3,643	3,614	3,551	3,497	29	-3
Accessory to Residential*	128	316	315	307	124	1	-3
Commercial*	572	799	781	768	809	7	29
Industrial*	1,507	1,301	1,328	1,249	616	5	-144
Public & Institutional*	2,351	2,186	2,197	2,246	3,255	27	28
Street & Highway Areas*	2,739	3,113	3,097	3,069	3,060	25	10
Vacant Land*	1,192	724	768	910	739	6	-61
Total	12,100	12,100	12,100	12,100	12,100	100	

* Includes water bodies ** May be discrepancies due to differences in source/calculation method (based on current tax codes)
May be discrepancies due to differences in source/calculation method

The majority of structures built in the City of Providence are over sixty years old. This potentially has a great impact on housing costs (heating, repairs) and home safety. At-risk property indicators, such as structure fires, have remained steady over the last few years, but the older housing stock has a greater susceptibility fires as the materials used to build the home are not up to modern day codes and standard for safer fire resistant building materials. The figure below shows the percentage of housing stock in the City as a depiction of what decade that stock was built. As you can see from the chart, over 60% of the structures in Providence were built before 1939.

Figure 9. Percent of Structure Built by Timeframe



Source: U.S. Census 2006-2010 American Community Survey

One of the great strengths of the City's economy throughout the 20th century has been the institutions of higher learning that draw students from across the world to Providence to earn degrees and begin their careers. Nearly a quarter of the total population of the city of Providence is represented by our college enrolled student population. The most recent enrollment figures for the six colleges in Providence that have on campus living are shown in the table below.

Table 17 – College Population in Providence

College or University	Total Enrollment	Estimated Number of Students Living Off Campus
Brown University	7, 809	1,562
Johnson And Wales University	10,848	6,909
Providence College	4,500	990
Rhode Island College	9,044	7,660
Rhode Island School of Design	2,406	1,027
University of Rhode Island (Feinstein)	4,000	4,000
Total	**38,607**	**22,148**

Source: Providence Tomorrow: The Comprehensive Plan 2011

Hurricane Barrier Protection

Since the building of the Fox Point Hurricane Barrier, the city has seen much growth in its downtown area. Major improvements to Kennedy Plaza in 1983 and 1999 transformed the plaza into a transit mall, a highly successful skating rink and beautiful parks. In addition, the City's banks built major buildings in the period from the 1970's to the present, including the Bank Boston Tower, (formerly Hospital Trust Tower), Fleet Center, and Citizens Plaza. In addition the City and State undertook a major renewal effort in the 1980s to relocate the mainline Amtrak railroad tracks, including a new train station and some 65 acres of new development that became the Capital Center District. In 1999, the newest addition opened; a 1.2 million square foot retail establishment known as the Providence Place Mall, whose anchors are the nationally renowned Nordstrom and Macy's department stores. Starting in the Fall of 2002, the I-195 Relocation Project began with land acquisition, the relocation of the Fox Point Portion of I-195, building the New Providence River Bridge (I-Way Bridge), rerouting of ramps and bridges from I-95 to Providence River Bridge, demolition of the Old Providence River Bridge, rebuilding affected Providence Streets, and Eastbound Traffic Crosses. Land made available from these many changes make the important to the Fox Point Hurricane Barrier and its effective operations critical to the resident and business in Providence.

Section 4.0 - Identifying Mitigation Actions

4.1 Planning Committee Formed for Flood Grants

The devastating floods of March 2010 were an eye opener to the City of Providence in showing how vulnerable the City could be. A planning team was formed to identify flooding issues in the City and identify different projects and funding opportunities. As part of the presidential disaster declaration several federal grant programs were initiated to assist impacted communities with recovery efforts. The following information is what the group had decided on for grant applications at the time this plan was being updated:

4.1.1 Summary of Providence EDA/ FEMA/ CDBG/ USACE Projects

The City of Providence is Rhode Island's capital city, and the center of education, government, business, finance and health care. In the spring of 2010, Rhode Island endured significant and unprecedented flooding along the banks of its many rivers. Chiefly affected were the businesses and residences along the Woonasquatucket River, a river which travels easterly through the city, ending in the Providence River and Narragansett Bay. The flooding that occurred in the epic 2010 storm led to the temporary and permanent closing of many businesses, and the loss of millions of dollars in damages to properties and revenues to individuals, the city and state. It is a perennial problem.

This City – through the collaboration of public and private leaders, and using extensive research and recommendations of key groups - seeks to address the flooding that occurs to a lesser extent perennially. They include: environmental remediation, infrastructure improvements, and longer-term

floodplain and watershed planning, to prevent these economic and personal crises from happening again.

Our projects cover a portion of the Woonasquatucket River, from Waterplace Park and Providence Place and the downtown, through the heavily populated and densely used 'green corridor' of Valley Street, down past the Atwells Avenue intersection to beyond Rising Sun Mills and The Plant. Given the extent of damages and measured USGS high water marks, we have included a 2000-foot swath from the center of that river on either side.

The State of Rhode Island Community Development Block Grant (CDBG) disaster recovery funding totals $8,935,237 and will be allocated on a statewide competitive process. These funds are geared towards meeting unmet housing, infrastructure, business, public service, and public facility, disaster recovery planning. The State of Rhode Island Hazard Mitigation Grant Program (HMGP) funding totals $11,033,039.00 and will be allocated on a statewide competitive process based on the number of applications received. The HMGP funds can be used for acquisition and relocation of existing structures, minor flood reduction projects, infrastructure retorfits, and soil stabilization. Below is a summary of the planned projects that the City will apply for using these grant opportunities.

Affected Areas

- 1,629 businesses with approximately 19,702 employees (2006 data) (not counting the addition of United Natural Foods, the expansion of Umicore and Capco Steel, Alteris Renewables, Eco Let, Box City, and the addition of numerous small green businesses along this so-called "Green Corridor" (see map)
- 26,826 persons (2000 Census)
- 11,349 housing units (2000 Census)
- 4,714 building structures (2006 data)

4.2 Mitigation Activities

In completing the risk and vulnerability analysis, the LHMC considered projects and actions that would reduce Providence's vulnerability to the identified hazards. The Risk Assessment Matrix presented in Table 5 is the basis for the mitigation actions presented in Section 4.2. The LHMC considered the goals of this plan and prioritized the matrix and the associated actions based on historical damage, safety of the population, property protection and consistency with city-wide goals and objectives. Issues and objectives were aligned to public health risks, evacuation and mass care considerations, disruption of essential services and potential economic losses to the city.

The LHMC determined that the identified objectives could be met by considering actions aligned to the following:

- Planning and Regulations
- Property Protection, Structural Projects and Maintenance (acquisition, elevation, flood gates, sewers, repairs)
- Public Information and Outreach, Incentive Programs
- Emergency Services (Protection of Critical Facilities)
- Post Disaster Opportunities

This Committee has worked to set goals and objectives that are bounded by a time frame and are compatible and consistent with state hazard mitigation goals. Upon submittal of this plan to RIEMA, the State Hazard Mitigation Committee (SHMC) is expected to review and approve these goals and objectives to ensure consistency with the statewide goals and objectives. The time frames used for this strategy are as follows:

- Short Term = 0 to 6 Months
- Medium Term = 6 to 18 Months
- Long Term = 18 Months to 5 Years

The following actions use the Risk Assessment Matrix (Table 5) to identify areas at risk, offer mitigation strategies and consider benefits. Each action offers a discussion of the project and if applicable, includes the options considered. Multiple actions associated with a vulnerable area reflect city priorities and are simply prioritized high, medium or low. If known, the actions include cost estimations and assign responsible parties to lead the efforts to complete the action. Other relevant departments/agencies that can offer support to the project are also listed. Finally, possible finance options are offered.

4.3 Mitigation Actions

Before we analyze the mitigation actions as prioritized by the Providence Hazard Mitigation Committee, a brief overview of current grant funding opportunities is given as the City is currently applying for several mitigation funding sources made available through Presidential Disaster Declaration DR-1894.

Through HUD Community Development Block Grant funds, the City would like to increase the carrying capacity of the Woonasquatucket River by:

- Identifying areas of land detain/retain flood waters, specifically Donigian Park, Merino Park and properties the Narragansett Bay Commission has recommended for holding sites

- Design and implement flood remediation efforts to absorb excess waters in Donigian Park Merino Park and the properties recommended by NBC for holding areas

    - **Estimated Cost $3.8 Million**

- Dredge the Woonasquatucket River back to its 1972 base levels

    - **Estimated Cost $3.8 million**

Through **FEMA/ UMHA** resources, we would restore wetland capacity along peripheral land adjacent to Merino Park. The Woonasquatucket River Wetland Restoration Project is intended to restore the flood holding capacity of areas adjacent to the stream channel whose natural function is to absorb flood waters. Land use decisions made in previous decades allowed for these lands to be filled and built upon, thus lessening the total acreage available for flood storage during high rain events. The Hazard along this river corridor is frequent flooding which meets the threshold of the one percent annual chance flood in river corridor areas throughout the City of Providence. By restoring this site's ability to absorb excess runoff, business and residences downstream will be less affected by rising waters.

Immediately downstream of this section of the Woonasquatucket is a heavily developed area known as Olneyville Square. During the March floods of 2010, flooding occurred along Manton Avenue, San Souci Drive, and Valley Street where many businesses and residences are located. There are between 10-15 repetitive loss properties located within a mile of Olneyville Square. Increasing flood storage capacity upstream of these residences and businesses will decrease the future likelihood of flooding affecting these locations.

Table 18 - Estimated Restoration Cost

Task	Units for Project	Cost Per Unit	Total Cost
Clearing & grubbing existing vegetation on fill	1.62 acres	$5,000/acre	$8,100
Cutting & disposing isolated trees	55 (4"-24")	$270/each	$14,850
Earth excavation	26,136 cy	$5.00/cy	$130,680
Rock excavation (assume 2% of area)	523 cy	$17.00/cy	$8,891
Baled hay	400 lf	$3.50/lf	$1,400
High organic soil	7,841 sy	$4.00/sy	$31,364
Wetland seed mix	7,841 sy	$1.00/sy	$7,841
Wetland plantings lump sum			$5,000
Subtotal			$208,126
Miscellaneous (10%)			$20,813
Total			$228,939

Through **US Army Corps of Engineers** funding, we would

- Conduct a flood management study of the Woonasquatucket River, in the city of Providence, and establish a recommended river maintenance system
    - **Estimated Cost $1.2 million**
- Recommend that the State of Rhode Island assume responsibility for a broader watershed study of those rivers affecting flooding in Providence and downstream.

- Army Corp may have funding for a long-term study on the Woonasquatucket which would either be cost shared with local municipalities or with State agencies for the benefit of local jurisdictions. The Army Corp is currently conducting a reconnaissance study which will determine the availability of funding; that is why this area of funding and who is responsible is still a little uncertain.

Through **US Commerce/ Economic Development Administration** funding, we would

- Implement a range of infrastructure improvements intended to address flooding/ remediation while increasing opportunities for new business/job growth and business retention.
- Efforts would include:
    - Establishing design/maintenance standards for commercial corridors of Atwells Avenue and Valley Street
    - Depaving and reconstruction of areas of roadway with culverts, swales, grassy strips in sidewalks, and permeable surfacing
    - Build rain gardens and vegetated swales and remove dams behind The Plant/Rising Sun Mills
    - Depaving portions of Eagle Square parking lots & replacing with permeable stones or surfacing
    - Dry flood-proofing business structures
    - Replacement of water-damaged areas of Waterplace Park and continuation of road way in Charlotte Hope Street area
    - **Estimated Cost $1.25 million**

Our projects come as a result of numerous meetings with local, state and federal officials; review of prior studies of the Woonasquatucket River corridor and recommendations made in those studies, and extensive discussions with local planners and environmental and public-interest groups. There is a uniform agreement among public and private sector leaders that the time has long since come to address this serious issue, directly impacting our quality of life and economic vibrancy.

As has been shown above, the city has taken a holistic approach towards mitigation projects by not just focusing on small scale projects which would be the type eligible for FEMA mitigation funding, but by focusing on large citywide efforts that seek to combine both structural and non-structural approaches to achieve flood reduction. Many of the items above are not included in the actions below because they were decided upon by a group of city department representatives in response to the federal grant

funding made available through Presidential Disaster declaration DR- 1894 and are tailored to fit the funding parameters of each specific grant source.

Several action items have been removed from the plan since the 2005 update because they have either been completed, deferred, or are no longer the responsibility of the City of Providence. Completed, Deleted, or Deferred, Mitigation Actions since 2005 Plan are as follows:

Action Items 1 and 2

The Army Corp of Engineers is now responsible for the routine overhaul of pumps and routine maintenance of the Fox Point Hurricane Barrier. This being the case, the City of Providence has removed Action Items 1 and 2 for this 2011 Plan Update as they are no longer the responsibility of the City of Providence.

Continuation of Action Items 3-10

The remaining Action Items are mostly a continuation of the Action Items from the 2005 Plan. The Hazard Mitigation Committee continued to view these as priorities that need to be focused on and will work in the years ahead to leverage federal, state, and local funding sources to move the items into implementation.

The Planning Department continues to be the lead on Flood Hazard Regulations under the National Flood Insurance Program (NFIP). Action Item 3 has not been completed since the 2005 Plan. Action Item 4 has not been implemented since the 2005 Plan because the priorities of the Planning Department were in other areas such as update to the Citywide Comprehensive Plan to add Neighborhood Specific Plans as well as the large scale development that occurred downtown which included the G-Tech building, Blue Cross/Blue Shield Office Building, and Luxury Condo High Rises at Waterplace Park; investments in downtown worth roughly $1 billion dollars.

Action Items 5 and 6 are the responsibility of Provport and Provport partners. No major development has occurred in the Port that would trigger changes in building under NFIP regulations. Provport businesses are members of the Local Emergency Planning Committee (LEPC) and focus mostly on Hazardous Materials releases and Hazmat response. The Planning Department will take the lead in reaching out to Provport and Army Corp of Engineers to study and find funding sources for flood mitigation projects.

Action Item 7 has seen some improvement based on projects that were actually funded under RIDOT's federally mandated Ten Year Transportation Improvement Program (TIP). Only a small amount of bridges get funded annually through the TIP and it is a constant battle for Providence to secure funding for bridge repairs through RIDOT and Federal Highway Administration (FHWA). Providence will continue to lobby RIDOT for faster movement on funding of local bridge repairs.

Action Item 8 is still relevant even though it has been a low priority for city officials and has not been implemented. Historic documents have intrinsic value and the Hazard Mitigation Committee will work with the Mayor's to fund measures to protect these vital documents in the next few years.

Action Item 9

This item was given inadvertent help by two storm events in 2011. On June 9, 2011 a severe storm moved through the City at 1am with straight line winds as powerful as an F1 or F2 tornado and destroyed thousands of cubic yards worth of trees. In Late August, Hurricane Irene struck Rhode Island causing extensive damage throughout the City of Providence. Overall, the City removed, grinded, and hauled over 20,000 Cubic Yards of vegetative storm debris. These two events, as tragic as they were; had the effect of downing the great majority of hazardous and diseased trees in the City. The Forestry Division and Parks will continue to fund their regular program of tree trimming in FY 2012-2015.

Action Item 10

The Department of Inspections and Standards has worked to enforce codes on older building stock in the City since 2005. There have been mixed results as some property owners had invested in improvements, but then the housing market crashed in 2007 and 2008 and instead of investments in housing stock, we have seen an unprecedented reverse to records home foreclosures and vacant commercial spaces. The ability to upgrade buildings in the City will hinge on the degree of economic recovery in the housing market in the years ahead.

Action Item 11

The Fire Department building at Atwells Avenue continues to be a concern for Providence Emergency Management Agency (PEMA). No changes have occurred since the 2005 Plan due to resistance from the Fire Department. The Fire Department has not been willing to work with other city officials to formulate a plan and funding sources to move the firehouse and re-arrange staffing and equipment in accordance. We continue to push for removal of the Firehouse from its current site, but the City is not of one mind on this issue.

Action Item 12

The Narragansett Bay Commission has made small revisions to its Emergency Operations Plan since 2005. PEMA will be working with Narragansett Bay Commission to include revisions that will be in accordance with PEMA's newly developed Fox Point Hurricane Barrier Coordination Plan.

The following Mitigation Actions have been updated and a new prioritization process has been used to rank the actions:

The Hazard Mitigation Committee has re-arranged the mitigation actions and prioritized them on a scale of 1-10 (the existing number of actions) in a process loosely based on the FEMA STAPLEE method whereby, given the following criteria (socially acceptable, technically feasible, administratively possible,

politically acceptable, legal, economic benefits, environmentally sound) the committee members voted on which items should be ranked for the highest and most immediate concerns and which should be longer term. The Hazard Mitigation Committee referred to the process of Simple Listing Qualitative Benefit-Cost analysis as outlined in FEMA's Using Benefit-Cost Review in Mitigation Planning: State and Local Mitigation Planning How To Guide Number Five, FEMA 386-5 May, 2007 to address Benefit Costs requirements as outlined in FEMA's hazard mitigation plan guidance, 2008.

Table 19 – Prioritized Mitigation Actions

Mitigation Action	Benefits (Pros)	Costs (Cons)	Who (Leadership)	When (Deadline)	How (Funding Source)	Project Priority
Repair/ Replace Structurally Deficient Bridges Estimates Costs $50 million to $100 million to bring all our bridges to sufficiency rating	Federal grants can be leveraged to help implement bridge repairs. Congressional delegation is strongly behind State bonding and increased spending in Federal FY12 Transportation Bill	Current TIP process remains woefully underfunded Statewide, we need $1.13 Billion to bring all of our bridges into a state of good repair. In Providence, roughly 20% of our bridges are structurally deficient	Public Works Rhode Island Department of Transportation	2012-2015	General Fund. Capital Improvement Program DOT General Funding and Federal Funds such as FHWA Highway Bridge Program	1
Bring Old Buildings Up to Current Code Standards Estimated Costs Hard to	Residential and Commercial structures brought up to code are less vulnerable to fire hazards. Compliant buildings have	Renovating "grandfathered" residential housing in underserved parts of the City could cost tens of millions of dollars.	Department of Planning and Economic Development Department of Inspections and Standards	2011-2015	General Fund Federal HUD Grants Federal CDBG Grants Private Entity Funding	2

estimate as it is a process that plays out over many years and costs would be on the building owners while the city would actually generate revenue from permits. Revenue – Potentially additional $1-$2 million per year	less maintenance costs over the long run Increase in compliant buildings will decrease number of structures fires on an annualized basis	Increasing number of foreclosed properties in the City will hinder success of code upgrades as banks continue to work through backlogs of ownership and titles issues.				
Army Corps Study Estimated Costs $1,000,000 *Byron Rupp, Army Corps of Engineers	List of identified flood mitigation projects along the Woonasqautucket River. Cost shared at a 50-50% ratio with in-kind match allowed.	No foreseeable downside	Army Corps of Engineers	2011-2015	Cost Shared Federal and Local	3
Flood Mitigation for Atwells Avenue Fire Department Building Estimated	Reduce flooding impact to building foundation and equipment during overtopping of Woonasquatucket River.	Cost will be about $100,000, yet this is $100,000 not currently budgeted for.	Providence Emergency Management Agency Department of Planning and Development	2012-2014	General Fund FEMA Grant Funding	4

Costs $8 to $12 per square foot of enclosed area. Roughly between $80,000 and $125,000 based on 10,305 square feet for the structure.	This option has been long discussed by city officials.	Will not prevent the need to still remove engine and ladder trucks if road is flooded				
Public Outreach on complying with A Zone and V Zone Floodplain Standards Estimated Costs $40,000 - $60,000	Outreach to residents and businesses will increase compliance with local regulations and increase awareness of NFIP program in Providence.	Largest landowners in the V Zones are Port Heavy Industry. They are not heavily involved in mitigation planning.	Department of Inspections and Standards	2012-2015	General Fund Federal Grants	5
Apply For and manage Community Rating System Estimated Costs $40,000 - $50,000 for additional staffer in Inspections and Standards	Reduced costs for homeowners insurance policies averaging $200-$500 annually depending on rating class achieved	Staffing reductions have decreased the City's ability to keep up with permitting compliance, let alone adding additional staff for a new program.	Department of Planning and Development Providence Emergency Management Agency Department of Inspections and Standards	2012-2015	General Fund	6

who could manage this program with other responsibilities						
Retrofit ProvPort Estimated Costs Additional structural piles to prevent LNG containers from becoming dislodged from their foundation $ 2 million – 10 million depending on how many businesses make improvements	Flood proofing LNG and Petroleum facilities with additional structural piles will prevent potential future environmental catastrophes.	Companies would likely not fund necessary mitigation measures on their own. May be considered cost prohibitive Federal funding needed.	ProvPort	2012-2015 and ongoing	Private Funding DHS Grants	7
Tree Trimming Program Estimated Costs Program costs have ranged between $400,000 to $800,000 depending on	Reduction of hazardous branches and dying trees. This will lessen overall number of trees down city-wide during a storm event. Annual costs	Current Program is small part of annual Forestry budget. The division of Forestry has seen its budget cut heavily in last few years, and may not be	Forestry Division of the Park Department	2012-2014	General Fund	8

which budget year and overall fiscal health of the City of Providence	$400,000 to $800,000	able to fund an appropriate tree-trimming program.				
Narragansett Bay Commission EOP Revisions Estimated Costs Cost would be roughly $70,000 to $80,000	Update will help coordinate efforts with existing Providence EOP and emergency planning annexes.	Narragansett bay Commission would have to set aside staff time to focus on this plan update	Narragansett Bay Commission	2012-2014	Private Funding	9
City Hall – Vital Documents Estimated Costs Given the availability of an existing state grant, this may be a low cost or no cost program that can be easily implemented	Several private foundation grants available for preservation of historic documents Building secure archive structures and space in City Hall	A very low priority for city officials. State Historic Preservation Grant Program no longer funded	Department of Vital Statistics City Archives Emergency Management	2012-2015	General Fund Private Foundation Grants	10

The following Actions have been updated from the 2005 plan:

Vulnerable Area One

Hurricane Barrier

During February 2010, the US Army Corps of Engineers (USACOE) officially took responsibility for the maintenance and operation of the Fox Point Hurricane Barrier. Most of the required maintenance, identified by the Providence Department of Public Works on August 6, 1998 has been addressed or is being addressed, by the USACOE. Among the routine maintenance items, the following is also requested of the USACOE; routine electrical and mechanical maintenance, cleaning, painting & sealing, routine overhaul of pumps and dike maintenance.

Vulnerable Area Two

A-V Zone Properties

Action 3 – Apply for the Community Rating System (CRS).

- Action Type – Public Information and Outreach, Incentive Programs
- Priority – Medium
- Lead – Inspection and Standards/Department of Planning and Development
- Financing Options – FEMA – Flood Mitigation Assistance Program
- Cost – Staff time
- Time Frame – Medium-Long Term
- Benefit - City membership in the CRS will enable property owners to receive a discount on flood insurance premiums.

Action 4 – Require property owners in A- and V-zones requesting building permits to comply with new flood plain standards. Consider a public outreach program to notify property owners in A- and V-zones of the requirements to comply with new flood plain standards.

- Action Type – Planning and Regulations and Public Information and Outreach, Incentive Programs
- Priority – High
- Lead – Inspection and Standards and Department of Planning and Development
- Financing Options – FEMA – Flood Mitigation Assistance Program
- Cost – Staff time and materials cost
- Time Frame – Medium Term
- Benefit - To encourage owners of older buildings within A- and V-zones, who are undertaking rehabilitation activities, to bring such buildings up to current flood plain standards. To educate the public on retrofitting homes.

Vulnerable Area Three

Woonasquatucket River, WaterPlace Park to the Hurricane Barrier, Port of Providence

Action 5 – Perform study of the area with US Corps of Engineers to identify upgrades necessary to limit damage due to flooding and earthquake.

- Action Type – Long Term Planning and Structural and Non-Structural Mitigation Projects
- Priority – High
- Lead – Army Corps of Engineers
- Supporting – Department of Planning and Development
- Financing Options – Army Corp and City General Fund
- Cost – Variable depending on the COE study
- Time Frame – Short Term
- Benefit – Mitigation against flooding, storm surges and high wind damage.

Action 6 – Retrofit the ProvPort facility to protect against flood and earthquake damage.

- Action Type – Property Protection, Structural Projects and Maintenance
- Priority – Medium
- Lead – ProvPort
- Financing Options – FEMA, FMAP, Corps of Engineers (COE) flood grant, private funding
- Cost – Variable depending on the COE study
- Time Frame – Long Term
- Benefit – Protection from flood and storm surge damage

Vulnerable Area Four

<u>Local and Interstate Highway Bridges</u>

Action 7 – Inspect, repair, replace and retrofit deteriorated bridge components. Below is a list of bridge sufficiency ratings for many bridges in Providence. For the 2009-2012 RI State Transportation Improvement Program (TIP) Providence has ten projects listed for funding for a total of over $65 million dollars. Funding of these projects will be contingent upon available funding in the context of shrinking federal assistance.

Table 20 – Bridges Located in Providence					
	Location	**State #**	**Sufficiency Rating***	**Scour Rating***	**Owner**
4	Manton Ave	007801	92.6	3	State
5	Harbor Junction	013101	57	N	State
6	Cypress St Ped OP	014201	-2	N	City
14	Reservoir Ave RR	032701	57.2	N	City
16	Glenbridge Ave	034801	76	9	City
17	Delaine Street	040201	78.3	8	City
19	Wanskuck	042801	67	N	State
26	Hawkins Street	042901	92.1	N	State
29	Admiral Street	043001	61.7	N	State
30	Branch Ave. Culvert	043701	85.1	6	State
31	Box Pond Culvert	043801	80.9	6	State
50	West River Culvert	043901	87.4	8	State
51	Union Ave.	045201	33.9	N	State
52	Frankfort Street	045401	90.6	N	State
53	Plainfield Street	050101	63.9	N	State
54	Pascoag RR	050201	-2	N	Railroad
55	Magnolia Viaduct	050301	37.7	N	State
57	Huntington Ave Viaduct	050401	38	N	State
58	Westminster St UP #1	050501	86.8	N	State
59	Westminster St UP #2	050601	81.7	N	State
60	Broadway Overpass	050701	63.9	N	State
63	Broadway Underpass	050801	96.8	N	State

65	Broadway Ramp Overpass	050901	81.1	N	State
66	Harris Ave RR	051001	62	N	State
67	Valley Street	051101	92.5	8	City
68	Tar Bridge	051301	51.1	8	City
69	Eddy Street	053701	67	N	State
70	Blackstone Street	053901	71	N	State
71	Broad Street	057101	74.7	N	State
72	Westminster Street	057201	76.1	N	State
73	Washington Street	057301	92.6	N	State
74	Broadway	057401	73.1	N	State
75	Atwells Ave	057501	93.3	N	State
77	Atwells Ave Ramp East	057601	79.7	N	State
79	Atwells Ave Ramp West	057701	50.4	N	State
80	Providence Viaduct	057801	50	5	State
	Ramp AD Civic Center	057901	94.8	8	State
	Ramp AC Civic Center	058001	93.7	N	State
	Ramp CB-1 Civic Center	058101	92.4	N	State
	Ramp CB-2 Civic Center	058201	91.4	N	State
	Ramp DB Civic Center	058301	94.8	8	State
	Ramp DA Civic Center	058401	93.5	N	State
	Ramp CA Civic Center	058501	92.4	N	State
	Hartford Ave. East	060201	65	N	State
	Sheridan Street Ped OP	060301	-2	8	State
	Woonasquatucket River	060401	95.1	5	State
	Merino Pond	060501	97.3	9	State

	Glenbridge Ave.	060601	72.6	N	State
	Killingly Street	060701	91	N	State
	Public Street (NB)	065101	84	N	State
	O'Connell Street	065201	82.3	N	State
	Oxford Street	065301	83	N	State
	Allens Ave Ramp	065401	84.4	N	State
	Thurbers Ave.	065501	85.5	N	State
	Eddy Street South	065601	89.4	N	State
	Broad Street South	065701	81.5	N	State
	Narragansett Electric Co	065801	70	N	State
	Elmwood Ave.	065901	69	N	State
	West Elmwood RR	066001	41	N	State
	Elmwood Ave. South	066701	80.2	N	State
	Hamlin	067401	93	N	State
	Smith Street	070101	80.3	N	State
	Orms Street	070201	76.3	N	State
	Louisquisset Pike	070301	92.4	N	State
	Park Street	070401	82.3	8	City
	Acorn Street	070501	90.1	8	City
	Chalkstone RR	070601	81	N	State
	Ashburton Street	070701	83	N	State
	Charles Street	070801	81	N	State
	Industrial Drive	070901	74.2	N	State
	Moshassuck South	071001	94.8	8	State
	Moshassuck North	071101	99.7	6	State

	Branch Ave.	071201	62.8	N	State
	Smithfield Ave.	071301	72.7	N	State
	Concord Street	071401	80.2	N	State
	Culvert A	071501	85	8	State
	Culvert BC	071601	59.5	8	State
	Culvert D	071701	97.7	8	State
	Culvert E	071801	78.6	8	State
	Atwells Ave RR	077501	95.6	N	State
	Dean Street	077601	78	N	State
	Pleasant Valley Parkway	077701	44.4	8	State
	Bath Street East	077801	71.4	5	State
	Bath Street West	077901	-2	8	State
	Hawkins Street	079601	31.1	3	City
	Ramp BC Civic Center	084801	95.9	N	State
	Ramp BD Civic Center	084901	93.9	N	State
	Waterplace Ped. OP West	086301	-2	8	City
	Memorial Blvd Ped UP	086401	75.8	N	City
	Francis Street (North)	086501	95.1	N	City
	Francis Street (South)	086521	77.9	9	City
	Park ROW	086601	99.7	8	City
	Steeple Street West	086701	97.1	3	City
	Steeple Street East	086721	97.5	8	City
	Washington Street	086801	83.3	3	City
	College St. Ped. OP No.	086901	-2	8	City
	College Street	087001	96.2	8	City

	College St. Ped. OP So.	087101	-2	8	City
	Crawford Street	087201	93.1	5	City
	Crawford St. Ped. OP	087301	-2	8	City
	Exchange Street	087401	83.5	8	City
	Water Place Ped. OP East	087501	-2	8	City
	Stevens Street	088101	75.6	8	City
	Industrial Drive	088201	53.1	8	City
	West River Street	088301	95	9	City
	Magnan Road RR	088401	93.8	N	City
	Caunounicus	088501	19.6	8	Local Park, Forest, or Reservation Agency
	Miantunnomu	088601	52	8	Local Park, Forest, or Reservation Agency
	Cladrastis Ave	088701	93.5	8	Local Park, Forest, or Reservation Agency
	Memorial Boulevard	088801	92.9	8	Local Park, Forest, or Reservation Agency
	Memorial Boulevard	088901	48.6	8	Local Park, Forest, or Reservation Agency
	Veazie Street	089001	49.6	3	City
	Roger Williams Ave. RR	092301	93.3	N	City

	Union Ave. RR	092501	89.8	N	City
	Westminster RR	092601	94.1	N	City
	Westminster RR Utility Br	092621	-2	N	City
	Broadway RR	092701	92.5	N	City
	Smith Street RR	092801	76.6	N	State
	Orms Street RR	092901	76.5	N	City
	Charles Street RR	093001	74.1	N	State
	Branch Ave. RR	093101	69.5	N	City
	Smithfield Ave. RR	093201	80	N	State
	Eagle Street	097201	78	8	City
	Charles Street	097301	97	3	City
	Randall Street	097401	46.9	3	City
	Atwells Ave	097501	92.6	8	City
	Branch Ave	097601	59.4	8	City
	Geneva Pond	097701	8	5	City
	Smith Street	097801	83.2	8	State
	Mill Street	097901	96.6	8	State
	Point Street	098001	62	3	City
	Memorial Blvd South	098101	76.3	8	City
	Memorial Blvd North	098121	57.6	3	City
	Park Row C – East	098201	82	N	State
	Park Row A – West	098301	22	N	State
	Park Row B - Exchange St	098901	94.9	N	State
	Exchange Terrace	099001	97.1	N	State
	Harris Ave.	102701	97.9	N	State

	Woonasquatucket River (Dyerville)	106401	-2	_	State
	Woonasquatucket River	106501	-2	_	State
	Ramp WS Public Street Bridge	107001	97.6	N	State
	Ramp WS	107101	95.6	N	State
	Ramp WES	107201	96	N	State
	Ramp NE	107301	97.7	N	State
	Ramp SE	107401	93.5	N	State
	Ramp WN	107501	98	N	State
	Ramp NP	107601	77	N	State
	Ramp WP	107701	79	N	State
	Ramp PS	107801	99	N	State
	Point Street (Over I-195)	107901	93.9	N	State
	Clifford Street Bridge	108001	77	N	State
	Providence River Bridge	108101	91.5	6	State
	South Main Street Bridge	108201	82.5	N	State
	Ramp EI	108301	99	N	State
	India Point Park Ped OP	108401	-2	_	State

* Sufficiency Rating is a factor that takes into consideration the condition of the main bridge deck, the substructure and support elements. A rating of 0 is total failure and 100 is considered perfect. The term Scour Rating refers to conditions underwater that may result in loss of material in the bridge's footings and substructure. Any "critical" rating would require attention.[31]

[31] Source: RIDOT, Bridge Inspections, 2005-2010. These standards are derived by the NBIS (National Bridge Inspection Standard).

Note that the Manton Avenue Bridge which had the lowest sufficiency rating at 22.0 during the last update; now as a rating of 92.6. The bridges below 50 will need immediate attention.

- Action Type – Property Protection, Structural Projects and Maintenance
- Priority – High
- Lead – Department of Public Works and RIDOT
- Supporting – FHWA
- Financing Options – FHWA and RIDOT, FMAP
- Cost – Variable depending on DPW/DOT study
- Time Frame –Ongoing and Long Term
- Benefit – Determine the condition of existing bridges and take corrective action to repair and/or replace bridges that are below the standards established by the NBIS (National Bridge Inspection Standards). Protect highway infrastructure.

Vulnerable Area Five

City Hall and Other Public Properties

Action 8 – Initiate study to determine the current storage situation of vital documents. For the most part, City Hall is protected from serious flooding by the Hurricane Barrier. In the unlikely event that the barrier should fail, the City's Department of Public Property must insure that vital documents are stored in upper stories or in flood-proof cabinets.

- Action Type – Property Protection, Structural Projects and Maintenance
- Priority – Low
- Lead – Department of Public Property , City Archives, Public Records
- Financing Options – City budget, FEMA, FMAP
- Cost – $100,000 +
- Time Frame – Long-Term
- Benefit – Protection of vital documents and data at City Hall from water or other damage.

Vulnerable Area Six

Tree Trimming and Debris Management Program

Action 9 – Initiate tree trimming and debris management program. Form a partnership with National Grid to implement the program which will help to reduce loose limbs and remove diseased trees.

- Action Type – Property Protection, Structural Projects and Maintenance
- Priority – High
- Lead – Parks Department
- Supporting – National Grid
- Financing Options – National Grid, City budget
- Cost – Approximately $20,000
- Time Frame – Medium Term

- Benefit – Protection of lives and property from falling tree limbs. Removal of dead and deteriorating trees and shrubs before they pose a problem to city residents. Prevention of power line collapse from falling trees and heavy limbs.

Vulnerable Area Seven

Buildings with Archaic Structural Systems

Action 10 – Retrofit older buildings to comply with current code requirements. Like City Hall, Downtown Providence is protected from serious flooding by the Hurricane Barrier. Moreover, most new buildings are earthquake resistant. Some buildings both in and out of downtown would require some retrofitting. Buildings constructed after the end of the World War II would have been designed according to then-accepted structural engineering practice, resembling current code requirements, to withstand hurricane force winds. Some pre-war buildings may not have utilized structural engineering criteria resembling current code requirements. Structural analysis should be provided by property owners to determine which buildings are structurally consistent with current code requirements and currently accepted engineering practice.

- Action Type – Property Protection, Structural Projects and Maintenance
- Priority – High
- Lead – Department of Inspection and Standards
- Financing Options – City budget for public buildings, private funds for privately-owned buildings
- Cost – Based on study
- Time Frame – Long Term
- Benefit – Protection of older buildings from flooding, winds and other natural hazards.
-

Vulnerable Area Eight

Public Buildings and Critical Infrastructure

Action 11 – The City's Fire Engine 14 on Atwells Avenue at Valley Street is in a floodplain. Evaluate one of the following two options to determine which would be better in the long-term: 1) Relocation of the fire station 2) Build a retaining wall on the fire station side of the river to protect from possible flooding.

- Action Type – Emergency Services (Protection of Critical Facilities)
- Priority – High
- Lead – City of Providence
- Financing Options – City budget, FEMA grants, Army Corps of Engineers, or Bonds
- Cost – Staff time
- Time Frame – Short Term-Medium
- Benefit – Protection of existing Critical Infrastructure from flooding.

Vulnerable Area Nine

Narragansett Bay Commission Sewage Treatment Plant

Action 12 – Update the Narragansett Bay Commission Emergency Operations Plan.
The Narragansett Bay Commission prepared its own emergency operations plan in 1988. The plan has been updated since then, but new efforts by Providence Emergency Management Agency, Providence Public Works Department, Army Corp of Engineers, and Narragansett Bay Commission to coordinate SOP's regarding the operation of the Fox Point Hurricane Barrier should prompt NBC to review and revise its Emergency Operation Plan.

- Action Type – Planning and Regulations
- Priority – Low
- Lead – Narragansett Bay Commission (NBC)
- Financing Options – NBC
- Cost – Based on study
- Time Frame – Long Term
- Benefit – Protection of the City and State's investment in the regional sewer system.

4.4 Capability Assessment

The community has initiated many studies and activities over the years that have laid the foundation for the development of its mitigation strategy. The city implements and enforces the state building code, and participates in the National Flood Insurance Program, as do all of the communities in Rhode Island. The city's Emergency Operation Plan for Hazard Mitigation recommended pre- and post-disaster strategies and measures to reduce loss of life and destruction of property. A variety of hazard mitigation strategies were developed following a Federal Disaster Declaration for Hurricane Gloria in 1986.

A. Comprehensive Plan

In 2007 the City Council adopted *Providence Tommorrow, The Interim Comprehensive Plan*, which reflects the overall vision for Providence. Providence Tomorrow revised the previous plan, *Providence 2000: The Comprehensive Plan* reflects extensive public input received during the fall of 2006 when the City hosted a week-long charrette and three follow- up meetings to discuss all of the topics addressed in the plan. Providence Tomorrow is a work in progress. Amendments have been made, as a result the neighborhood planning process. In addition, some revisions to the Zoning Ordinance are based on the results of neighborhood and specific plans and the resulting amendments to this Plan, as a means of implementing the objectives of the Plan.

In 2011 the City of Providence, Department of Planning and Development began the latest update of the Comprehensive Plan. The format of the plan is being changed to more easily portray goals and objectives and move the data intensive sections to the end of the plan document. Sections of this Hazard Mitigation Plan update have already been included in the new Comprehensive Plan update for 2011 such as the information on planned studies and available grants for mitigation work to alleviate flooding along the Woonasquatucket River, as well as the bridge deficiency list for Providence and discussion about funding bridge repairs.

The State of Rhode Island requires all municipalities to develop a comprehensive plan to guide development decisions and to establish the basis for zoning ordinances and other land use regulation tools. The plan must address community concerns such as housing, parks, transportation, community services, and many others. In Providence Tomorrow you will find all of the required elements and a few others such as sustainability, the city's built environment, and the arts. You will also find discussions about growth and change and where and how the city plans for future development.

The plan outlines goals, policies, issues, and actions to be taken by the community to fulfill that vision. It was determined that the potential impact of natural hazard events could be integrated into many elements of the plan, which would help carry out and implement the suggested mitigation actions in this plan. The city recognized that inclusion of mitigation initiatives – both pre-disaster and post-disaster – would not only benefit the community by reducing human suffering, damages, and the costs of

recovery, but it will also help build and maintain the sustainability and economic health of the community over the long run.

The implementation actions enhance the ongoing activities within the community and provide a framework for current decisions and for those faced in the future. A hazard mitigation component, identifying both pre-disaster and post-disaster actions, should be an extension of the Comprehensive Plan. This will help to insure that the vision identified in the Comprehensive Plan can continues to be realized despite the disaster event and can be used to make appropriate decisions to restore the sense of community lost to a natural disaster.

B. The Fox Point Hurricane Barrier - A Major Mitigation Action

The barrier itself is a 700-foot-long concrete structure, 25 feet high, that extends westerly across the Providence River from Tockwotton Street, near Fox Point to Globe Street, near the power plant. The facility's five pumps are capable of pumping 3,150,000 gallons of water per minute. The structure contains three transfer gate openings that, when closed, prevent the entry of flood waters from the bay. It permits the passage of small vessels when open. Each gate is 40 feet high and 40 feet wide. Two 10 to 15 foot high earth fill dikes, each with stone slope protection, flank each side of the barrier. The eastern dike is 780 feet long and the western dike is 1,400 feet long.

A pumping station and cooling water canal are integral parts of the project. During a tidal/flood situation, the pumping station's five large pumps can discharge the floodwaters of the Providence River through the barrier into the bay. Two gated openings in the pumping station, each 10 feet high and 15 feet wide, admit water into the cooling water canal used by the New England Power Company located immediately behind the barrier. There are three vehicular gates, located at Allens Avenue, South Main Street, and the New England Power Plant and five sewer gates that prevent high tides from backing up through the sewer lines. With continued funding for pending maintenance projects, the Barrier will continue to hold its ground as it provides safety against flood for the City of Providence.

C. Emergency Operation Center & Emergency Operations Plan

On 19 April 2009 the Providence Emergency Management Agency completed the construction of a dedicated National Incident Management System (NIMS) compliant Emergency Operations Center located in the north end of the City. Additionally, the City revised its Emergency Operations Plan during 2010 to reflect these important changes. The plan addresses the response to extraordinary emergency situations associated with natural disasters. The plan predetermines, to the maximum extent possible, actions taken by the community to prevent or minimize disasters.

The plan primarily addresses response and recovery operations associated with catastrophic incidents. This will help insure that activities during the response and recovery phase of the natural disaster will address mitigation, thereby reducing potential losses in the future. At a minimum, the City should develop a list of Funding Priorities for incorporation into the plan, as a reference of ideas for potential mitigation grants. If the city chooses to develop a post-disaster redevelopment plan, the plan should be

consistent with the Emergency Operations Plan (and the Local Comprehensive Plan), so that actions taken in short-term recovery are compatible and complement the long-term vision of the community.

D. Debris Management Plan

The new 2010 Debris Management Plan provides policies and guidance to the City of Providence for the removal and disposition of debris caused by a major disaster. A debris management task force has been created to work with the Public Works Director in determining the extent of damage and debris resulting from a disaster and to assist the local authorities in the process.

E. Dredging Study

In 2007 the City of Providence prepared a dredging study of the Providence and Woonasquatucket Rivers. The results of the study showed approximately 9,000 Cubic Yards of material needed to be removed to achieve design depths. Multiple options were studied in order to decide the most feasible solution to the problem. Costs range from 1-1.7 million for dredging and disposing adding an additional $150,000 to $260,000. The second part of the study proposes a solution to manage the rivers long term.

F. Emergency Management Accreditation Program (EMAP)

The City of Providence received its EMAP accreditation in October 2010. In order to receive this, the City created a plan to link the existing 2005 Hazard Mitigation Plan with the 2011 Update of the Mitigation Plan.

The Emergency Management Accreditation Program (EMAP), an independent non-profit organization, is a standard-based voluntary assessment & peer review accreditation process for government programs responsible for coordinating prevention, mitigation, preparedness, response, and recovery activities for natural & human-caused disasters. Accreditation is based on compliance with collaboratively developed national standards, the Emergency Management Standard by EMAP. Accreditation is open to all U.S. States, territories, and local government emergency management programs.

5.0 Plan Implementation and Maintenance

5.1 Plan Adoption

The City of Providence Emergency Management Plan and Hazard Mitigation Strategy was approved for adoption by the LHMC in 2004 and was submitted to the State that year. This plan was approved once again by the Providence City Council as an element of Comprehensive Plan for the City which is entitled "*Providence 2000 - The Comprehensive Plan"*. This new plan revision, which responds to FEMA's comments and LHMC comments from previous iterations as well as this new plan update process will once again, need to gain the approval of the State Hazard Mitigation Officer (SHMO), the Federal Emergency Management Agency Region I Reviewer, and the Providence City Council for Final Adoption. Once the plan is approved by FEMA and adopted by the City Council, the City's Comprehensive Plan will incorporate the updated plan by reference as is the current relationship between the two plans.

5.2 Implementation, Monitoring, Evaluation, and Update of Strategy

"The success of the hazard mitigation plan is measured by the degree to which actions are accomplished. Without the implementation and maintenance of the plan, the previous components have merely been an effort in research void of any practical application."

-Tennessee Emergency Management Agency

Implementation

The LHMC realized that assigning a time frame to each recommended mitigation action is important so that activities can be coordinated with other important governmental functions, such as committee meetings and budget hearings. Assigned time frames also provide inputs to a project plan used for tracking the progress of all activities.

In order to establish the authority and accountability for implementation, Providence includes amendments to its comprehensive plan that incorporate the theme of hazard mitigation. Once the plan is adopted, the actions are assigned to the responsible agencies for review and planning. Providence is now acting on securing sufficient resources to carry out these recommended actions.

Formal adoption and implementation of this hazard mitigation strategy will help Providence gain credit points under the Federal Emergency Management Agency's (FEMA) Community Rating System (CRS) program, which provides discounts on National Flood Insurance Program (NFIP) flood insurance premiums for residents of communities that voluntarily participate in this program. In addition, the adoption of this mitigation strategy increases Providence's eligibility for federal grants for hazard mitigation, which include FEMA's Pre-Disaster Flood Mitigation Assistance (FMA) program, Pre-Disaster Mitigation Program (PDM) and post-disaster Hazard Mitigation Grant Program (HMGP). (Refer to Appendix B for further information.)

Monitoring

To monitor the implementation of the mitigation plan, the Planning Committee will collect and process the annual reports from the agencies involved in implementing mitigation projects or activities identified in this plan or conduct phone calls and meetings with persons responsible for overseeing the mitigation projects; they also will discuss the plan's status at the annual meeting of the Planning Committee. An annual report summarizing the previously mentioned activities will be written and maintained. These annual reports will provide data for the 5-year update of this plan and will assist in pinpointing implementation challenges. By monitoring the implementation of the plan on an annual basis, the Planning Committee will be able to assess which projects are completed, which are no longer feasible, and what projects may require additional funding.

Evaluation

The LHMC and other local officials will meet every year or after a disaster to ensure that the mitigation actions are being implemented in accordance with the assigned time frames. They will monitor and

document progress**.** Within two months of this meeting, a status report will be given to the plan commission and city council. Progress will be reviewed with the public every two years at advertised public hearings held by the City Plan Commission. The Multi-Hazard Mitigation Coordinator will be responsible for coordinating the annual meeting with the Steering Committee. The group will reconvene in the first quarter of each year. Prior to the meeting, each of the participating jurisdictions will gather data to assess progress toward meeting plan objectives and goals. The evaluation will assess whether:

- Goals and objectives address current and expected conditions.
- The nature or magnitude of the risks has changed.
- Current resources are appropriate for implementing the plan and if different or additional resources are now available.
- Actions were cost-effective.
- Schedules and budgets are feasible.
- Implementation problems, such as technical, political, legal or coordination issues with other agencies are present.
- Outcomes have occurred as expected.
- Changes in City resources impacted plan implementation (e.g., funding, personnel, and equipment).
- Changes in programming or government structures warrant changes to the plan.
- New agencies/departments/staff should be included.

Specifically, the Steering Committee will review the mitigation goals, objectives, and activities using performance-based indicators, including:

- Project completion
- Percent complete versus percent of resources allocated
- Under/over spending
- Achievement of the goals and objectives
- Resource allocation (e.g., If there had been more money would the activity have been more successful)

Additionally, the group will review the mitigation implementation strategy using performance-based indicators including:

- Timeframes
- Budgets
- Lead/support agency commitment
- Resources (funding, personnel [have people been reassigned or left?])
- Feasibility (Is it still an appropriate measure?)

Finally, they will evaluate how other programs and policies have conflicted, or augmented, planned or implemented measures. Other programs and policies can include those that address:

- Sustainability
- Economic development
- Water quality management
- Environmental protection
- Historic preservation
- Redevelopment
- Health and/or safety
- Recreation
- Land use/current and comprehensive planning
- Transportation
- Public education and outreach

Update

The mitigation plan will be updated every five years and will reflect the results of the annual plan evaluations. The Planning Committee will initiate the next revision process for the plan during its annual review meeting in 2011. Following an update of the mitigation plan, the plan will be distributed for public comment. After all comments are addressed, the plan will be revised and distributed to all Steering Committee members, to each city department, and to the Rhode State Hazard Mitigation Officer.

The Providence Hazard Mitigation Coordinator is responsible for coordinating the plan evaluation portion of the meeting, soliciting feedback, collecting and reviewing the comments, and ensuring their

incorporation in the 5-year plan update as appropriate. Members of the Steering Committee will assist the Coordinator, as necessary.

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Appendices

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Appendix A – Johnson & Wales University

Johnson & Wales University

Founded in 1914, JWU's first and largest campus is its Providence Campus, which hosts more than 10,000 students from all 52 states and territories and 71 countries in the city's fast-paced urban center. The Providence campus of JWU is comprised of two separate campus areas. The Downcity Campus is anchored by Gaebe Commons, a popular hub of student activity, and surrounded by a variety of shops, restaurants, cafes, music venues and a scenic riverfront. Four theaters are within walking distance, including the Providence Performing Arts Center, just next to Gaebe Commons, where Broadway shows, comedians and concerts are staged weekly.

The Harborside Campus sits on nearly 100 scenic acres along Narragansett Bay, and houses the College of Culinary Arts, the Alan Shawn Feinstein Graduate School, and the Harborside Recreation Center (two gyms, 17 varsity sports for men and women, and 14 additional club and intramural sports and home of the NCAA Division III Wildcats). A recently completed Urban Coastal Greenway runs along the shoreline by Save the Bay and is open to the public during daylight hours. The Coastal Greenway was developed under the State of Rhode Island Coastal Resources Management Council's (CRMC) Metro Bay area Special Area Management Plan (SAMP). The Harborside Campus is also home to the Culinary Arts Museum with more than 500,000 culinary artifacts, some dating back 5,000 years.

In addition to several newly developed, state of the art buildings, Johnson & Wales owns several historic buildings fronting Weybosset and Pine Streets. While issues such as small floor plates and renovation costs present challenges for their re-use, these buildings nonetheless are important assets that contribute to the quality and character of the campus; the preservation and reuse of the historic buildings are important elements of the university's identity. The university maintains and upgrades its historic structures in a manner which complies with applicable codes and regulations. In addition, the university maintains a campus master plan, which has been presented to an approved by the City of Providence and is periodically updated, which identifies its intended future development activities within the City.

A significant portion of the Harborside Campus is located within the FEMA mapped Narragansett Bay 100-year flood zone (A zone), and some portions are located within the Coastal Flood within Velocity Hazard Zone (V-zone). State regulations define permitted uses and activities within these areas. As a general rule, development within the flood zone must be raised above the V zone elevation, and any fill requires the approval of FEMA and State regulatory agencies. The boundary of the Narragansett Bay 100-year flood zone is a significant factor that shapes the planning and development of the campus. The flood zone extends over much of the existing campus core up to the student residence complex at the west edge of the campus. The university is aware of the requirement that new buildings must be raised above the flood plain in order to address life safety and regulatory requirements and will meet that requirement for new projects in a manner that relates and responds properly to existing land and building elements still within the flood zone.

The elevation of the V zone at the Harborside Campus is 18 feet. As a reference point, the elevation at the existing Harborside Academic Center is approximately ten feet, so any new development in this area would need to be raised at least 8 feet above existing grades. Harborside Village, which is newly developed student housing was raised above 19 feet using a significant amount of imported, compacted fill. The design included the installation of rip rap armament along the edge to protect the fill from erosion during a 100-year storm event. After reviewing the design and confirming the completion of the

project, FEMA determined that the site was no longer located within either the V or A zones. FEMA has issued a Letter of Map Amendment to the Cities of Providence and Cranston designating the Harborside Village a B Zone, which is not subject to the 100 year flood.

As the university continues to develop the Harborside Campus, it will continue to raise all new buildings above the floodplain. Older, obsolete, buildings will be demolished, thereby reducing the vulnerability of the Harborside Campus to flooding. Developing new buildings that are raised by up to ten feet above existing grades is expected to present architectural, engineering and regulatory challenges that will require innovative urban design solutions in order to achieve a cohesive campus environment. The university has demonstrated its ability to successfully develop fully conforming and attractive major projects at its Harborside Campus in spite of those challenges.

Johnson and Wales has been very proactive in implementing flood control Mitigation measures for the Harborside campus. The following describes mitigation measures over the last five years as well as potential future mitigation plans:

Harborside Village

- Building site was raised 10-12' to comply with new flood plain standards
- Rip Rap was placed around approximately half of the edge of the site

Center for Culinary Excellence

- First floor of the building is '12 above existing grade to comply with new flood plain standards
- Lower Level has breakaway walls
- Rip Rap placed around part of the exterior of the site
- Ability to immediately shut down HVAC controls via any computer in the event of an emergency

Grace Welcome Center

- Building site raised 8' at its lowest point to comply with new flood plain standards
- Building located on the site so as to remove it from the velocity zone
- Professional arborist examined existing trees, 16 dead and dying tress removed from the site
- Ability to immediately shut down HVAC controls via any computer in the event of an emergency

Urban Coastal Greenway

- Debris removed from the site and shoreline
- Rip Rap placed along entire length of shoreline
- Natural habitat (riparian buffer) restored to 6 acres of the site

Information Technology:

- In the process of implementing a data center disaster recovery program.
- Instituted an IT Emergency Response Team (ISERT) that will manage and coordinate IT efforts in the event of a disaster or service related disruption.

Other:

- Emergency Operations Center (EOC) added to Downcity Campus, with capacity to respond to emergencies at both the Harborside and Downcity Campuses
- Larger emergency generator added to Downcity Campus for the IT building and the building location of Campus Safety and Security and the EOC
- Partnered with PEMA on Port Siren project, added emergency siren to Harborside Campus
- Purchased 8 800 MHZ radios for Campus Safety and Security to be interoperable with local and state emergency agencies
- Member of Port Chemical Sensor emergency notification network
- Participate with local and state emergency agencies in emergency planning and drills
- Has established the ability to communicate with faculty and staff via mass telephone and electronic communications in emergency situations

Anticipated Future Measures

- All future buildings on the Harborside Campus will be elevated to comply with applicable floodplain standards
- Purchase of additional 800 MHz emergency radios for Campus and Safety Security to supplement communication capability during emergency situations
- Provide ongoing training to students, faculty and staff with regard to emergency response activities, to include evacuation drills
- Extend emergency shutdown of HVAC equipment to the Downcity Campus, and install emergency HVAC shutdown controls at Campus Safety & Security
- Extend the urban coastal greenway, thereby improving the condition of the balance of the shoreline at the Harborside Campus

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Appendix B – Providence Healthcare Cluster

Hospital Cluster Profile

The Providence Healthcare Cluster includes Rhode Island Hospital, the State's only Level I Trauma Center, Hasbro Children's Hospital, and Women & Infants Hospital of Rhode Island.

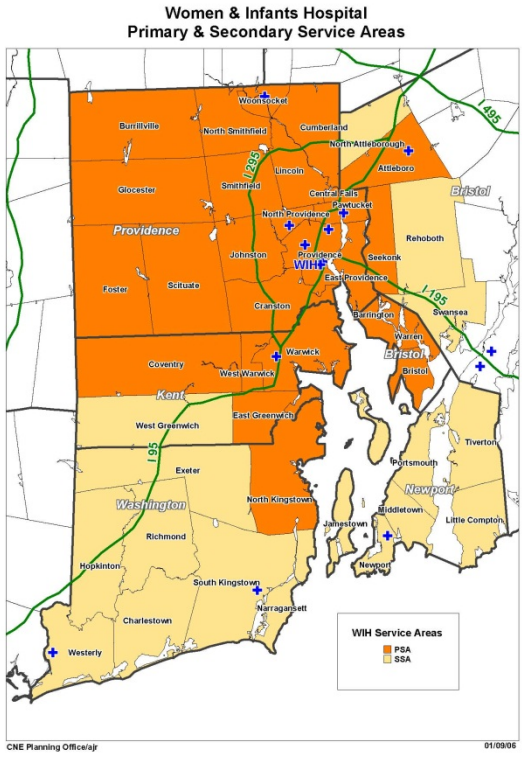
Providence Healthcare Cluster Overview	
Providence Healthcare Cluster Campus	3,012,610 SF or 69.16 acres
Total Employees on Campus :	Between 9,000 and 11,000 considering employees and foundation members
People on Complex During Typical Day	7,500 – 10,000

Organizational Capacity: Lifespan is the state's largest private employer with over 12,000 employees and is also the state's largest hospital network. The other affiliate hospitals include Bradley Hospital, Miriam Hospital and Newport Hospital. Rhode Island Hospital, was founded in 1863, and is a private, not-for-profit hospital (www.rhodeislandhospital.org). A major trauma center for southeastern New England, the hospital is dedicated to being on the cutting edge of medicine and research. Rhode Island Hospital provides a full range of diagnostic and therapeutic services to patients, with particular expertise in cardiology, oncology/radiation oncology, neurosciences, orthopedics and pediatrics. Lifespan's capacity for attracting federal and private funding for its research has made it a leader in healthcare research.

Lifespan, Rhode Island's first health system was founded in 1994 by Rhode Island Hospital and The Miriam Hospital. A comprehensive, integrated, academic health system, Lifespan's present partners also include RI Hospital's Hasbro Children's Hospital, Bradley Hospital, and Newport Hospital.

A not-for-profit organization, Lifespan is overseen by a board of volunteer community leaders who are guided by its mission to improve the health status of the people it serves in Rhode Island and New England through the provision of customer friendly, geographically accessible and high value services. Lifespan believes that this can best be accomplished within the environment of a comprehensive, integrated academic health system.

In fiscal year 2009, Rhode Island Hospital, including its pediatric division, Hasbro Children's Hospital, served patients in 194,747 outpatient visits and 34,942 patient discharges. Emergency department visits for the hospitals totaled 147,633. True to its original mission of being a hospital for the benefit of all Rhode Islanders, $29.2 million in charity care and $5.8 million in subsidized health services were provided in 2009. Along with being the only Level 1 certified Trauma Centers in southeastern New England; it now has been certified as the only American Burn Association Center in the state of Rhode Island. As a frequent destination for critical care by Congressional members and members of the federal government, RIH works closely with federal law enforcement to be better prepared for high level readiness when dignitaries are local. Lifespan, the corporate structure that oversees RI Hospital, has systemized many aspects of readiness to include Emergency Preparedness. The Lifespan



Office of Emergency Preparedness located two blocks away in the corporate and research section of the campus provide fully integrated incident command for all hazards events.

Adjacent to Rhode Island Hospital but integral with the hospital cluster, Women and Infants Hospital, a Care New England hospital, is one of the nation's leading specialty hospitals for women and newborns. The primary teaching affiliate of The Warren Alpert Medical School of Brown University for obstetrics, gynecology and newborn pediatrics, Women & Infants is the seventh largest obstetrical service in the country with more than 8,500 deliveries per year and the only major provider of service in Rhode Island. Women & Infants recently opened the country's largest, single-family room neonatal intensive care unit, which in Fiscal Year 2010 cared for close to 1,300 high-risk newborns from throughout southeastern New England. The hospital's surgical program, with a volume of nearly 8,000 procedures a year, provides a comprehensive array of services including women's oncology, infertility and urogynecology programs to meet the needs of women throughout their lives.

Women & Infants Hospital has long been a mainstay of medical care for diverse populations throughout the region. In Fiscal Year 2010 Women & Infants Hospital's Ambulatory Services conducted nearly 170,000 patient visits, received more than 52,000 Triage and Health Line calls, and conducted patient education programs for 24,000 women and families.

The hospital serves as a primary care facility for maternal-child health and women's health in Rhode Island, with particular emphasis on the low-income neighborhoods surrounding its South Providence main campus setting, and populations who because of language, age, race, ethnicity, disability or disadvantage present special needs. In 2009, Women & Infants provided $20 million in free and uncompensated care to those in need, in addition to over $5 million in community health services, community education and outreach programming throughout the state.

Healthcare Delivery in Rhode Island

In terms of its health care delivery system, Rhode Island has sixteen (16) hospitals ranging in size from 100 to 719 beds. Altogether there are 3,703 licensed beds. Included in this total are ten (10) general acute care facilities, one (1) regional obstetrical facility, two (2) psychiatric facilities and one (1) long term care facility managed by the state. Rhode Island also has one (1) licensed rehabilitation center hospital. Outpatient clinics are operated by all of the short stay hospitals. Distinct (i.e., separately licensed) outpatient facilities include two (2) freestanding emergency care facilities, three (3) general ambulatory surgery facilities, four (4) specialty ambulatory surgery facilities, and thirty-six (36) "organized ambulatory care facilities." In addition, the federal government maintains the Providence Veterans Administration Medical Center and an ambulatory care facility at the Newport Naval Station in Rhode Island.

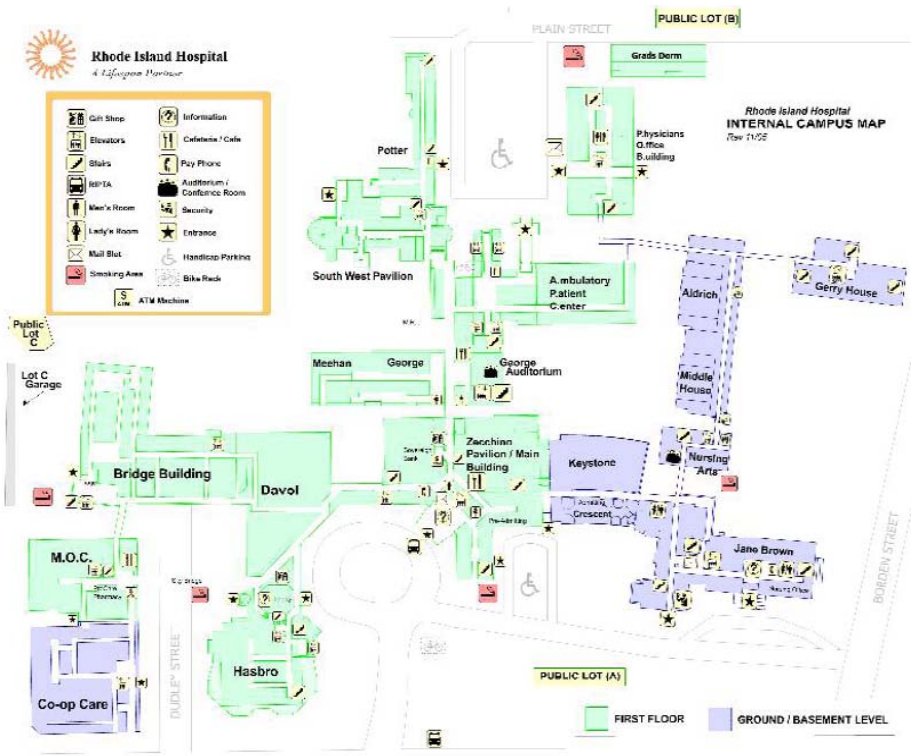
In addition to inpatient and outpatient services, several facilities have formal affiliations with medical, nursing and dental schools, providing highly regarded educational opportunities to future physicians, nurses and allied health professionals. Many hospitals also offer select specialty services for adults and children. Despite the State's compact size, RI hospitals have nationally recognized clinical medicine and

research programs. RI Hospital is the only Level 1 Trauma Center in the State and the only newly certified burn center in Rhode Island. Those criteria are established by the American College of Surgeons in collaboration with the American Burn Association.

The delivery of healthcare within the state is well balanced with smaller community hospitals facilitating care in moderate levels to small numbers of patients. The uniqueness of Rhode Island Hospital is its ability to rapidly increase its capacity to handle larger volumes of surge. Other hospitals, while readily capable of handling smaller, less intensive cases, are unable to satisfy the need of caring for large volumes of critically injured. The surgical department alone accesses over 25 surgical suites in RI Hospital alone with additional capacity in the critical care rooms staffed in the trauma area of the emergency department. Increased surge capacity is critical when offering high levels of emergency interventional care from pediatric and adult trauma to all aspects of critical burn care. While these facilities are genaerally operating at capacity, the need to create care during surge periods is critical to maintain the continuity of care.

Unique Characteristics

Rhode Island Hospital



Central to emergency preparedness and medical response in the state is Rhode Island Hospital, the state's only Level 1 Trauma center which is the highest designation a trauma center can receive; it also serves as the Level I Trauma Center for southeastern New England. RIH's and Hasbro Children's hospital emergency departments see over 150,000 patients a year, 22,000 of which are trauma patients.

RIH's emergency department alone sees over 100,000 patients a year, 22,000 of whom are trauma patients. In addition, RIH has recently been certified by the American Burn Association as the state's only certified burn center capable of providing robust burn care to large numbers of victims. "Trauma" is

defined as any severe or life-threatening injury – often times the consequence of a motor vehicle crash, violent attack, or fires and burns. To maintain Level I status, RIH must demonstrate that it has an ongoing quality assurance program, maintains a standard response for treatment of major trauma and has a trauma surgeon and anesthesiologist available at all times. RIH is a founding affiliate of the Lifespan hospital network. Its pediatric division, Hasbro Children's Hospital, is the largest pediatric hospital between Boston and New York City. It is important to note that Rhode Island Hospital and Hasbro Children's Hospital are servicing a large population of people between the metropolitan areas of Providence and Boston and its location on the I-95 corridor makes it both an asset and a threat. Other Lifespan affiliates are The Miriam Hospital (Providence), Bradley Hospital (East Providence) and Newport Hospital.

Economic Impact

Lifespan hospitals employ nearly 12,000 employees. With system-wide operating revenue and equivalent expenses of $1.5 billion annually, Lifespan is the state largest private employer. Lifespan hospitals are the teaching sites for the Warren Alpert School of Medicine at Brown University and the other health professional training programs in our state. RIH serves as the principal teaching affiliate of Brown University's medical school. The RI Hospital campus can be populated at any part of the business day with over 5,000 patients, staff and/or visitors. The adjacent corporate and research areas can add an additional 1,000 people to that volume.

At any one time there could be upwards of an additional 2600 – 2700 people in Women and Infants. This would include staff, patients, visitors and vendors. These totals, not including area medical office visits separate from the hospital, can total a minimum of 8500 to 9000 people during heavy volume.

The true economic impact of this cluster is very difficult to calculate, the loss of employment alone, impacting over 15,000 people would have critical impact to the city and state economies on a large scale. It is further difficult to calculate the fiscal impact as it relates to the redistribution of an estimated 200,000 patient visits per year in the event of a catastrophic event on that campus. From a patient care view, the high acuity of many of the patients seen within the trauma service as well as the obstetrical and pediatric impacts if lost would be catastrophic to healthcare in Rhode Island.

Providence Healthcare Cluster Plan Development Process

Hazard Mitigation Plan Development Staff

The following staff assisted in the Providence Healthcare Cluster hazards mitigation planning process.

Title	Representative
Director of Emergency Preparedness	Peter T. Ginaitt
Operations Coordinator	David Schnell

Logistical Planning Coordinator	Loreen Angell

Hazard Mitigation Plan Development

The following activities supported the development of Providence Healthcare Cluster local hazard mitigation planning process:

Date	Location	Activity	Subject
September 27, 2010	Providence EMA (PEMA)	Communications Meeting	Discussion on communications and EOC coordination
October 4, 2010		Communications Meeting	RI State Police meeting to discuss integration of communications and response for the Fusion Center.
October 10, 2010		Operations Meeting	Purchased and met with Ops Center vendors for merger of operations software with PEMA
November 23, 2010		CHEMPACK Planning	RIH/CDC CHEMPACK planning for City of Providence coordination of nerve agent antidotes stored on campus. Affiliation agreement with PEMA and PFD to transport within City and adjacent communities.
December 6, 2010	PEMA	Hazard Mitigation Planning Meeting	Discussion of hazard mitigation plan update for the City of Providence
December 9, 2010	RIEMA	UASI Grant Meeting	Security connection initiative of CCT to RIH and infrastructure hardening of Miriam Hospital
December 21, 2010	PEMA	Hazard Mitigation Planning Meeting	Decision to create Hospital Healthcare Annex
January 11, 2011	PEMA	Hazard Mitigation Planning Meeting	Current status of plan update and follow-up to do-outs
February 4, 2011	PEMA	Hazard Mitigation Public Meeting	Attended as committee member and community member

Mitigation Initiative Prioritization Process

This is the first version of the Providence Healthcare Cluster Annex. The Mitigation Initiatives were drafted and brought before the Hazard Mitigation Committee for discussion and comment. These initiatives were then ranked and prioritized according to mitigation need and funding capabilities. The hospital cluster partners examine threats annually through the hazard vulnerability assessments and also through annual assessments with private consultants. The Office of Emergency Preparedness identifies physical infrastructure protection initiatives and fund when available. Over the last five years, various funding sources through DHS, CDC, HHS and other sources fund identified vulnerabilities that may be exsist on the campus. They have purchased concrete barriers and planned for their placement (however very difficult and time consuming), installed various PTZ and fixed camera systems that cover critical generators, access points, critical areas such as the emergency departments and most especially our power plant which has had significant protective measures installed, radiological source locations, mass casualty and pandemic equipment and supply cache locations and the federal CHEMPACK nerve agent antidote supply location. Further improvements have installed fence barriers to receiving areas, radiological proximity monitors to the central receiving areas and emergency room entrances and roll down doors to secure the parking areas under the trauma center and helipad. Additional improvements to emergency operations include developing better operations centers at the hospitals, robust satellite communications systems at each hospital and 2 rapidly deployable units for mobile relocation.

The Lifespan Office of Emergency Preparedness has further improved their EOC with limited funds to facilitate in an area command operation for systemic events that require an organized approach to incident command structures. Added communications systems have been integrated as they move forward with systemic improvements.

Providence Hospital Risk Assessment

Introduction

The risk assessment provides information about the hazards that threaten Providence Healthcare Cluster. This information provides the factual basis to identify and support a strategy that can effectively mitigate the effects of the hazards that threaten this jurisdiction's safety and challenge its ability to perform essential functions.

The content and structure of this plan's risk assessment was developed using the Federal Emergency Management's (FEMA) 2008 "Local Multi-Hazard Mitigation Planning Guidance."

Hazard Analysis

Rhode Island is approximately 50 miles from Boston to the north and 200 miles from New York City to the south. Its location along the northeastern seaboard makes it vulnerable not only to natural disasters such as blizzards and hurricanes, but also man-made disasters such as acts of terrorism, and events resulting in mass casualties. RI has seen its share of both in recent years. The Egypt Air crash in 1999,

just 50 miles from the Massachusetts coast, involved RI state-level assistance in the recovery and identification of bodies, body parts and personal effects of passengers. The Station Nightclub fire in February 2003 is documented as the nation's fourth worst fire disaster in US history, resulting in the loss of 100 lives. That event tested RI's capacity to respond to a large-scale mass casualty incident with ramifications that extended beyond that horrific night. In addition to that event, 9/11 and Hurricane Katrina has helped RI's emergency care administrators, first responders and providers learn a great deal about what works well in our systems and what needs improvement. One of the greatest lessons learned at that fire was the need for a robust patient tracking system. While systems have been investigated, few have offered a daily fix to this problem.

Hazard vulnerabilities of hospitals are determined by using criteria that include the probability of human impact, property impact, business impact, preparedness, and internal and external response. Each set of criteria is rated on a scale of zero (0) to three (3), with (3) being the highest and zero (0) being not applicable to the hospital. After all the criteria have scored, the events with the highest totals are considered the vulnerabilities. Hospitals are keenly aware of the need to be better prepared for "All Hazards" events that may not present themselves initially as patient care issues.

Each hospital in RI has submitted HEALTH their top three HVAs. HEALTH compiled the data and came to the following conclusion about the HVA of RI hospitals. The top 2 vulnerabilities are: Natural disaster (27 points) and loss or failure of utility systems (18 points). For natural disasters, the most frequently identified hospital vulnerabilities were identified as a hurricane, severe thunderstorm, and blizzard. Loss or failure of utility systems vulnerabilities included loss of power, loss of potable water, generator failure/fuel, and loss of information systems.

Additionally, Providence as a target for an intentional (terrorist) attack was made apparent by a recent security risk analysis and report prepared in 2005 for the Rhode Island Attorney General's Office. The report detailed the security risk to Providence, the greater Providence area, and the state, of intentional damage to a proposed expansion of the state's Liquid Natural Gas (LNG) facility and its transport route into Narragansett Bay.[32] This reports states that "both the proposed urban LNG off loading facility and the proposed LNG tanker transit through 29 miles of Rhode Island have security vulnerabilities that are unlikely to be successfully remediated." Providence is at the head of Narragansett Bay, and the route from the Atlantic Ocean to Providence exposes multiple municipalities, to a high level of security risk. In addition to reporting on the intent of potential terrorists, the report outlines in detail the high level of catastrophic damage that could occur if a large breach were made in the urban LNG facility's tank, if three of five containers aboard an LNG tanker were breached, or if an attack occurred involving both the facility and the tanker during unloading.

The report's author predicts that, "The consequences of a major attack could include fires that would damage homes, hospitals, a chemical plant, and other infrastructure, depending upon where the attack

[32] Clark, Richard A. Good Harbor Consulting Group, LLC. *LNG Facilities in Urban Areas: A Security Risk Management Analysis for Attorney General Patrick Lynch Rhode Island. May 2005. Pro bono publico.*

occurred. Many fires could exceed the 2000 BTU limit for the employment of fire fighters, necessitating a “let it burn” approach to many structures. There would be both prompt and delayed fatalities…. The delayed fatalities and the wounded could place a burden on all healthcare facilities in the region….Consequently, the overall emergency medical system might not have the capacity to deal with it.”

Summary of Risk Assessment

Based on the regional risk assessment and the local risk assessment in the subsequent section, the following hazards pose the greatest threat to Providence Healthcare Cluster.

Naturally Occurring Events

- Hurricanes
- Temperature Extremes
- Epidemic

Technological Events

- Information Systems Failure
- Water Failures

Human Related Events

- Mass Casualty Incident (medical/infectious
- Rail Event
- Labor Action
- Terrorism, Biological
- Forensic Admission
- Bomb Threat
- Hostage Situation

Events Involving Hazardous Materials

- Small Casualty Hazmat Incident
- Chemical Exposure, External

RHODE ISLAND HOSPITAL HAZARD VULNERABILITY ANALYSIS May 2010

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Naturally Occurring Events

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interruption of services*	*Preplanning*	*Time, effectiveness, resources*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 - 100%*
Hurricane	2	1	2	2	1	2	1	33%
Temperature Extremes	2	1	1	1	1	1	1	22%
Epidemic	1	2	1	2	1	2	2	19%
Storm Surge	1	2	2	2	1	1	1	17%
Snow Fall	2	0	0	1	1	0	1	11%
Severe Thunderstorm	2	0	0	0	1	1	1	11%
Flood, External	1	1	1	1	1	1	1	11%
Tornado	1	1	1	1	0	1	1	9%
Blizzard	1	1	1	1	1	0	1	9%
Ice Storm	1	1	0	1	1	0	0	6%
AVERAGE SCORE	0.81	0.56	0.56	0.69	0.50	0.56	0.63	6%

**Threat increases with percentage.*

RISK = PROBABILITY * SEVERITY		
0.06	0.29	0.20

Technological Events

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EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interruption of services*	*Preplanning*	*Time, effectiveness, resources*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 - 100%*
Information Systems Failure	2	1	2	2	1	1	2	33%
Water Failure	1	1	1	2	2	1	2	17%
Electrical Failure	1	1	1	2	1	1	2	15%
Generator Failure	1	1	1	2	1	1	2	15%
Natural Gas Failure	1	1	1	3	1	1	1	15%
Sewer Failure	1	1	1	3	1	1	1	15%
Fuel Shortage	1	1	1	2	1	1	1	13%
Fuel Shortage	1	1	1	2	1	1	1	13%
Communications Failure	1	1	0	2	1	1	2	13%
Medical Vacuum Failure	1	1	1	1	1	1	2	13%
HVAC Failure	1	1	1	2	1	1	1	13%
Transportation Failure	1	1	0	1	1	1	2	11%
Structural Damage	1	1	1	1	1	1	1	11%
Fire, Internal	1	1	1	1	1	1	1	11%
Flood, Internal	1	1	1	1	1	1	1	11%
Steam Failure	1	1	1	2	1	1	0	11%
Hazmat Exposure, Internal	1	1	0	1	1	1	1	9%

Human Related Events

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interruption of services*	*Preplanning*	*Time, effectiveness, resources*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 - 100%*
Mass Casualty Incident (medical/infectious)	2	2	1	2	1	1	1	30%
Rail Event	1	2	0	1	1	1	1	11%
Labor Action	1	0	1	2	1	1	1	11%
Terrorism, Biological	1	2	0	1	1	1	1	11%
Forensic Admission	1	1	0	0	2	2	1	11%
Bomb Threat	1	1	1	1	1	1	1	11%
Hostage Situation	1	1	1	1	1	1	1	11%
VIP Situation	1	1	0	0	1	1	1	7%
Infant Abduction	1	1	0	0	1	1	1	7%
Civil Disturbance	1	0	0	1	1	1	1	7%
AVERAGE	0.90	0.90	0.30	0.70	1.00	1.00	0.90	9%

**Threat increases with percentage.*

RISK = PROBABILITY * SEVERITY		
0.09	0.30	0.30

Events Involving Hazardous Materials

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EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interruption of services*	*Preplanning*	*Time effectiveness resources*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 - 100%
Small Casualty Hazmat Incident *(From historic events at your MC with < 5 victims)*	3	2	1	1	1	1	1	39%
Chemical Exposure, External	2	1	1	1	1	1	1	22%
Mass Casualty Hazmat Incident *(From historic events at your MC with >= 5 victims)*	1	2	1	1	1	1	1	13%
Terrorism, Radiologic	1	1	1	1	1	1	1	11%
Large Internal Spill	1	1	1	1	1	1	1	11%
Terrorism, Chemical	1	1	1	1	1	1	1	11%
Radiologic Exposure, Internal	1	1	1	1	1	1	1	11%
Radiologic Exposure, External	1	1	1	1	1	1	1	11%
Small-Medium Sized Internal Spill	1	1	1	1	1	1	1	11%
AVERAGE	0.78	0.89	0.78	0.78	0.78	0.78	0.78	0%

Local Risk Assessment

Even though hospitals are better prepared, adequate gaps analyses are still required to better identify the overall needs of the facilities. Accesses to the facilities are better controlled than ever before but the overall integrity of hospitals is always at risk. Constant analysis of threat assessments is required to identify the actual weaknesses and vulnerabilities that may exist. Emphasis is always placed on the security of this campus for the protection of its patients, staff and visitors with a balance of patient comfort and sense of security. True gap and consequence analysis have not been performed for the overall threats that may exist. The use of hazard vulnerability assessments is the only tools to gauge our initiatives. Obviously, the events of the world often result in improvements to better protect the critical infrastructures of the healthcare cluster. This area is in need of a comprehensive assessment with solid recommendations to better prepare for and protect the area as a whole.

Other federal agencies such as the Department of Energy do recognize the threats that exist as a facility that maintains large quantities of radioactive sources which power the state's only Gamma knife and Gamma cell. Collectively, the entire campus needs control measures that better regulate access and security to the entire facility.

Identification of Hazards/Vulnerabilities/Gaps

The potential to disrupt normal community activities exists in the State of Rhode Island because of the following hazards identified by the Rhode Island Emergency Management Agency (RIEMA) and recorded by the Federal Emergency Management Agency (FEMA). All thirteen (13) identified hazards could create potential medical and public health consequences requiring the HEALTH, other state agencies and healthcare facilities to activate their Incident Command System. In addition to nuclear attack, these hazards could also cause casualties and cause property damage to the state. Hazards Identified: (1) Hurricane/Tropical Storm (2) Winter Storm (3) Hazardous Materials (4) Flood (5) Power Failure (6) Transportation Accident (7) Urban Fire (8) Earthquake (9) Tornado (10) Drought (11) Dam failure (12) Terrorism (13) Wildfire.

The population density in and around the State of Rhode Island makes it necessary to plan and implement mass evacuations in the event of large–scale natural, manmade and technological hazards. Hurricanes, winter storms and other potentially large–scale regional hazards can trigger an emergency relocation of vulnerable residents at rates and volumes that will drastically overload roadway networks, public transportation, public shelters and host medical facilities. In addition, Providence was recently designated as part of the Tier 2 Urban Area Security Initiative (UASI).

As described earlier, each hospital in RI has submitted to HEALTH their top HVAs. The top 2 vulnerabilities are: Natural disaster (27 points) and loss or failure of utility systems (18 points). For natural disasters, the most frequently identified hospital vulnerabilities were identified as a hurricane, temperature extremes and epidemic. Loss or failure of utility systems vulnerabilities included loss of power, loss of potable water, generator failure/fuel, and loss of information systems.

A comprehensive risk assessment of the major natural hazards that threaten the Providence Healthcare Cluster was developed for this plan through the regional risk assessment process described in Section 3.3 of the Providence Hazard Mitigation Plan. The regional risk assessment and its hazard profiles serve as the foundation for this jurisdiction's risk assessment. A list of all the potential natural hazards that could impact this jurisdiction is located in Chapter 3. The Providence Hazard Mitigation Plan includes the following natural hazards: Hurricane, Flood, Winter Storms & Nor'easters, Pandemic, Extreme Temperatures, and Man-Made Hazards and a profile for each hazard. This profile includes effects, severity, impacts, probability of occurrence, and historical data. The base plan also includes all relevant data on the population, employment, critical facilities, and other pertinent information.

Current Mitigation Activities

Rhode Island's vulnerability to natural disasters, such as hurricanes and blizzards, and its proximity to New York City and Boston as potential targets for terrorist attacks necessitate that it be extraordinarily prepared for a coordinated response to these threats. Clearly, these vulnerabilities are common to many states subject to weather extremes, to those with coastal climates and to those who are in close proximity to major metropolitan areas.

Until recently, RI has not had a single EMS communications system. During the response to the Station Nightclub Fire incident, some EMS crews were unfamiliar with the location and correct emergency radio contact numbers, because most EMS communications are locally derived and a common inter-city frequency not readily available. An interoperable system for communications is currently being integrated into daily communications with all first responders in the state.

Learning from 9/11, the West Warwick Station Nightclub fire, Katrina and numerous other local emergency, multi-victim, public health events in recent years (e.g. Hepatitis A exposure of a large number of restaurant workers and patrons), RI has made building a patient tracking system and comprehensive interoperable statewide communications system a priority.

Woman and Infants completed construction of the South Pavilion addition to the hospital. The South Pavilion boasts the largest single-family room neonatal intensive care unit (NICU) in the nation, with 70 rooms that give each family private space. There are 80 beds in the two-story NICU, with some rooms designated for families of twins or triplets. The South Pavilion also features a 30-room Antenatal Care Unit with its own amenities suite to help pamper women who find themselves on days and weeks of bed rest during a high-risk pregnancy.

Future Mitigation Actions

<u>Capital Improvement Plans</u>

Construction continues to occur with improvements continuing on the campus, recently a new state of the art trauma center was completed after the investment of almost 200 million dollars. This center provides for expedited access into the system with comprehensive care for medical events and CBRNE

events. It has recently installed a roof top helipad for immediate access into the system removing some of the original barriers that were experienced with a remote helipad. It has been lauded by all commercial providers as a state of the art improvement to healthcare. Lifespan continues to integrate other services into this system by working and training closely with the Rhode Island Army National Guard to increase awareness, policies and communications with their Medevac unit in the state. This component alone can add an additional 16 staffed Blackhawk helicopters as potential responders in a statewide or regional response. The hospital continues to work closely with the US Coast Guard supporting training between both entities regarding overall support as a critical receiving agent to facilitate the needs of their vast jurisdiction which includes all of Rhode Island, the supporting waterways and the southeastern portions of Massachusetts which include Cape Cod and the tourist island of Martha's Vineyard and Nantucket. The USCG has indicated their preference to coordinate care through RI Hospital since the facilities are conducive to the needs of that agency.

Homeland Security Measures

RIH has made improvements to the security system by constantly updating the CCTV system on campus. 190 cameras are monitored 24/7 to ensure optimal response but with 140 entrances on the campus, these security issues are immense.

In addition, increased security has been placed within the power plant which provides full utility support to the entire campus which includes heating, cooling and the ability to cogenerate power.

Additional fencing has been installed to further limit access to areas close to the facility and to underground garages but additional bollards for complete closure are needed. While we have 30 barriers to deploy around the campus for proximity protection, the time and effort necessary is considerable and prevents an immediate protective barrier if time is essential.

Additional radiological monitoring is performed within the receiving section where goods are brought in and also within the emergency departments. These portals, while basic at this point, add additional recognition to threats that may enter the facility.

In 2010, WIH implemented a new Security Identification System that requires all visitors in the hospital to clearly wear a temporary picture ID badge at all times which identifies the area of the hospital that they will be visiting.

WIH has continued to add video surveillance equipment throughout the hospital and is hopeful to add more in the future.

WIH has also implemented controlled card access to many areas of the hospital that have been determined to be security sensitive. The number of controlled access areas will continue to grow as we move forward.

The entire campus is in need of upgraded signage for immediate messaging, pneumatic bollards in critical locations, increased access control and surveillance in many areas and completes integration of the operations center into PEMA.

Lifespan EOC improvements should include a robust web based ICS system, increased capabilities in the areas of CCTV, communications and overall response to the campus.

Overall, the improvements made to further protect the critical infrastructures at RI Hospital have helped to further protect and secure identified challenges. While much work has been accomplished, multiple weaknesses remain that will require additional funding to properly mitigate. The planning process assists with those mitigation goals and continues to be placed on long term improvement agendas.

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Appendix C – 2011 Hazard Mitigation Committee Meeting Minutes, Sign-in sheets and Public Notices

Providence Emergency Management Agency
+ Office of Homeland Security

David N. Cicilline, Mayor | Peter T. Gaynor, Director

12 October 2010

Dear Providence Partners,

During September 2010, the City of Providence Emergency Management Agency (PEMA) was awarded a FEMA Pre-Disaster Mitigation (PDM) Grant designed to update the City's 2005 *Natural Hazard Mitigation Strategy*. The PDM Grant provides funds to local jurisdictions for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Updating this plan has never been more important and relevant following the March 2010 floods. The plan is a mandatory document in order to receive mitigation federal funds following a major disaster.

Through a completive bid process, via the City's Board of Contract and Supply, we have awarded the Maguire Group Inc. the contract to update this plan. The next step is to form a *Multi-Hazard Mitigation Committee* made up of representatives from City departments and public-private entities across the jurisdiction. They are:

- Thomas Deller, Planning & Development
- Sheila McGauvran, Building & Standards
- Dean Esserman, Providence Police
- George Farrell, Providence Fire
- Paul Thomas, Public Works
- Thomas Brady, School Department
- Pamela Marchand, Water Supply Board
- Peter Ginaitt, Lifespan
- Bruce Waterson, ProvPort
- Russell Carey, Brown University
- Paul Annarummo, RI Department of Transportation
- J. David Smith, RI Emergency Management Agency
- Angelo De Peri, Providence/Warwick Convention & Visitors Bureau

My request is that you appoint an appropriate staff member to represent your interests in this project. We have scheduled three (3) formal public meetings with the goal of having a final draft of the new *City of Providence Multi-hazard Mitigation Plan* to FEMA in February 2011 for approval and implementation.

The dates of the public meetings are:

- Hazard Mitigation Plan Update Kick-off Meeting, Monday, November 8, 2010 1:00 pm
- Hazard Mitigation Plan Update Mid-Planning Meeting, Monday, December 6, 2010 1:00 pm
- Hazard Mitigation Plan Update Final Planning Meeting, Monday, January 10, 2011 1:00 pm

PROVIDENCE THE CREATIVE CAPITAL

591 Charles Street Providence, Rhode Island 02904 | 401 680 8000 OFFICE | 401 228 8009 FAX
www.readyprov.com

Please confirm your interest and your representative to Josh O'Neill (680-8096) or by e-mail to Joneill@providenceri.com by 25 October 2010.

Respectfully,

Peter T. Gaynor
Director

During September 2010, the City of Providence Emergency Management Agency (PEMA) was awarded a FEMA Pre-Disaster Mitigation (PDM) Grant designed to update the City's 2005 Natural Hazard Mitigation Strategy. The PDM Grant provides funds to local jurisdictions for hazard mitigation planning and the implementation of mitigation programs prior to a disaster event. The plan is a mandatory document in order to recieve mitigation federal funds following a disaster.

We have scheduled a formal public meeting for comments on this Plan Update.

The November 8, 2010 Meeting of the Multi-Hazard Mitigation Committee will be held at the Public Safety Complex Auditorium, 325 Washington Street, Providence at 1:00 pm.

City of Providence Hazard Mitigation Kick-Off Meeting Agenda

November 8th 2010

1) Introductions
2) Overview of the Hazard Mitigation Plan
3) Review City of Providence Risk Assessment Matrix
4) Review/Prioritize Hazards- Identify Man-Made Hazards
5) Existing Plans/Policies that should be incorporated into the HMP
6) Ideas for Public Participation

- Keep track of costs associated with information gathering including printing, mileage, etc. These costs are needed to document of the local in-kind match for the FEMA PDM grant.

PETER T. GAYNOR
DIRECTOR

DAVID N. CICILLINE
MAYOR

PROVIDENCE EMERGENCY MANAGEMENT AGENCY

AGENDA: Hazard Mitigation Committee **DATE:** 11/8/10

NAME	AGENCY/DEPT.	PHONE/FAX	EMAIL
Russell Drysdale	Maguire Group	940-231-9009	russd3@me.com
Marybeth Groff	Citizen	401-424-4841	MB_Groff@yahoo.com
Amy Lofton	Maguire Group	225-241-8297	alofton@aer.us.com
Alyssa Carrier	Maguire Group	940-367-8094	acarrier@metricog.com
PAUL TITZMANN	PROV WATER	401-521-6300 x7167	ptitzmann@provwater.com
DAVID EVERETT	Prov. Dept. of Planning & Dev.	401-351-4300	deverett@providenceri.com
Josh O'Neill	PEMA	on file	on file
BILL BOMBARD	PROV DPW	401 467 7950	wbombard@providenceri.com
MICHAEL DILLON	PROV. FIRE	401 243-6075	MDILLON@PROVIDENCERI.COM
STEVE CURTIS	PROVPORT / WATERSIDE TERMINAL SERVICES	401-255-4688	SCURTIS@WATERSIDETSC.COM
PETER MANNUCCI	PEMA	401-680-8000	PMANNUCCI@providenceri.com
PETER GAYNOR	PEMA	680-8000	PGAYNOR@PROVIDENCERI.com
Stephen Morin	Brown University	863-3353	Stephen_Morin@brown.edu
Kerry Anderson	DIS	578-3403	kanderson@providenceri.com
Peter Ginaitt	Lifespan/RIH	444-4135	pginaitt@lifespan.org

Providence – HMGP – Kickoff Meeting

November 8, 2010

- **Meetings to Follow: December 6, 2010**

  January 10, 2011

- **Need to have draft ready for February for review**
- **Plan Information**
  - **Add in man-made hazards to plan (encouraged but not required)**
  - **What about adaptation?**
    - **Climate Change (Need to recognize issue)**
  - **Make sure all plans are consistent and reference each other**
    - **Providence Comprehensive Plan (Have updated & added amendments)**
      - **Mandatory in RI – State mandated**
    - **Make sure to incorporate these documents into the plan**
  - **Hazard Identification – P.Gaynor has information and will forward on to everyone**
    - **Categories: Natural, Man-made & Technology**
    - **Must be ranked by committee**
  - **Past events since plan update in 2005**
    - **Josh will fill in information for March floods**
    - **Motiva Fire**
    - **Ice Storm – Flooding 2006**
  - **Drought?**
    - **Water usage**
    - **Reference as a trend instead of a particular event**
    - **Record breaking heat this past summer**
      - **Possibly have most vulnerable population to heat effects (elderly)**
      - **Definite impacts on hospitals**
  - **Port Issues**
    - **How do water issues affect it?**
      - **Flooding; Tanks?**
  - **Documentation Information**
    - **March floods and 2006 floods – Josh**
    - **Motiva Fire – Fire Chief**
    - **Drought – Paul**
    - **Snow Storms – Especially 2007 – P. Gaynor**

        - Historical/Natural Events – Dave
    - HVA from Hospitals
        - Revise/amend in April of every year
    - Waterplace Park
        - Economic effects?
    - Brown University
        - Business Continuity Plans – everything ties in to this
        - Is working on capturing costs
    - Hazard Mitigation Plan (2005)
        - Josh is sending out to everyone for review
    - Is there a current list of valuable buildings?
        - Providence Foundation
    - List of City infrastructure?
        - Bill Bombard?
    - Does State have a list of critical structures?
    - What impact will dams located upstream have on the downstream communities?
    - What is the average depth of the 100-year floodplain?
    - Are the current building requirements for the 100-year floodplain? YES
    - We should capture the 500 year floodplain information as well just in case an event does occur
        - Include as an Appendix in Plan
    - Communication and Network Assets?
    - Repetitive Loss Properties?
        - Do we have locations?
        - Show changes between 2005 and present
        - Ask Larry Macedo for all updates after the March floods (Need the most current information and data)
    - Growth and development since 2005
        - Growth and shrinkage
        - Building Permit Numbers?
            - Permitting by year for the past 5 years?
            - Any of this info in the comprehensive plan?
        - Tax Assessor – How many taxable properties?
        - Brown has grown in the past 5 years (Bio-Research)
            - No significant change in enrollment
        - Re-development of older buildings (remodeling of mills?)
        - Future Growth
            - Planned Developments?
        - Enhancement of Building Codes and Ordinances (Zoning?)
            - Dave – Will make a list
        - Warning Systems?
        - Critical infrastructure Sectors will be invited to attend

- What about CRC, RIDOT, Coast Guard, NBC, RIEMA?

- Public Participation Outreach
  - On city website and calendar
  - Advertise in Projo?
  - City Council Office
  - City News

During September 2010, the City of Providence Emergency Management Agency (PEMA) was awarded a FEMA Pre-Disaster Mitigation (PDM) Grant designed to update the City's 2005 Natural Hazard Mitigation Strategy. The PDM Grant provides funds to local jurisdictions for hazard mitigation planning and the implementation of mitigation programs prior to a disaster event. The plan is a mandatory document in order to recieve mitigation federal funds following a disaster.

We have scheduled a second formal public meeting for comments on this
Plan Update.

The December 6, 2010 Mid-Term Planning Meeting of the Multi-Hazard Mitigation Committee will be held at the Providence Emergency Management Agency Headquarters, 591 Charles Street, Providence at 1:00 pm.

City of Providence Hazard Mitigation Meeting #2 Agenda

December 6th 2010

1) Introductions
2) Address any additional Private/Nonprofits participating
3) Review and Prioritize Mitigation Goals
4) Review/Change existing Risk Assessment Matrix

PETER T. GAYNOR
DIRECTOR

DAVID N. CICILLINE
MAYOR

PROVIDENCE EMERGENCY MANAGEMENT AGENCY

AGENDA: Providence Hazard Mitigation Committee DATE: 12/6/10

NAME	AGENCY/DEPT.	PHONE/FAX	EMAIL
PETER GAYNOR	PEMA	680-8000	on file
MICHAEL DILLON	PROV FIRE DEPT	243-6075	MDILLON@PROVIDENCERI.COM
Susan MAYO	Johnson & Wales Univ.	598-2213/598-4665	SMAYO@jwu.edu
Alyssa Carrier	Maguire group	940-367-8094	acarrier@maguiregroup.com
Josh O'Neill	PEMA	680-8000	Joneill@providenceri.com
Bill Bombard	Prov DPW	467-7950	wbombard@providenceri.com
PAUL TITZMANN	PROV WATER	521-6300 x7167	ptitzmann@provwater.com
John Kennedy	National Grid	781-907-3630	john.kennedy@us.ngrid.com
James Boyd	RICRMC	783-3370	JBOYD@CRMC.RI.GOV
Stephen Morin	Brown University	863-3353	Stephen_Morin@brown.edu
NORM MENARD	RED CROSS/RIEMA	401-692-6075	MENARDN@REDCROSSRI.ORG
Peter Ginaitt	Lifespan	444-4135	pginaitt@lifespan.org
JEFFREY EMIDY	RI HISTORICAL PRESERVATION	222-4134	[illegible]
Kerry Anderson	DIS	421-7740 X365	Kanderson@providenceri.com
JANET FREEDMAN	CRMC	783-3370	jfreedman@crmc.ri.gov
Peter Mancinucci	PEMA	680-8000	[illegible]
Marisa Albanese	N.GRID	784-7090	MARISA.ALBANESE@US.NGRID.COM
Richard Fisher	P&W Railroad	508-755-4000 x 316	RichardF@PWRR.com

During September 2010, the City of Providence Emergency Management Agency (PEMA) was awarded a FEMA Pre-Disaster Mitigation (PDM) Grant designed to update the City's 2005 Natural Hazard Mitigation Strategy. The PDM Grant provides funds to local jurisdictions for hazard mitigation planning and the implementation of mitigation programs prior to a disaster event. The plan is a mandatory document in order to receive mitigation federal funds following a disaster.

Providence Emergency Management Agency has scheduled a third formal public meeting for comments on this Plan Update.

The January 10, 2011 Final Planning Meeting of the Multi-Hazard Mitigation Committee will be held at the City of Providence Planning and Development Department, 4th Floor Conference Room 400 Westminster Street, Providence at 1:00 pm.

City of Providence Hazard Mitigation Meeting #3 Agenda

January 10th 2011

1) Add any additional Mitigation Actions/Projects
2) Rank and Prioritize Mitigation Projects
3) Plan to review draft

PETER T. GAYNOR
DIRECTOR

ANGEL TAVERAS
MAYOR

PROVIDENCE EMERGENCY MANAGEMENT AGENCY

AGENDA: Hazard Mitigation Committee DATE: 1/10/11

NAME	AGENCY/DEPT.	PHONE/FAX	EMAIL
Peter Marsocci	PEMA	468-8000	pmarsocci@providenceri.com
Josh O'Neill	PEMA	on file	on file
Paul Fitzmann	Prov Water	521-6300 x7167	ptitzmann@provwater.com
Stephen Morin	Brown University	863 7676	Stephen_Morin@brown.edu
Susan Mayo	Johnson-Wales Univ.	598-4213 / 598-4665	SMAYO@JWU.edu
Glenn Skalubinski	RBS Citizens	401-734-5275	glenn.j.skalubinski@rbs citizens.com
Ryan Gillon (Intern)	RBS Citizens	617-872-2461	Ryan.H.Gillon@rbs.citizens.com
David Everett	DPD	401-[redacted]351-4300	deverett@providenceri.com
Jeffrey Emidy	RI Historical Preservation	222-[redacted]4134	Jeffrey.Emidy@preservation.ri.com
Leo Pollock	Southside Community Land Trust	401-273-9419 x28	education@southsideclt.org
Peter Ginaitt	Lifespan	444-4135	pginaitt@lifespan.org

Providence Hazard Mitigation Plan Update

January 10, 2011

Final Planning Meeting

Mitigation Projects:

Structural Vs. Non-Structural - E.g. zoning changes, comprehensive plan changes vs. replacement of culverts or home buyouts.

- Nobody had any to add to the existing plans and project already submitted to Maguire as part of this planning process

Southside Community Land Trust

- Community Gardens
- Division of Agriculture projects
    - Food Security
    - Food Supplies during a disaster
    - Problems revolving around "just in time ordering"

Healthcare Cluster

- Plans + Mitigation Projects
- 96 hours of sustainability (water, electric, fuel, food)
- Fuel Supply a big issue
- Peter Ginaitt working on MOU with Alan Sepe

Historic Structures

- Mapping – produce a map to identify historic structures in Providence, deviating between National Register sites and State historic sites etc...
    - Define differences
    - Talk to city archivist ?
- Ideas for floodproofing / retrofit historic structures. Perhaps add some general description of needs

- **Draft of Mitigation Plan will be distributed via email in the next few weeks -**

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Appendix D - Technical and Financial Assistance for Mitigation

State Resources

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

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

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

Rhode Island Geological Survey
8 Ranger Road, Suite 2 University of Rhode Island Kingstown, RI 02881 Phone: (401) 874-2265

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

State of Rhode Island Building Committee Office
Building Commissioners Office One Capitol Hill Providence, RI 02903 Phone: (401)222-3529

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

Department of Transportation-Design Section/Bridges
2 Capitol Hill, Room 231D Providence, RI 02903 Phone: (401) 222-2053

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

State Fire Marshal's Office
24 Conway Avenue
North Kingstown, RI 02852 Phone: (401) 222-2335

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

Public Utilities Commission
100 Orange Street Providence, RI 02903 Phone: (401) 277-3500 Ext. 153

Department of Environmental Management Division of Parks and Recreation
2321 Hartford Avenue Johnston, RI 02919 Phone: (401) 222-2635

Federal Resources

Federal Emergency Management Agency
Mitigation
Division
Region I Office
J.W. McCormack POCH, Room
462 Boston, MA 02109
(617) 223-9561

(617) 223-5203

U.S. Army Corps of Engineers
New England
District 424
Trapelo Road
Waltham, MA
02254
(617) 647-8505

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

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

Economic Development Administration
143 North Main Street,
Suite 209 Concord, NH
03301
(603) 225-1624

Department of the Interior National Park Service
Rivers and Trails Conservation
Program Regional Office 15 State
Street Boston, MA 02109

U.S. Fish and Wildlife Service
New England Field
Office 22 Bridge
Street, Unit #1
Concord, NH 03301-
4986

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

Small Business Administration
360 Rainbow Boulevard South, 3rd
Floor Niagara Falls, NY 14303
(716) 282-4612 or (800) 659-2955

Environmental Protection Agency
Region I - JFK Federal Building
Government Center Boston, MA
02203
(617) 565 3400

Other Resources

The Association of State Floodplain Managers (ASFPM)
Professional association with a membership of almost 1,000 state employees that assist communities with the NFIP. ASFPM has developed a series of technical and topical research papers and a series of proceedings from their annual conferences. Many mitigation "success stories" have been documented through these resources and provide a good starting point for planning.

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

Institute for Business and Home Safety (IBHS) (formally Insurance Institute for Property Loss Reduction)
An insurance industry-sponsored, nonprofit organization dedicated to reducing losses— deaths, injuries, and property damage—resulting from natural hazards. IBHS efforts are directed at five specific hazards: flood, windstorm, hail, earthquake, and wildfire. Through its public education efforts and information center, IBHS communicates the results of its research and statistical gathering, as well as mitigation information, to a broad audience.

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

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

New England States Emergency Consortium (NESEC) Lakeside Office Park
NESEC conducts public awareness and education programs on natural disaster and emergency management activities throughout New England. Brochures and videotapes are available on such topics as earthquake preparedness, mitigation, and hurricane safety tips. NESEC maintains a WWW homepage that is accessible at http://www.serve.com/NESEC.

The New England Floodplain and Stormwater Managers Association (NEFSMA)
Professional organization for New England floodplain and stormwater managers. Provides workshops, conferences, and a newsletter to membership and interested individuals and companies. Contact: Nicholas Winter, chairman, at (617) 727-0488 or NEFSMA's homepage on the Web.

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Appendix E –Financing Options

Federal Emergency Management Agency

National Flood Insurance Program (NFIP)

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 Flood Insurance Rate Maps as an overlay regulatory district.
- Require that all new construction or substantial improvement to existing structures in the flood hazard area be elevated or (if nonresidential) floodproofed to the identified flood levels on the maps.
- 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 floodprone property.

If a community participating in NFIP's Community Rating System (CRS) program performs activities that include maintaining records for floodplain development, publicizing the flood hazard, improving flood data and floodplain management planning, then the flood insurance premiums paid by policy holders in the community will be reduced by 5 to 45 percent. Developing a flood mitigation plan or a multi-hazard mitigation plan will help communities gain additional credit under the CRS.

For further information contact the State of Rhode Island Flood Plain Manager (401) 222-6478 or FEMA Region I (617)223-9561.

Flood Mitigation Assistance Program (FMAP)

Two programs that have been authorized under the National Flood Insurance Reform Act of 1994 include the Flood Mitigation Assistance (FMA) program and a provision for increased cost of compliance (ICC) coverage. FMA makes grants available on a pre-disaster basis for flood mitigation planning and activities, including acquisition, relocation and retrofitting of structures. FMA grants for mitigation projects will be available only to those communities with approved hazard mitigation plans. ICC coverage has recently been implemented for all new NFIP policies and renewals and is intended to be "mitigation insurance" to allow homeowners whose structures have been repeatedly or substantially damaged to cover the cost of elevation and design requirements for rebuilding with their flood insurance claim up to a maximum of $15,000. Each state has the the discretion to award funds to communities or to state government agencies. 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.

The Rhode Island Emergency Management Agency (RIEMA) receives about $110,000 to award as grants form the Federal Emergency Management Agency (FEMA) every April plus $12,000 for planning and $12,600 for technical assistance. In order to be eligible for these grants, communities must have a flood mitigation plan or a multi-hazard mitigation strategy. Communities that are suspended or on probation from NFIP are not eligible. In 1998, Charlestown, RI received over $108,000 to help implement the mitigation activities as indicated in the proposed Comprehensive Plan amendments. In 1999, Pawtucket, RI received $100,000 to floodproof city hall, which is located along the Blackstone River (the lowest elevation in the city).

For further information contact the State of Rhode Island Hazard Mitigation Officer (401)9469996 or FEMA Region I (617)223-9540.

Hazard Mitigation Grant Program (HMGP):

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

For further information contact the State of Rhode Island Hazard Mitigation Officer (401)9469996 or FEMA Region I (617)223-9540.

HUD - Community Development Block Grant Program (CDBG)

When a Presidential Disaster Declaration is made under the Robert T Stafford Disaster and Emergency Relief Act (Stafford Act) CDBG funds may be made available depending upon the availability of supplemental appropriations. The state receiving the funds is required to publish an "Action Plan for Disaster Recovery" that describes the proposed use of HUD/CDBG funds. HUD generally awards noncompetitive, nonrecurring Disaster Recovery grants by a formula that considers disaster recovery needs unmet by other Federal disaster assistance programs. Grantees may use CDBG Disaster Recovery funds for recovery efforts involving housing, economic development, infrastructure and prevention of

further damage to affected areas, if such use does not duplicate funding available from the Federal Emergency Management Agency, the Small Business Administration, and the US Army Corps of Engineers.

Examples of these activities include:

1. buying damaged properties in a flood plain and relocating residents to safer areas;
2. relocation payments for people and businesses displaced by the disaster;
3. debris removal not covered by FEMA;
4. rehabilitation of homes and buildings damaged by the disaster;
5. buying, constructing, or rehabilitating public facilities such as streets, neighborhood centers, and water, sewer and drainage systems;
6. code enforcement;
7. homeownership activities such as down payment assistance, interest rate subsidies and loan guarantees for disaster victims;
8. public services (generally limited to no more than 15 percent of the grant);
9. helping businesses retain or create jobs in disaster impacted areas; and
10. planning and administration costs (limited to no more than 20 percent of the grant).

Economic Development Administration: Public Works and Economic Adjustment Assistance Program

EDA supports development in economically distressed areas of the United States by fostering job creation and attracting private investment. Specifically, EDA will consider construction, non-construction, and revolving loan fund investments under the Public Works and Economic Adjustment Assistance programs. Grants made under these programs will leverage regional assets to support the implementation of regional economic development strategies designed to create jobs, leverage private capital, encourage economic development, and strengthen America's ability to compete in the global marketplace. EDA solicits applications from rural and urban communities to develop initiatives that advance new ideas and creative approaches to address rapidly evolving economic conditions.

This grant program allows for public works related construction projects such as new sewage treatment facilities, new public works facilities, deployment of innovative technologies, industrial development and general renovation or construction of publicly owned facilities. Project costs are split between the federal government and the applicant on a 50-50 cost shared basis.

National Weather Service (NWS)

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

For further information contact NWS (508)823-2262.

American Red Cross (ARC)

The American Red Cross chapter of Rhode Island has supplied public education materials and they

have also volunteered to conduct training programs and hold seminars.

For further information contact ARC (401)831-7700.

U.S. Army Corps of Engineers

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

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

Under *Flood Control Act of 1946-Section 14, as amended* projects are eligible for construction only after an analysis demonstrates the engineering and environmental feasibility and economic justification of the improvement. The local sponsor must be a municipality or public agency. Funding may also be available for flood damage reduction measures if the community writes a request letter to the U.S. Army Corps of Engineers. The no-federal share of the cost is 35 percent of the analysis and implementation and the initial $40,000 of the analysis is 100 percent federally funded.

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

For further information contact US ACE (978)318-8087 or (978)318-8647.

Website: http://www.usace.army.mil.

State of Rhode Island

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

RI Department of Environment Management

In the 1980's, four major open space bond issues were approved that resulted in an investment of more than $100 million for recreational and open space land acquisition. Each application is reviewed by a committee to assure consistency with local plans and habitat values. The state participates in funding

either through a matching grant or a revolving loan. For state-owned recreational areas, improvements could be made by coordinating with ongoing Rhode Island Department of Environmental Management (RIDEM) efforts on various projects. Funds may be available through the RI DEM Parks and Recreation Division for tree trimming, dune restoration and bulkhead repair. In addition, the state has several funding programs (amount varies for each program) for the acquisition of land or purchase of development rights to protect open spaces. For instance, two Rhode Island municipalities use a real estate transfer tax for land preservation. Rhode Island has several incorporated land trusts who work to preserve land and natural resources. Land owners can participate in the Farm, Forest and Open Space Program. Under this program, land may qualify for a reduced property tax assessment if it meets specific criteria as farmland, forest lands or open space.

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

RI Department of Transportation (RIDOT) Transportation Improvement Program (TIP)

The TIP is a list of transportation projects the State of Rhode Island intends to implement using United States Department of Transportation funds. For transportation projects to utilize federal funds, it must be included in the TIP. The TIP lists projects by category which include: Bicycle, Pedestrian, Bridge, Congestion Management Air Quality (CMAQ), Enhancement, Highway, Interstate, Major Projects, Pavement Management, Planning, Study and Development, Traffic Safety, Bus, Transit, and Rail. The TIP is the product of an extensive public planning and outreach effort to communities, public interest groups, and citizens throughout the state by agencies all involved in transportation planning and project implementation.

The State Planning Council, acting as the single statewide Metropolitan Planning Organization (MPO) in Rhode Island, is responsible for adopting a new TIP every (4) years. The TIP must present a four (4) year program, by year, and may present additional future year funding for projects. The TIP lists specific projects according to an anticipated phased schedule of expenditures. Project scheduling in the TIP denotes that implementation is expected to begin during the TIP's four-year timeframe. However, the TIP schedule of project implementation is not fixed, rather it serves as the best estimate for development at the time it is adopted. Sometimes projects cannot adhere to the TIP schedule and will be moved to a later year. Conversely, projects may also proceed faster than planned and can be advanced to an earlier year.
For further information contact RI DOT (401)277-2481.

North East States Emergency Consortium (NESEC)

Since 1998, RIEMA has been given funds for preventative measures and maintenance. Providence and Woonsocket both received $5,000 grants from NESEC for mitigation activities that were addressed in their local hazard mitigation strategies. For further information contact NESEC (781)224-9876.

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Appendix F – Public Information & Outreach from Previous Plan Updates 2000 and 2005

2005

LEO D. MESSIER
DIRECTOR

DAVID N. CICILLINE
MAYOR

PROVIDENCE EMERGENCY MANAGEMENT AGENCY

January 22, 2004

Gary Mulcahy
Acting Fire Chief
Public Safety Complex
325 Washington Street
Providence, RI 02903

Dear Chief Mulcahy:

The Providence Hazard Mitigation Committee convened on January 20, 2004 to address the Federal Emergency Management Agency (FEMA) recommendations in updating our Hazard Mitigation Plan. As indicated in my letter to you dated January 6, 2004, members of Planning and Development, Inspection and Standards, Public Works, Fire Department and the Tax Assessor were invited to attend and participate with this Agency in the process. In attendance at the January 20 meeting were myself, Gerald Florio representing DPW and Karen Scarcella from the Tax Assessor's office. Mr. Ed Paxon phoned to say he could not attend. We went over the changes and each was given a copy of the Federal Register and the suggested recommendations from PEMA.

Enclosed please find copies of the Federal Register and the recommendations we need to address. There are eleven (11) items that did not receive either "satisfactory" or "outstanding" and they are marked "need improvement'; you will find a hand written asterisk and a number from one to eleven next to the ones that need attention. Please review them at your earliest convenience and address the ones that you feel pertain to your department.

This project must be completed and approved by FEMA in order for the City of Providence to be considered for any further federal funds. Thank you for your anticipated assistance.

Sincerely,

Peter Marinucci
Deputy Director

Enclosure: 3
PM/sdp

325 Washington Street • Providence, Rhode Island 02903 • (401) 243-6425 • Fax: (401) 243-6411 • TDD #: (401) 831-3456

LEO D. MESSIER
DIRECTOR

DAVID N. CICILLINE
MAYOR

PROVIDENCE EMERGENCY MANAGEMENT AGENCY

January 22, 2004

S. Jon Ozbek
Principal Planner
Planning & Development
400 Westminster Street
Providence, RI 02903

Dear Mr. Ozbek:

The Providence Hazard Mitigation Committee convened on January 20, 2004 to address the Federal Emergency Management Agency (FEMA) recommendations in updating our Hazard Mitigation Plan. As indicated in my letter to you dated January 6, 2004, members of Planning and Development, Inspection and Standards, Public Works, Fire Department and the Tax Assessor were invited to attend and participate with this Agency in the process. In attendance at the January 20 meeting were myself, Gerald Florio representing DPW and Karen Scarcella from the Tax Assessor's office. Mr. Ed Paxon phoned to say he could not attend. We went over the changes and each was given a copy of the Federal Register and the suggested recommendations from PEMA.

Enclosed please find copies of the Federal Register and the recommendations we need to address. There are eleven (11) items that did not receive either "satisfactory" or "outstanding" and they are marked "need improvement'; you will find a hand written asterisk and a number from one to eleven next to the ones that need attention. Please review them at your earliest convenience and forward your comments to me. You will be notified of the next meeting within a few weeks.

This project must be completed and approved by FEMA in order for the City of Providence to be considered for any further federal funds. Thank you for your anticipated assistance.

Sincerely,

Peter Marinucci
Deputy Director

Enclosure: 3
PM/sdp

325 Washington Street • Providence, Rhode Island 02903 • (401) 243-6425 • Fax: (401) 243-6411 • TDD #: (401) 831-3456

January 6, 2004

John Gelati
Acting Tax Assessor
Office of the Assessor
City Hall
Providence, RI 02903

RE: LOCAL HAZARD MITIGATION COMMITTEE

Dear Mr. Gelati:

This Agency has been informed by the Rhode Island Emergency Management Agency (RIEMA) of the Federal Disaster Mitigation Act (DMA 2000) requirements pertaining to the development and implementation of Local Hazard Mitigation Plans. Providence must complete its Hazard Mitigation Plan and have it federally approved by November 2004, or it will not be eligible for federal public disaster assistance funds after a natural disaster event. This legislation sets forth the criteria that must be followed in order to receive the approval by the Federal Emergency Management Agency (FEMA).

The Providence Emergency Management Agency (PEMA), together with representatives from the city's Redevelopment Agency, Public Works Department, Department of Inspections and Standards and the Fire Department developed the Hazard Mitigation Plan to mitigate natural hazards in the City in 1999. This Plan was completed and presented to the State Hazard Mitigation Committee for review and was approved in the year 2000.

FEMA has provided us with a scoring template that contains comments related to the Plan. These comments and changes need to be addressed soon, in order to resubmit the Plan to RIEMA for final approval.

I would like to ask for your assistance and participation in this process and invite you to attend a meeting at 10:00 a.m. on January 20, 2004 in the Fire Department's conference room, located on the third floor of the Public Safety Complex, 325 Washington Street.

If for any reason you cannot attend this meeting yourself, please assign someone else from your department to attend. Your input is essential to the success of our goal. Please confirm your attendance by calling this office at 243-6425.

Thank you for your anticipated cooperation.

Sincerely,

Peter Marinucci
Deputy Director

City of Providence

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

CHAPTER 2000-5

No. 135 **AN ORDINANCE** AMENDING *PROVIDENCE 2000: THE COMPREHENSIVE PLAN*, CHAPTER 1994-52, No. 798, ADOPTED ON DECEMBER 27, 1994, AS AMENDED.

Approved March 23, 2000

Be it ordained by the City of Providence:

That Chapter 1994-52, No. 798, approved December 27, 1994, also known as *Providence 2000: The Comprehensive Plan*, (hereinafter referred to as "Plan") is hereby amended, pursuant to Rhode Island General Laws Section 45-22.2-12. The following sections shall be considered to be a single action to amend to the Plan.

Section 1 - To adopt the plan entitled **"Strategy for Reducing Risks from Natural Hazards in Providence, Rhode Island, 1999"** as Plan Number 5 of the Comprehensive Plan Series of *Providence 2000: The Comprehensive Plan,* attached and made part of this Ordinance.

Section 2 - This Ordinance shall take effect upon passage.

IN CITY COUNCIL
MAR 3 2000
FIRST READING
READ AND PASSED
CLERK

IN CITY COUNCIL
MAR 16 2000
FINAL READING
READ AND PASSED
PRESIDENT
CLERK

APPROVED
MAR 23 2000
MAYOR

CHAPTER

AN ORDINANCE

IN CITY COUNCIL
OCT 7 1999
FIRST READING
REFERRED TO COMMITTEE ON
~~ORDINANCES~~ Urban Redevelopment, Renewal and Planning
Michael L. Clement CLERK

THE COMMITTEE ON
U.R.R.P.
Recommends Set up P.H.
Barbara A. Grewe
10/18/99 Clerk
11/29/99 P.H. Held

THE COMMITTEE ON
URBAN REDEVELOPMENT
RENEWAL & PLANNING
Approves Passage of
The Within Ordinance
Claire DeBettencourt
Dec. 23 2000 Clerk

Council President Lombardi (By Request)

MEMORANDUM
****

TO : JOHN J. PARTINGTON
COMMISSIONER OF PUBLIC SAFETY

FROM: PETER MARINUCCI
DIRECTOR

DATE: NOVEMBER 23, 1999

RE : NATIONAL SUMMIT
****

The Providence Emergency Management Agency has developed a plan to mitigate natural hazards in the city. This plan is intended to address the multi-hazards and suggests both short term and long term mitigation actions to protect the citizens of Providence. Hazard Mitigation is any action taken to reduce or eliminate long risk to people and property from the effects of natural hazards, such as winds, fire, floods, hurricanes, etc.

Goals: It is the goal of the Hazard Mitigation Plan to preserve and enhance the quality of life, property and resources for the citizens of Providence by:

1) identifying areas at risk from natural hazard.
2) implementing priority hazard mitigation actions in order to protect the city's built environment, people, historic, cultural, economic and natural resources.

Pre-disaster planning will reduce the cost of post disaster clean up significantly. Money spent today will save money on recovery tomorrow.

By developing this Hazard Mitigation Plan, Providence has become a Disaster Resistant Community . Providence is now a Project Impact Community qualified to receive up to $300,000.00 in Federal Grants through FEMA.

On December 12 through December 16, 1999 the Federal Emergency Management Agency is sponsoring a National Summit in Washington, DC. This summit will attract more than 1,000 public officials, public administrators, educators, media and corporate partners who are committed to building disaster resistant communities. The attendees will learn how to get the private corporates involved in the community and build public support for all the Mitigation Projects.

FEMA reimburses all expenses for attending

FEMA is sponsoring this summit. The attendees must pay for transportation, hotel and meals. FEMA will reimburse later. FEMA allows up to $6,000.00 per community for travel and related expenses.

Hazardous Mitigation Meeting - 5/3/99

Present: Victor Parmateer, Lori Watson, Joseph Almeida, Sam Shamoon, Peter Marinucci

Met at Victor Parmateer's office (Statewide Planning) at 2:30 p.m. and made final corrections to the Local Hazardous Mitigation Plan.

Mr. Shamoon will forward a copy of the completed plan to this office after he has made the corrections.

The next meeting of the State Planning Committee will take place at RIEMA on 6/16/99. At that time the Plan will be reviewed.

MEETING OF THE PROVIDENCE HAZARD MITIGATION COMMITTEE

Date: April 6, 1999

Place: Providence Emergency Management Agency
200 Chad Brown Street
Providence, Rhode Island

Time: 9:15 a.m.

Topic: Make Final Corrections/Additions to Plan /before Submission to State

Attendees: Peter Marinucci, Deputy Director, PEMA
Edgar Paxson, Chief of Building Inspection
Samuel Shamoon, Associate Director of Planning & Development
Joseph Almeida, Jr., Federal Disaster Planner, RIEMA
Lori Watson, Haz/Mit Specialist, URI Coastal Resources
Chief John Thomas, Fire Department

****

Minutes Sheila Del Pico, Secretary 9:15 a.m. - 10:05 a.m.

A meeting of the Providence Hazard Mitigation Committee convened at 9:15 a.m. in the office of Providence Emergency Management.

Mr. Marinucci thanked the committee for their hard work and especially Sam Shamoon for all his effort.

Committee members discussed the plan and made final corrections. It was decided that the cover picture would be in color and the inside pictures would remain black & white. Ms. Watson will make several additions and fax them to Mr. Shamoon (add appendix c, grant info, update state committee).

Mr. Shamoon will make several corrections/changes to the plan including changing the order of items 4.1 -4.10 (pages 8-18), adding JT Morris's figures on pump capacity (p. 19) and filling in the date our EOP was revised (p. 22).

Mr. Paxson will write something to be included in the Earthquake info (4.7) and fax it to Mr. Shamoon.

Ms. Watson suggested that we add newspaper clippings (last 5 years) to the plan. We will select some articles and send them to Mr. Shamoon for inclusion in the plan.

We will send copies of the plan to Chief Rattigan and James Morris for their final input.

All changes will be submitted to Mr. Shamoon who will then have the plan ready to be picked up by Ms. Watson on Friday.

The plan will be reviewed by the State on 4/28. When it has approval, we will send it to Mayor Cianci for his approval before going to city committee. The Mayor is aware of the plan as Mr. Marinucci has corresponded with him concerning it.

The meeting adjourned at 10:05 a.m.

JOHN J. PARTINGTON
DIRECTOR
PETER P. MARINUCCI
DEPUTY DIRECTOR

PROVIDENCE EMERGENCY MANAGEMENT AGENCY

200 Chad Brown Street
Providence, Rhode Island 02908
272-3121; Extension 2607
FAX 331-7948; T.D.D. 831-3456

VINCENT A. CIANCI, JR.
MAYOR
EDWARD W. XAVIER
OPERATION & PLANNING OFFICER

ATTENDANCE SHEET
****

DATE: 4/6/99

NAME	BUSINESS ADDRESS	PHONE #
Ed Paxton	Inspection & Standards	421-7740 x 353
Lori Watson	RIEMA/CRC	874-6855
Joseph Almeida, Jr	R.I.E.M.A	946-9996
Sam Shayoon	DPD	351-4300
Jack Thomas	Prov. Fire Dept	781-3439

PROVIDENCE EMERGENCY MANAGEMENT AGENCY

JOHN J. PARTINGTON
DIRECTOR
PETER P. MARINUCCI
DEPUTY DIRECTOR

200 Chad Brown Street
Providence, Rhode Island 02908
272-3121; Extension 2607
FAX 331-7948; T.D.D. 751-0203

VINCENT A. CIANCI, JR.
MAYOR
EDWARD W. XAVIER
OPERATION & PLANNING OFFICER

April 1, 1999

The Honorable Vincent A. Cianci, Jr.
Mayor of Providence
City Hall
25 Dorrance Street
Providence, Rhode Island 02903

Dear Mayor Cianci:

I have received a copy of a letter addressed to you by US Congressman Robert Weygand, dated March 17, 1999, indicating his support for a legislation intended to assist cities and towns in Rhode Island in obtaining grants for disaster mitigation. This bill, designed to create federal funding for disaster prevention programs, requires a participating community to submit a comprehensive plan for mitigation against disaster to the Federal Emergency Management Agency (FEMA).

I am happy to report that this Agency has already drafted a plan to address this issue; in fact, last year, upon learning of this program, I formed a Hazard Mitigation Committee. This committee is comprised of one member each from the Fire Department, Planning and Development, Inspection and Standards, Public Works and myself as Chairman. We have identified areas at risk from natural hazards in the City of Providence, assessed its vulnerabilities and developed mitigation actions that address initiatives to minimize the effects of future hazards.

On April 6, 1999 the committee will review the final draft of the plan and then it will be sent to the State Mitigation Committee for its approval. Once the state committee accepts our draft, I will forward you a copy for review and, if you accept it, it will then be sent to the other city agencies for their approvals.

In the meantime, I am keeping in contact with the Rhode Island Emergency Management Agency (RIEMA) to secure the funds once our plan is accepted.

Sincerely yours,

Peter Marinucci
Deputy Director

PM/sdp

JOHN J. PARTINGTON
DIRECTOR
PETER P. MARINUCCI
DEPUTY DIRECTOR

PROVIDENCE EMERGENCY MANAGEMENT AGENCY

200 Chad Brown Street
Providence, Rhode Island 02908
272-3121; Extension 2607
FAX 331-7948; T.D.D. 751-0203

VINCENT A. CIANCI, JR.
MAYOR
EDWARD W. XAVIER
OPERATION & PLANNING OFFICER

MEMORANDUM
* * * * * * * * * * * * * * *

TO : LOCAL HAZARDOUS/MITIGATION COMMITTEE

FROM : PETER MARINUCCI, DEPUTY DIRECTOR

DATE : MARCH 26, 1999

SUBJ : THE PROVIDENCE PLAN

****

A MEETING OF THE HAZARDOUS/MITIGATION COMMITTEE IS SCHEDULED FOR TUESDAY, APRIL 6, 1999 AT 9:00 A.M. IN MY OFFICE.

THIS IS A VERY IMPORTANT MEETING, PLEASE MAKE EVERY EFFORT TO ATTEND. THIS WILL BE OUR LAST MEETING BEFORE THE PLAN IS SENT TO THE STATE FOR FINAL APPROVAL.

TELEPHONE MY OFFICE TO CONFIRM YOUR ATTENDANCE.

PM/sdp

MEETING OF THE
PROVIDENCE HAZARD MITIGATION COMMITTEE

Date: November 18, 1998

Place: Providence Emergency Management Agency
200 Chad Brown Street
Providence, Rhode Island

Time: 9:45 a.m.

Topic: Discuss final draft of Hazard Mitigation Plan for the City of Providence

Attendees: Peter Mariucci, Deputy Director, PEMA
James T. Morris, Superintendent of Hurricane Barrier
Edgar Paxson, Chief of Building Inspection
James T. Rattigan, Fire Chief
Samuel Shamoon, Associate Director of Planning & Development
Joseph Almeida, Jr., Federal Disaster Planner, RIEMA
Lori Watson, Haz/Mit Specialist, URI Coastal Resources

****

Minutes Sheila Del Pico, Secretary 9:45 a.m. - 11:25 a.m.

A meeting of the Providence Hazard Mitigation Committee convened at 9:45 a.m. in the office of Providence Emergency Management.

Ms. Watson expressed the importance of prioritizing the projects on the matrix. We have them numbered at random instead of importance, so the committee's first task was to prioritize the projects. They will appear as follows on the Matrix:

1. Hurricane Barrier
2. A-V Zone
3. Port of Providence
4. Bridges
5. City Hall
6. Tree Trimming
7. Buildings having archaic structural systems
8. Public Buildings
9. NBC

Ms Watson suggested moving the Matrix to page 15.

Much discussion ensued about the plan. Mr. Shamoon went over the changes with the committee members. The rest of the meeting was spent "brainstorming" on new project actions. Highlights follow:

A-V Zone - Ms. Watson felt that the public should be notified if they reside in a floodplain and she explained that other cities and towns do that but the City of Providence has never done this. Mr. Paxson stated that when people come in for permits we wait for them to tell us that they live in a flood zone rather than telling them. The committee discussed ways of informing people without causing panic. Should we send carefully worded letters to people. Would they come from EMA or Building Inspection We can get sample letters from Narragansett Electric. Display FEMA Q-3 Flood Maps in the Building Inspection Dept. Tell people that according to FEMA they are located in a flood plain (no need to mention the City al all). It was suggested that all AV-zone property owners when applying for permits will be told that they are in a flood zone. Ms. Watson will check on this with other towns and cities. We would have to speak to the Mayor before any action takes place. Ms. Watson stated that federal grants are available under the flood program which cities can apply for on behalf of private citizens to help them retrofit their property.

City Hall

1).Vital Records should not be kept in the basement or on the first floor of City Hall (includes License Bureau, Vital Statistics, Board of Canvass) When plan is complete this should be brought up at a Director's meeting to suggest that records be stored higher up. 2). Address concern for the aerials, antennas and towers in severe weather (according to insurance standards). 3). Currently city hall uses sandbags to prepare for flooding but it was suggested that the basement be made flood-proof; 4). Instead of municipal use FEMA.

Downtown - High Rise

1). Don't limit to downtown (use citywide); 2). Leave out earthquake (state meteorologist says that we are not in danger) 3). Use public education and outreach programs ; 4). Ms. Watson mentioned that maybe we could use the fact the RI was named as showcase state; 5). Instead of cost unknown say variable depending on property, city budget and staff time.

Hurricane Barrier

1). FEMA Funds - Haz/Mit - 404 Grants, Bond Issue, NESEC, FEMA Hurricane Protection Money; 2). We have $900,000 for improvements to pumps #2 & #3 from bond money.

Bridges

1). Are there bridges that are at greater risk than others; 2). Are some more low lying than others; 3). Prioritize according to deterioration; 4). Note which have been recently repaired; 5). Note that Valley Street bridge was under water in both 38 and 54 hurricanes.

Jim Morris will get information on bridges and report to Sam Shamoon.

NBC

1). Uninterrupted power supply.

Port of Providence

1). Mention that we tried contacting Prov Port; 2). Any new development at the port must meet new codes; 3). Fences - need to be 8ft into foundation or they will be swept away (Mr. Paxson will check into)

Discussed the possibility of the Army Corps of Engineers doing a study on flooding at the port - perhaps the entire V-zone. We can apply for F-Map Money, FEMA Money.

Public Safety Buildings

1). Can be relocated in case of emergency; 2). Find out how much PS building will cost ($12 mil?), financing is from sale of existing property; 3). Engine #14 (Atwells Ave. Is in floodplain.

Tree Trimming

1). Copy from Pawtucket Plan; 2). Can talk to electric company (Mike or Paul) and state DOT; 3). Ongoing and long term.

Mr. Shamoon will make the corrections and mail it to Lori Watson. Hoping to have the plan ready so that it can go to the City Planning Commission meeting set for December 15, 1998. The Plan must go before the Public Hearing Board which meets in January and also the City Council it was suggested by Mr. Shamoon that perhaps we could hold a joint meeting. The Plan must pass twice and then go to the Mayor for his signature. Mr. Shamoon is hopeful that it can be accomplished by February.

The meeting was adjourned at 11:25.

JOHN J. PARTINGTON
DIRECTOR
PETER P. MARINUCCI
DEPUTY DIRECTOR

PROVIDENCE EMERGENCY MANAGEMENT AGENCY

200 Chad Brown Street
Providence, Rhode Island 02908
272-3121; Extension 2607
FAX 331-7948; T.D.D. 831-3456

VINCENT A. CIANCI, JR.
MAYOR
EDWARD W. XAVIER
OPERATION & PLANNING OFFICER

MEMORANDUM
* * * * * * * * * * * * * * *

TO : LOCAL HAZARDOUS/MITIGATION COMMITTEE

FROM : PETER MARINUCCI, DEPUTY DIRECTOR PM.

DATE : OCTOBER 27, 1998

SUBJ : THE PROVIDENCE PLAN

****

A MEETING OF THE HAZARDOUS/MITIGATION COMMITTEE IS SCHEDULED FOR WEDNESDAY, NOVEMBER 18, 1998 AT 9:30 A.M. AT MY OFFICE FOR THE PURPOSE OF FINALIZING THE DRAFT.

THIS IS A VERY IMPORTANT MEETING, PLEASE MAKE EVERY EFFORT TO ATTEND. IF THIS IS NOT POSSIBLE, PLEASE SEND A REPRESENTATIVE.

TELEPHONE MY OFFICE TO CONFIRM YOUR ATTENDANCE.

PM/sdp

MEMORANDUM
* * * * * * * * * * * * * *

TO : LOCAL HAZARDOUS/MITIGATION COMMITTEE

FROM : PETER MARINUCCI, DEPUTY DIRECTOR

DATE : SEPTEMBER 18, 1998

SUBJ : THE PROVIDENCE PLAN

****

A MEETING OF THE HAZARDOUS/MITIGATION COMMITTEE IS SCHEDULED FOR MONDAY, SEPTEMBER 28, 1998 AT 9:00 A.M. AT MY OFFICE FOR THE PURPOSE OF COMPLETING THE DRAFT.

THIS IS A VERY IMPORTANT MEETING, PLEASE MAKE EVERY EFFORT TO ATTEND. IF THIS IS NOT POSSIBLE, PLEASE SEND A REPRESENTATIVE.

TELEPHONE MY OFFICE TO CONFIRM YOUR ATTENDANCE.

PM/sdp

PROVIDENCE EMERGENCY MANAGEMENT AGENCY

JOHN J. PARTINGTON
DIRECTOR
PETER P. MARINUCCI
DEPUTY DIRECTOR

200 Chad Brown Street
Providence, Rhode Island 02908
272-3121; Extension 2607
FAX 331-7948; T.D.D. 831-3456

VINCENT A. CIANCI, JR.
MAYOR
EDWARD W. XAVIER
OPERATION & PLANNING OFFICER

MEMORANDUM
* * * * * * * * * * * * * *

TO : LOCAL HAZARDOUS/MITIGATION COMMITTEE

FROM : PETER MARINUCCI, DEPUTY DIRECTOR P.M.

DATE : JULY 10, 1998

SUBJ : THE PROVIDENCE PLAN

****

A MEETING OF THE HAZARDOUS/MITIGATION COMMITTEE IS SCHEDULED FOR TUESDAY, JULY 21, 1998 AT 9:30 A.M. AT MY OFFICE FOR THE PURPOSE OF FINALIZING THE REVISIONS TO THE DRAFT.

PLEASE TELEPHONE MY OFFICE TO CONFIRM YOUR ATTENDANCE.

PM/sdp

MEETING OF THE
PROVIDENCE HAZARD MITIGATION COMMITTEE

Date: March 13, 1998

Place: Providence Emergency Management Agency
200 Chad Brown Street: Providence, Rhode Island

Time: 10:15 a.m.

Topic: Completion of Plan

Attendees: Peter Marinucci, Deputy Director
Providence EMA
James T. Morris, Superintendent
Providence Hurricane Barrier
Jon Ozbek, Senior Planner
Planning & Development
Samuel Shamoon, Associate Planner
Planning & Development

****

Minutes Sheila DelPico, Secretary 10:15 a.m. - 10:35 a.m.

The meeting of the Providence Hazard Mitigation Committee convened at 10:15 a.m. in the office of Providence Emergency Management.

Mr. Marinucci opened the meeting by passing out the pages of suggestions to the draft made by Ed Paxson who was unable to attend this morning's meeting. The committee went over the above and discussed changes to the second half of the draft and corrected where necessary.

Mr. Shamoon will make corrections on his disk and will send it to us for the secretary to merge with the first half of the plan.

Mr. Shamoon also offered to make approximately 20 color copies for us of figure #2.

The plan is now completed.

Mr. Marinucci will call the state to get together with us at the next meeting. (Date to be announced).

Meeting adjourned at 10:35 a.m.

MEETING OF THE
PROVIDENCE HAZARD MITIGATION COMMITTEE

Date: December 16, 1997

Place: Providence Emergency Management Agency
200 Chad Brown Street; Providence, Rhode Island

Time: 9:45 a.m.

Topic: Discuss Risk Assessment Chart

Attendees: Peter Marinucci, Deputy Director
Providence EMA
James T. Morris, Superintendent
Providence Hurricane Barrier
Jon Ozbek, Senior Planner
Planning & Development
Edgar Paxson, Chief
Building Inspection

****

Minutes Sheila DelPico, Secretary 9:45 A.M. - 10:59 A.M.

The meeting of the Providence Hazard Mitigation Committee convened at 9:45 A.M. in the office of Providence Emergency Management.

Mr. Marinucci opened the meeting by passing out the Risk Assessment Chart. Much discussion took place.

Mr. Ozbek presented the first half of the draft on behalf of Mr. Shamoon who had made corrections and suggestions to. The committee went over his changes.

Mr. Marinucci will talk to Mr. Shamoon about rewriting the second half.

Mr. Ozbek excused himself early from the meeting.

No date was set for the next meeting.

Meeting adjourned at 10:59 A.M.

Providence Hazard Mitigation Committee

12/02/97
9:30 AM
Providence Emergency Management Agency
200 Chad Brown Street, 3rd floor
Providence, Rhode Island 02908

Meeting called by:	Peter Marinucci	Type of meeting:	Hazard Mitigation Draft Plan

Committee Members:	Peter Marinucci, James T. Morris, Jon Ozbek, Edgar Paxon, James Rattigan, Sam Schamoon
Handout:	Providence Draft for Hazard Mitiigation

Agenda

1. Committee Reports:	Emergency Management Agency	Peter Marinucci
	Department of Public Works - Providence Hurricane Barrier	James T. Morris, Superintendent
	Department of Building Inspection	Edgar Paxon, Chief
	Providence Fire Department	James T. Rattigan, Chief
	Planning & Development	Sam Schamoon, Assoc. Director
		Jon Ozbek, Senior Planner

2. Risk Assessment Matrix # 1
3. Risk Mitigation Matrix # 2
4. Existing Goals for Haz/Mit
5. Next Meeting Date
6. Adjournment

Additional Information

Resource persons:

Special notes:

MEETING OF THE
PROVIDENCE HAZARD MITIGATION COMMITTEE

Date: December 2, 1997

Place: Providence Emergency Management Agency
200 Chad Brown Street, Providence, RI

Time: 9:45 a.m.

Topic: Discuss revised draft of Hazard Mitigation Plan for the City of Providence

Attendees: Peter Marinucci, Deputy Director
Providence EMA
James T. Morris, Superintendent
Fox Point Hurricane Barrier
Jon Ozbek, Senior Planner
Planning & Development
Edgar Paxson, Chief
Building Inspection
James T.. Rattigan, Chief
Providence Fire Department

****

Minutes Sheila Del Pico, Secretary 9:45 - 11:30 a.m.

The meeting of the Providence Hazard Mitigation Committee convened at 9:45 a.m. in the office of Providence Emergency Management.

Mr. Marinucci began the meeting by passing out the revised pages (1st 16) of the Pawtucket Plan hereafter referred to as the "Providence Plan". He asked the members to go over the changes page-by-page to get their input.

Jon Ozbek will summarize the 7 goals (found pages 13-14) using the Providence Comprehensive Plan as a base.

Mr. Marinucci handed out the Risk Assessment Chart and the Committee worked as a whole to list the priorities for the City. After much discussion the following was decided upon:

1. Hurricane Barrier
2. Public Safety Buildings
3. V-Zone
4. Local Bridges
S. Schools
6. Hospitals
7. City Hall
8. Fields Point
9. Scituate Reservoir Water Purification Plant
10. High Rises (over 6 stories)

Mr. Ozbeck excused himself early from the meeting. He will speak to George Turlo about rewriting pages 16-23 of the plan.

Mr. Morris has updated maps of the downtown area (1990) with plat and lot listings. He will supply us with copies as well as lists of bridges and schools (catholic and public).

The next meeting is scheduled for 12/16/97 at 9:30 a.m.

The meeting adjourned at 11:30

Providence Hazard Mitigation Committee

11/18/97
9:30 AM to AM
Providence Emergency Management Agency
200 Chad Brown Street, 3rd floor
Providence, Rhode Island 02908

Meeting called by:	Peter Marinucci	Type of meeting:	Hazard Mitigation Draft Plan

Committee Members: Peter Marinucci, James T. Morris, Jon Ozbek, Edgar Paxson, James Rattigan, Sam Shamoon

Handout: Pawtucket Draft for Hazard Mitiigation

Agenda

1. Committee Reports:

Department of Public Works -	
Providence Hurricane Barrier	James T. Morris, Superintendent
Department of Building Inspection	Edgar Paxon, Chief (Paxson)
Providence Fire Department	James T. Rattigan, Chief
Planning & Development	Sam Shamoon, Assoc. Director
	Jon Ozbek, Senior Planner

2. Risk Assessment Matrix # 1
3. Risk Mitigation Matrix # 2
4. Next Meeting Date
5. Adjournment

Additional Information

Resource persons:

Special notes:

LOCAL HAZARD MITIGATION COMMITTEE
NOVEMBER 18, 1997

REPORTS:

- RESEARCH AREAS AT RISK
- COMPLETE TWO MULTI-HAZARD MATRICES:

  RISK ASSESSMENT MATRIX
  MITIGATION MATRIX

- IDENTIFY 3-4 GENERAL CATEGORIES AT RISK ON THE RISK ASSESSMENT MATRIX
- ASSESS THE EXISTING CONDITIONS - WHAT PROGRAMS ARE ALREADY IN PLACE TO ADDRESS THESE RISKS?
- WORKING WITH THE LOCAL PLANNER PICK 2-3 IN EACH OF THE SEVEN ELEMENTS IN THE LOCAL COMPREHENSIVE PLAN AND INCORPORATE THE TEAM OF HAZARD MITIGATION (7 ELEMENTS ARE: LAND USE, HOUSING, ECONOMIC DEVELOPMENT, NATURAL & CULTURAL RESOURCES, SERVICE & FACILITIES, OPEN SPACE & RECREATION AND TRANSPORTATION.)
- DEVELOP A MISSION STATEMENT
- BEGIN TO IDENTIFY RISK AREAS ON GIS MAPS

MEETING OF THE
PROVIDENCE HAZARD MITIGATION COMMITTEE

Date: November 18, 1997

Place: Providence Emergency Management Agency
200 Chad Brown Street, Providence, Rhode Island

Time: 9:52 a.m.

Topic: Discuss 1st draft of Hazard Mitigation Plan for the City of Providence

Attendees: Peter Marinucci, Deputy Director
Providence EMA
David Costa, Fire Marshall
Providence Fire Department
Edgar Paxson, Chief
Building Inspection
Sam Shamoon, Associate Director
Planning & Development

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Minutes Sheila DelPico, Secretary 9:52 A.M - 11:06 A.M.

The meeting of the Providence Hazard Mitigation Committee convened at 9:52 A.M. in the office of Providence Emergency Management. Mr. Morris called to say that he would not make the meeting and Mr. Shamoon was delayed.

Mr. Marinucci opened the meeting by stating that he had received a copy of the City's Comprehensive Plan as promised by Mr. Shamoon at the previous meeting. Said plan will be assimilated into the Pawtucket report. Mr. Marinucci has already started making changes to the disk. He asked the Committee to go over the Plan page by page as a group to get input on the changes.

Much discussion ensued over changes to the Plan.

Mr. Shamoon volunteered Jon Ozbek to make maps and also stated that George Turlo of Planning can help rewrite Action 1, Risk Area 1, 2 and maybe 3. Pages 16-23 on Pawtucket draft. He is on vacation until 12/1. At that time he will work on it.

Mr. Paxson suggested overlaying a flood plain zoning map on a planning map.

It was decided that Mr. Marinucci will put together a first draft to be circulated among the Committee who will make his individual additions/corrections. This draft will encompass the first 16 pages of the Pawtucket Plan (meeting scheduled for 12/2) We will then have a meeting with RIEMA people to go over the 2nd draft (meeting scheduled for 12/9)

Discussed top priorities for life and safety

1. Hurricane Barrier - Pumping Station
2. Fire Stations
3. Electric Power Plant

Mr. Shamoon excused himself from the meeting.

General discussion: Hospitals (are they quakeproof ?)
Shelters -Specifically schools (no backup generators). Mr. Costa added that the new Bucklin St. school has an emergency generator.
Surplus property (PM obtained generators)
V-zone (DPW, Salt Pile, Damn, Allens Avenue)

Mr. Marinucci gave Mr. Costa & Mr. Paxson copies of his agenda outline for 11/18/97
Mr. Marinucci inquired if Chief Rattigan had gotten in touch with Pawtuckets' Fire Chief - Mr. Costa believed that he had but that he was not very active in developing Pawtucket's Plan.

The next meeting is scheduled for Tuesday, December 2nd at 9:30 a.m.

Meeting adjourned at 11:06 a.m.

Providence Hazard Mitigation Committee

11/4/97
9:30 AM to 10:30AM
Providence Emergency Management Agency
200 Chad Brown Street, 3rd floor
Providence, Rhode Island 02908

Meeting called by:	Peter Marinucci	Type of meeting:	Hazard Mitigation Draft Plan

Attendees: Peter Marinucci, James T. Morris, Jon Ozbek, Edgar Paxon, James Rattigan, Sam Shannon

Handout: Pawtucket Draft for Hazard Mitiigation

Agenda

1. Introduction
2. Mission Statement - Draft
3. Issue Identifications - Research
4. Risk Matrix # 1
5. GIS Maps
6. Next Meeting Date
7. Adjournment

Additional Information

Resource persons:

Special notes:

MEETING OF THE
PROVIDENCE HAZARD MITIGATION COMMITTEE

Date: November 4, 1997

Place: Providence Emergency Management Agency
200 Chad Brown Street, 3rd floor
Providence, Rhode Island

Time: 9:30 A.M.

Topic: Discuss 1st Draft of Hazard Mitigation Plan for the City of Providence

Attendees: Peter Marinucci, Deputy Director
Providence EMA
James T. Morris, Superintendent
Providence Hurricane Barrier
Jon Ozbek, Senior Planner
Planning & Development
Edgar Paxson, Chief
Building Inspection
James T. Rattigan, Chief
Providence Fire Department
Sam Shamoon, Associate Director
Planning & Development

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Minutes Sheila Del Pico, Secretary 9:30 - 10:30 A.M.

The meeting of the Providence Hazard Mitigation Committee convened at 9:30 a.m. in the office of Providence Emergency Management.

Mr. Marinucci opened the meeting by explaining that money is available from the Federal Government. They would like to see Hazard Mitigation plans in effect in all States. It would enable the Government to pay us ahead of time. He went on to explain what the plan would do for Providence. (Damages from earthquake, floods, hurricanes, loss of life, etc.)

The Committee will need to meet approximately 3 times in order to formulate the plan which needs to be completed by January.

The State selected Pawtucket and Charlestown (due to their flooding potential) to receive monies for Haz/Mit - Charlestown has already received the money and Pawtucket should shortly. Mr. Marinucci passed out copies of Pawtucket's plan for the Committee to review and to use as a guideline for our own plan. Lori Watson who is affiliated with URI and Joseph Almeida from RIEMA worked with Pawtucket on their plan and will be available to help us. The Pawtucket plan was covered page by page by the Committee and suggestions were made to add such

information as population, density and bridges; to contact engineering offices for area hospitals to see if buildings are earthquake proof. It was suggested that an engineering study be made on public buildings. Planning has a list of public facilities - schools and city owned properties and they can submit this list to us. They will also furnish GIS maps.

Mr. Shamoon spoke about the City's Comprehensive Plan and about incorporating this new plan into it. He will sent us a copy of the plan today and give us a copy of their plan on disk.

Mr. Marinucci stated that when the plan is finished it will be submitted for review by the Statewide Planning Board, then to FEMA and on to public hearings before it becomes part of the City's Comprehensive plan. Mr. Shamoon further explained the sequence of hearings.

Mr. Morris spoke about flooding and the Hurricane Barrier and will furnish us with any information he can. He also invited everyone to attend the next barrier test.

Ed Paxson expressed a need for a revised map due to the changes in the downtown river but it was generally felt that the changes were not significant enough to warrant new maps at this time. Mr. Paxson also stated that he will make a research list - give input on buildings that may collapse.

Chief Rattigan will collect any information that he feels will be useful to us.

Mr. Marinucci again stressed that there is a lot of money available from FEMA for many projects and that we have received grants for projects with the hurricane barrier in the past and we are currently applying for another one. We have a good working relationship with the state and it is important that we get this plan done as soon as possible.

The next meeting will be held at 9:30 a.m. on Tuesday, November 18th.

Meeting adjourned at 10:30 a.m.

Respectfully submitted,

Sheila Del Pico, Secretary

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Appendix G – Maps

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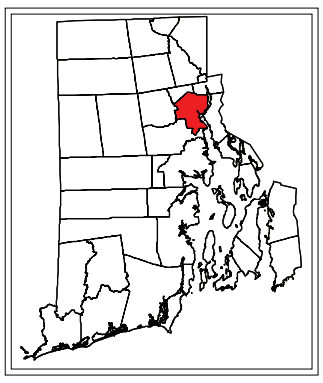


City of Providence

Community Facilities

PAWTUCKET

NORTH PROVIDENCE

PROVIDENCE

JOHNSTON

EAST PROVIDENCE

WARWICK

95

195

N

W

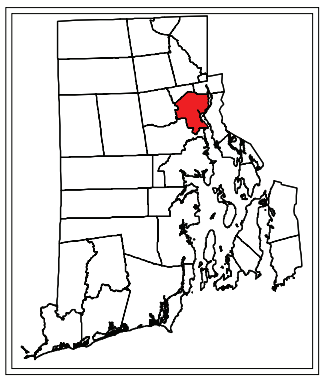
E

S

Legend

- Schools
- Police Stations
- Fire Stations
- Hospitals
- Libraries
- Local
- INTERSTATE
- US
- Ponds and Lakes

0 0.4 0.8 1.2 1.6 Miles



City of Providence

Critical Infrastructures

PAWTUCKET

NORTH PROVIDENCE

JOHNSTON

EAST PROVIDENCE

WARWICK

N

W E

S

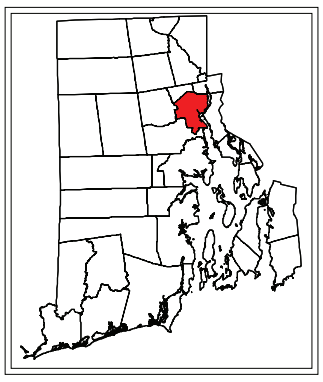
Legend

Critical Infrastructures

Type

- ROAD
- PORT
- TUNNEL
- BARRIER
- HOSPITALS
- CITY BUILDINGS
- STATE BUILDINGS
- FEDERAL BUILDINGS
- COLLEGES & UNIVERSITIES
- RIDOT Roads
- Railroads
- Ponds and Lakes

0 0.4 0.8 1.2 1.6 Miles



City of Providence

Flood Zone AE

PAWTUCKET

NORTH PROVIDENCE

JOHNSTON

EAST PROVIDENCE

WARWICK

N

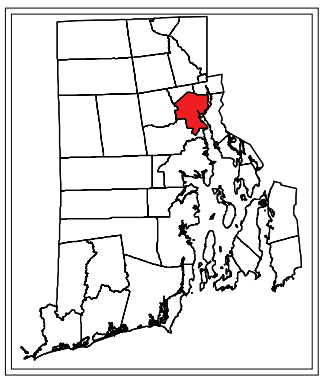
W E

S

Legend

- RIDOT Roads
- ZONE AE
- Railroads
- Ponds and Lakes

0 0.4 0.8 1.2 1.6 Miles



City of Providence

Water Supply and Sewer Infrastructure

NORTH PROVIDENCE

PAWTUCKET

JOHNSTON

EAST PROVIDENCE

WARWICK

N

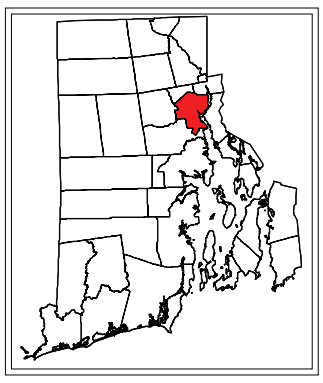
W E

S

Legend

- Sewer Lines
- Water Supply Pipelines
- Local
- INTERSTATE
- US
- Ponds and Lakes

0 0.4 0.8 1.2 1.6 Miles



City of Providence

Areas Vulnerable to Flooding

PAWTUCKET

NORTH PROVIDENCE

JOHNSTON

EAST PROVIDENCE

WARWICK

N

W

E

S

Legend

Estimated Flood Levels

100-yr Return

- 0 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- > 20

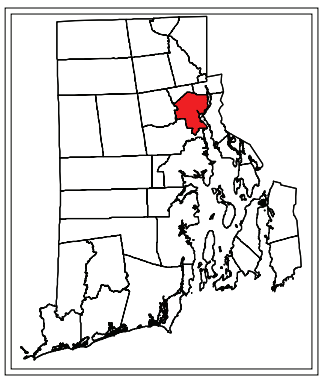
Local

US

INTERSTATE

Railroads

0 0.4 0.8 1.2 1.6 Miles



City of Providence

Flood Zone AH, AO and VE

NORTH PROVIDENCE

PAWTUCKET

JOHNSTON

EAST PROVIDENCE

WARWICK

N

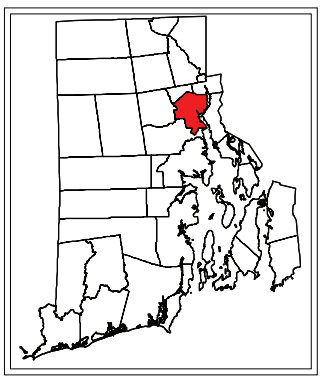
W E

S

Legend

- RIDOT Roads
- ZONE AH
- ZONE AO
- ZONE VE
- Railroads
- Ponds and Lakes

0 0.4 0.8 1.2 1.6 Miles



City of Providence

Flood Zone X

PAWTUCKET

NORTH PROVIDENCE

JOHNSTON

EAST PROVIDENCE

WARWICK

N

W

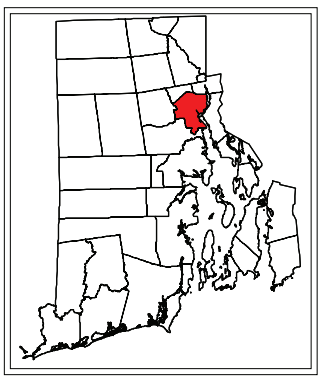
E

S

Legend

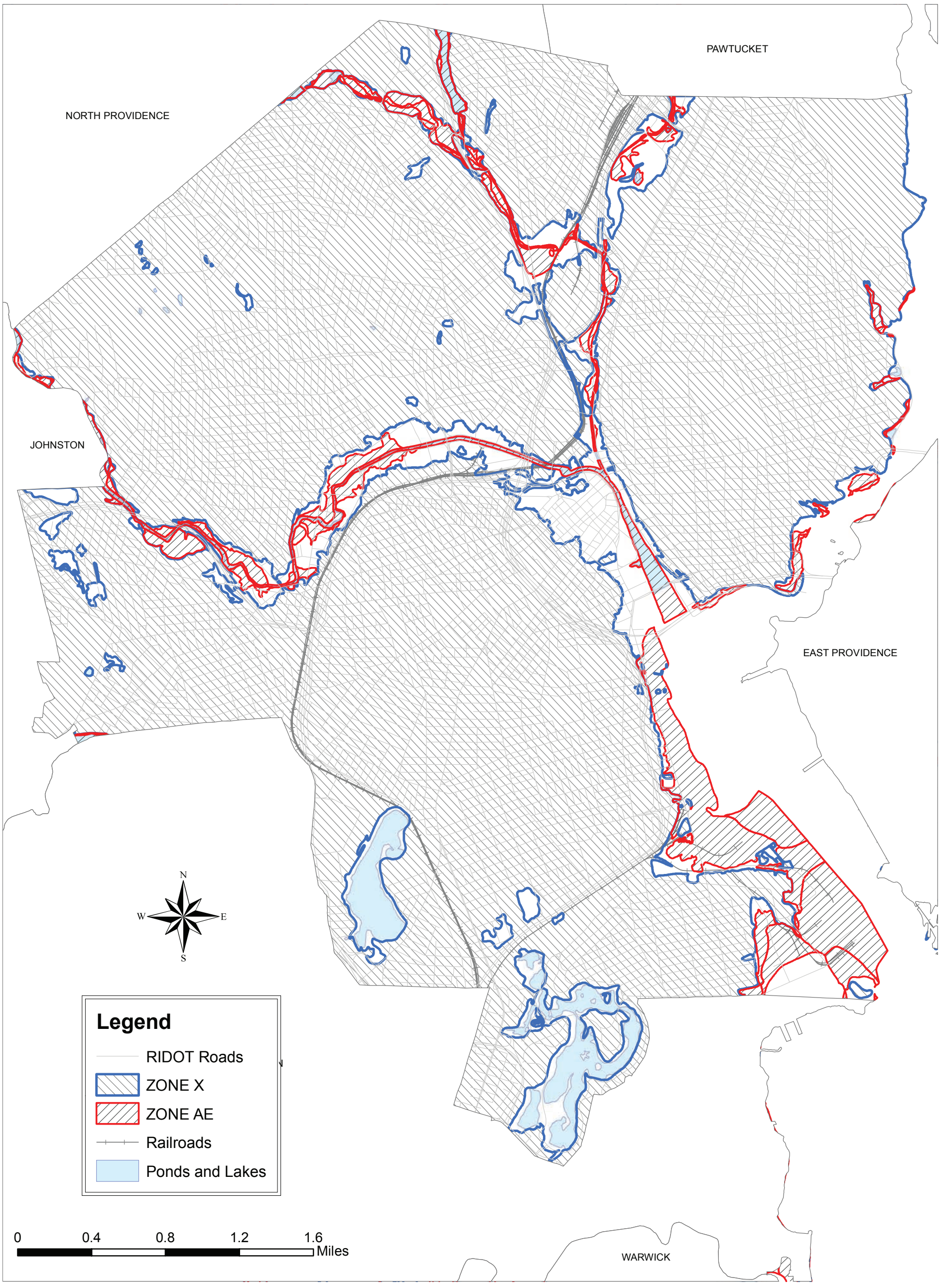
- RIDOT Roads
- ZONE X
- Railroads
- Ponds and Lakes

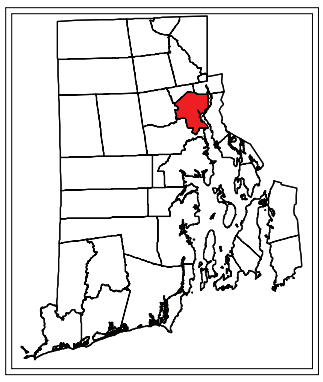
0 0.4 0.8 1.2 1.6 Miles



City of Providence

Flood Zone X and AE





City of Providence

Shelters

PAWTUCKET

NORTH PROVIDENCE

PROVIDENCE

JOHNSTON

EAST PROVIDENCE

WARWICK

N

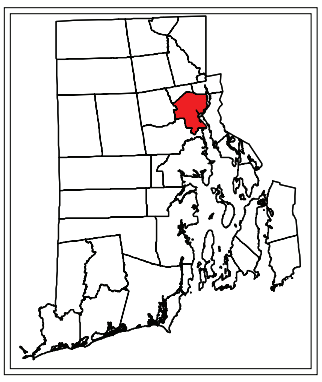
W E

S

Legend

- City of Providece Shelters
- American Red Cross Shelters
- Local
- INTERSTATE
- US
- Ponds and Lakes

0 0.4 0.8 1.2 1.6 Miles



City of Providence

Transportation Network

NORTH PROVIDENCE

PAWTUCKET

PROVIDENCE

JOHNSTON

EAST PROVIDENCE

WARWICK

N

W E

S

Legend

RIDOT Roads

- Local
- INTERSTATE
- US
- Active Railroad
- Ponds and Lakes

0 0.4 0.8 1.2 1.6 Miles