Town of West Warwick, RI

Hazard Mitigation Plan

March 2012

Strategy for Reducing Risks From Natural Hazards in West Warwick, Rhode Island:

A Multi-Hazard Mitigation Strategy

Acknowledgements

Lincoln Chafee
Governor

RI Emergency Management Agency

MG Kevin McBride
Director

Theresa Murray
Executive Director

Authors

Town of West Warwick Local Hazard Mitigation Committee
Town of West Warwick Planning Board
Maguire Group, Inc.

Adopted by West Warwick Town Council
December 6, 2011

Approved by FEMA
March 26, 2012

Additional Acknowledgements

Mitigation planning has been successfully initiated in West Warwick with the continuing support and resources provided by the Rhode Island Emergency Management Agency. The guidance and assistance provided by the Rhode Island State Hazard Mitigation Committee is essential for implementing the strategy presented in this plan. West Warwick is also grateful for the efforts of the Town Planning Board, the Emergency Management Agency, and the Local Hazard Mitigation Committee in preparing this plan.

Elected Officials

West Warwick Town Manager

James Thomas

West Warwick Town Council

Angelo Padula, Jr., Council President

David Gosselin, Jr.

Edward Giroux

Filomena Gustafson

Mark Bourget

Town Employees

Elaine Mansour

Local Hazard Mitigation Committee

James Thomas, Town Manager

Dave Lombari, Acting Director of Public Works

Alfred DeCorte, Chief Building Official

Joseph Baris, Fire Chief

Peter Ethier, Business Owner

James Williamson, Planning Board Chair, West Warwick School Committee Chair

Ken Townsend, School Department

Tom Senerchia, Emergency Management Director

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

Peder 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

Kenneth Dumais, RI Emergency Management Agency

Edward Fratto, NESEC

Emily R. Pysh, RI Emergency Management Agency

J.David Smith, 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

U.S. Department of Homeland Security
99 High Street, 6th Floor
Boston, MA 02110-2320

FEMA

March 26, 2012

Angelo A. Padula, President
West Warwick Town Council
Town of West Warwick
1170 Main Street
West Warwick, RI 02893

Dear Mr. Padula:

Thank you for the opportunity to review the Town of West Warwick Hazard Mitigation Plan. The Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA) Region I has evaluated the plan for compliance with 44 CFR Part 201. The plan satisfactorily meets all of the mandatory requirements set forth by the regulations. Congratulations on this achievement!

With this plan approval, the Town is eligible to apply for Mitigation grants administered by FEMA. Requests for mitigation funding will be evaluated individually according to the specific eligibility and requirements of each of these programs. Furthermore, a specific mitigation activity or project identified in your community's plan may not meet the eligibility requirements for FEMA funding, and even eligible mitigation activities are not automatically approved for FEMA funding under the programs referenced above.

The Town's Hazard Mitigation Plan must be reviewed, revised as appropriate, and resubmitted to FEMA for approval within **five years of the plan approval date of March 26, 2012** in order to maintain eligibility as an applicant for mitigation grants. Over the next five years, we encourage the Town to continue updating the plan's assessment of vulnerability, adhere to its maintenance schedule, and begin implementing, when possible, the mitigation actions proposed in the plan.

Once again, thank you for your continued dedication to public service demonstrated by preparing and adopting a strategy for reducing future disaster losses. Should you have any questions, please do not hesitate to contact Marilyn Hilliard at (617) 956-7536.

Sincerely,

Mark F. Gallagher for

Don R. Boyce
Regional Administrator

DRB: mh

cc: Emily R. Pysh, State Hazard Mitigation Officer
Michelle F Burnett, NFIP Coordinator

Enclosure

TOWN OF WEST WARWICK

RESOLUTION

OF

TOWN COUNCIL

NO. 2011 - 181

SUBJECT: ADOPTION OF THE TOWN OF WEST WARWICK HAZARD MITIGATION PLAN

RESOLVED, that the attached Adoption of the Town of West Warwick Hazard Mitigation Plan for approval of the Town Council, in accordance with 44CFR 201 Federal Law, is hereby approved.

PASSED AND APPROVED THIS 6TH DAY OF DECEMBER, 2011.

APPROVED: _____
ANGELO A. PADULA, JR., TOWN COUNCIL PRESIDENT

ATTEST: _____
LAURENT E. LAMOTHE, COUNCIL CLERK

Table of Contents

1.0 INTRODUCTION 11

1.1 WHAT IS HAZARD MITIGATION? 11

1.2 WHAT HAZARD MITIGATION CAN DO FOR WEST WARWICK 11

1.3 WEST WARWICK'S MISSION STATEMENT AND GOALS 13

1.4 A LOOK AT WEST WARWICK 13

1.4.1. POPULATION 13

1.4.2. ECONOMY 14

1.4.3. LAND USE 15

1.5 PLANNING PROCESS 16

1.5.1 PUBLIC PROCESS 17

1.5.2 PUBLIC PROCESS GOALS 17

1.5.3 PUBLIC MEETING PROMOTION 17

1.5.4 PUBLIC MEETING ACTIVITIES 17

1.5.5 DOCUMENT REVIEW 18

1.5.6 SCENARIO 18

2.0 HAZARD RISK ASSESMENT 18

2.1 HAZARD PROBABILITY 18

2.2 WEST WARWICK: GEOGRAPHY, HAZARDS AND HISTORY 19

2.2.1 SEVERE WEATHER 19

2.2.2 HURRICANES 22

2.2.3 FLOODING AND DAM FAILURE 25

2.2.4 CONFLAGRATION 28

2.2.5 EARTHQUAKES 30

2.2.6 PANDEMIC 32

2.3 CAPABILITY ASSESSMENT 35

3.0 ASSESSING VULNERABILITY 37

3.1 RISK ASSESSMENT MATRIX – VULNERABLE AREAS 41

4.0 MITIGATION ACTIONS 44

4.1 MITIGATION ACTIVITIES 44

4.2 ACTION PLAN....45
5.0 PLAN MAINTENANCE....58
5.1 IMPLEMENTATION....58
5.2 MONITORING....58
5.3 EVALUATION....58
5.4 REVISION....59
5.5 INCORPORATION INTO EXISTING PLANNING MECHANISMS....59
Maps....61
Map 1 – Community Facilities....62
Map 2 – Population by Census Block....63
Map 3 – Transportation Networks....64
Map 4 – Water Supply and Sewer Infrastructure....65
Map 5 – Flood Zone A....66
Map 6 – Flood Zone AE....67
Map 7 – Flood Zone AO....68
Map 8 – 500-Year Flood Zone....69
Map 10 – Areas Vulnerable to Flooding....70
Map 11 – Anticipated Peak Wind Speeds during Hurricane....71
References....72
Appendices....74
Appendix A: Technical and Financial Assistance for Mitigation....75
State Resources....75
Federal Resources....76
Other Resources....77
Appendix B: Existing Protection Systems - State and Federal....78
Appendix C: Public Information and Outreach....81

1.0 INTRODUCTION

The plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 and to achieve eligibility for the Federal Emergency Management Agency (FEMA) hazard mitigation grant programs. This plan updates the Town of West Warwick's 2005 Hazard Mitigation Plan.

The Local Hazard Mitigation Committee (LHMC) conducted a risk assessment to update the hazards identified and profiled in the previously approved plan. The updated hazards profiled in the 2011 plan are the following:

- Severe Storms
- Hurricanes
- Flooding and Dam Failure
- Earthquake
- Conflagration
- Pandemic

The plan also assesses the vulnerability of people, structures, and critical facilities to these hazards and examines the capabilities in place to mitigate them. Based upon the risk assessment, the LHMC updated the mitigation strategy. The LHMC revised the goals and mitigation actions for reducing risk to hazards. The LHMC also went further in-depth into the various hazards that affect the Town and incorporated historical data into those hazards.

In the 2011 update planning process, the West Warwick LHMC 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 Town of West Warwick. The LHMC also decided to profile pandemics and added that to the list of hazards that could affect West Warwick.

Note to Reviewers: A signed resolution will be included in this section once the plan has been reviewed and received preliminary approval pending adoption by FEMA.

1.1 WHAT IS HAZARD MITIGATION?

Hazard mitigation is an action taken to permanently reduce or eliminate long-term risk to people and their property from the effect of natural, technological, or man-made hazards.

Money spent today on preventative measures can significantly reduce the cost of tomorrow's post-disaster recovery. By planning ahead, West Warwick minimizes the economic and social disruption that results from natural hazards including floods, severe weather, hurricanes and earthquakes which can result in the destruction of property, loss or interruption of jobs, loss of business and loss of life.

1.2 WHAT HAZARD MITIGATION CAN DO FOR WEST WARWICK

The purpose of this plan is to recommend actions and policies for the Town of West Warwick to minimize the social and economic loss of hardships resulting from natural hazards. These hardships include the loss of life, destruction of property, damage to crucial infrastructure and critical facilities, loss/interruption of jobs, loss/damage to businesses, and loss/damage to significant historical structures. Hazardous events include severe weather, hurricanes, conflagration, floods, earthquakes,

and pandemics. To minimize the social and economic hardships, the Town of West Warwick implements the following general actions and policies:

- Revisions to the Town's comprehensive plan
- Incorporation of hazard mitigation into the site plan review process
- State and Local Building Code Review
- Public education/outreach
- Post-disaster recovery opportunities/strategies

The adoption and implementation of this hazard mitigation plan will assist West Warwick in receiving assistance from the Federal Emergency Management Agency (FEMA) for pre- and post- disaster assistance such as:

- National Flood Insurance Program
- FEMA's Community Rating System
- FEMA's Pre-Disaster Flood Mitigation Assistance Program
- FEMA's Post-Disaster Hazard Mitigation Grant Program

West Warwick participates in the National Flood Insurance Program (NFIP). The NFIP is a Federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. Participation in the NFIP is based on an agreement between communities and the Federal Government. This insurance is designed to provide an insurance alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and replacing their contents. West Warwick is planning on starting the process to participate in the NFIP's Community Rating System (CRS). The CRS provides discounts on National Flood Insurance Program (NFIP) premiums in those communities that establish floodplain management programs that go beyond NFIP minimum requirements. Under the CRS, communities receive credit for more restrictive regulations, acquisition, relocation, or flood proofing of flood-prone buildings, preservation of open space, and other measures that reduce flood damages or protect the natural resources and functions of floodplains.

FEMA's Pre-Disaster Flood Mitigation Assistance Program makes grants available for communities to implement flood mitigation planning and activities such as acquisition, relocation, and retrofitting of structures. This program is only available for communities having a pre-existing approved hazard mitigation plan.

FEMA's Post-Disaster Hazard Mitigation Grant Program is only available for communities after a federally declared disaster. An approved mitigation plan expedites the application process for pre- and post- federal mitigation funding, as well as, assists in ensuring a funded project is eligible and technically feasible.

1.3 WEST WARWICK'S MISSION STATEMENT AND GOALS

"Preserve and enhance the quality of life, property, and resources by identifying areas at risk from natural hazards and implementing priority hazard mitigation strategies to protect West Warwick's citizens, infrastructure, and historical, cultural, and natural resources".

The LHMC reviewed the mitigation goals and decided they were still relevant and will remain the goals of the 2011 Hazard Mitigation update. West Warwick has established the following mitigation goals:

- Implement actions which protect the lives and property of West Warwick's residents
- Implement actions which protect West Warwick's critical facilities and infrastructure
- Implement actions which protect West Warwick's Cultural, historical, natural and economic resources

1.4 A LOOK AT WEST WARWICK

West Warwick, the last community to be incorporated in Rhode Island, is located in the center of Rhode Island in Kent County. The town was incorporated in 1913 when the decision was made to split Warwick and create West Warwick. Part of the decision to create West Warwick was based on the geography of the area. West Warwick housed the majority of the textile mills and was more of a blue collar community compared to Warwick. The textile mills attracted people of many different nationalities who formed many villages within the town, many of which still exist today. The villages are Arctic, Centerville, Crompton, Riverpoint, Natick, and Phenix.

West Warwick is a small town with a big population, ranking 10th out of 39 cities and towns in Rhode Island. The Town's population in 2000 was 29,581. Although most of the old mills have closed their doors, one mill, Riverpoint Lace, is still in operation. Another mill is currently owned by "The Original Bradford Soap Works", a manufacturer of specialty soaps.

Four of the other mills are being converted into apartments and condominiums, while others are still used for business and manufacturing. Old mills have become attractive resources in the last few years because of liberal State and Federal historical tax credits.

West Warwick is experiencing business revitalization with the West Warwick Industrial Park off of Route 2 and the addition of an exit off of Route 95 which exits commuters directly into the heart of the business area.

1.4.1. POPULATION

The Town of West Warwick has seen a slight decrease in population since the 2000 U.S. Census. The estimated population for the City in 2007 is 29,446, a decrease of 0.46%. In the tables below are some of the available demographic and social characteristics of the Town. These tables are based on a population total of 29,446 from the U.S. Census Bureau, 2005-2009 American Community Survey.

Age	Number	%
Under 5	1,778	6.0
65+	3,741	12.6

Table 1 – Age Distribution within the Town of West Warwick

Race	Number	%
Not Hispanic or Latino, White alone population	27,003	91.7
Minority population	2,443	8.3

Table 2 – Race Distribution within the Town of West Warwick

1.4.2. ECONOMY

According to the 2005 - 2009 U.S. Census American Community Survey, the median income for a household was $50,606 and the median income for a family was $64,399. The per capita income for the town was $26,570.

West Warwick has certain characteristics which are considered advantages in promoting economic development, as follows:

- Existing mill structures which could support certain types of economic development;
- Good quality of life – strong and affordable housing stock, wide range of community facilities and services;
- Available business,/industrial zoned land;
- Availability of some industrial sites in West Warwick Industrial Park;
- Geographical position of Town;
- 95 percent of Town is sewered;
- Most of Town is served by Kent County Water Authority water systems;
- Inexpensive land costs in comparison to other areas in the regional market;
- Convenient access to Interstate Route 95 and Route 2, important regional highways; and,
- Available and diverse workforce.

Commuting

West Warwick is approximately a 16 minute drive from T.F. Green Airport located in Warwick, Rhode Island, 13 miles from Providence, and approximately 68 miles to Boston, Massachusetts. Approximately 1.6% of commuters take public transportation, 5.1% walk, bike, or have an alternate mode, .7% works from home, and 92.6% drive or carpool.

Poverty Rates

According to the 2005 - 2009 U.S. Census American Community Survey, 10.7% of the population of the Town fell below the poverty level. This is lower than the state average of 12.0%. 17.9% of children are below the poverty level with a state average of 17.3%.

1.4.3. LAND USE[1]

The West Warwick Comprehensive Plan Update discusses land use as follows:

During the nineteenth century, West Warwick was transformed from a farming area into one of Rhode Island's most heavily industrialized towns. Textile mills were built along the Town's rivers and became the nuclei of small villages. The creation of these villages – Centerville, Crompton, Natick, Lippitt, Phenix, Riverpoint, Clyde, and Arctic – gave the Town its characteristic arrangement and flavor which it retains even now.

Later in the century, some of these villages, especially, Phenix and Arctic, grew into genuine urban centers. As the scale of production increased in the Town's mills, the growth of the villages surrounding them kept pace. The mill villages, which began as small hamlets, acquired many of the institutions which would serve the needs of the community – schools, churches, post offices, stores, and banks – and became the focus of the area's economic and social life.

In 1913, West Warwick was incorporated as a separate town. Development in the preceding century had not focused on a single institution or commercial center, the Town was essentially a federation of mill villages. Although West Warwick remains a factory town, the decline of the textile industry after World War I affected great physical and social changes, almost as great as the change from agriculture to manufacturing a century earlier.

Since the end of World War II, most residential building has followed a suburban pattern, and large tracts of single-family houses have been built, such as those in the Cowesett Farm area in the southern part of town, at the Knight Farm in Westcott, and in the area off Wakefield Street. In recent years, some multi-family buildings have also been constructed, including elderly housing projects, apartments and condominiums. The open spaces which once separated the mill villages are now filling up with such developments.

Increasing use of the automobile and highway and commercial improvements have diminished the dominance of the mill villages. Changes in the Town's highway system have been both a reflection of and an encouragement to the new growth. State Route 2 and Washington Street in Arctic are the sites of many businesses which serve the automobile-oriented public, and the construction of Interstate 95 in the 1960's has provided a convenient link from West Warwick to other parts of the metropolitan region. Industrial development also had been influenced by automobile-oriented patterns. While some manufacturers have continued to use the nineteenth-century mills, others have located in the industrial park established in the early 1970's in the southern part of town, near Interstate Route 95.

Currently, the Town of West Warwick is heavily developed, with over 70 percent of its total area in some form of development. Most of this development, 39.7 percent, is in residential use, including single family homes, two and three family homes, multifamily homes and condominiums. Over the past 25 years, 995 acres of land have been developed for residential uses in the Town. Seventy percent of the

[1] West Warwick Comprehensive Plan, 2005

residential development in the Town is single family, followed by multifamily (defined as more than two families in a structure), at 16 percent, and two-family housing at 14 percent.

Land use goals and policies are centered on six main goals, as follows:

- To promote a harmonious relationship between land development and natural resources and to consider the natural capacity of land to support development and population.
- To provide a land use pattern which is capable of meeting present and future community needs in an efficient, environmentally sound, economic, equitable and aesthetically pleasing manner.
- To relate the use of land to the level of public facilities and services available or planned to be available.
- To establish a balance between residential, commercial, industrial, recreational, public facility and conservation land uses that serve the needs of the community. Maintain and improve the distinctive character of the Town's neighborhoods and landscapes.
- Promote the preservation and enhancement of the positive and desirable characteristics of West Warwick's traditional New England mill town environment and land use patterns.
- Develop a future land use concept or set of concepts that articulate the vision of the Town's land uses, and develop a plan schedule to adjust the municipal zoning ordinances so that the ordinances are consistent with the future land use plan. The future land use map, included in the Plan, will allow the Town to address any zoning inconsistencies with the zoning ordinances.

1.5 PLANNING PROCESS

West Warwick initiated hazard mitigation planning in 2000 at the recommendation of the Rhode Island Emergency Management Agency (RIEMA). The Local Hazard Mitigation Committee (LHMC) was organized as a committee consisting of Department Heads, led by the Town Planner, to create West Warwick's Hazard Mitigation plan. The original LHMC members were the Town Planner, Department of Public Services Director, the Chief of Police, the Chief of the Fire Department and Rescue Service, the Superintendent of Sewers, the Town Engineer, and the Building Inspector. The Town Planner, as coordinator and contact person for the hazard mitigation effort, collected responses from committee members in December, 2000. During January and February of 2001, research on hazard events and background information was completed. In March, the committee convened to review mapped information and begin working on developing a "risk matrix". Mitigation projects were chosen based on the knowledge and experience of the Department Heads, some of whom have worked for the Town of West Warwick for over 20 years. Many were familiar with the vulnerable areas and were involved with responses to hazards in those areas. The LHMC reviewed, discussed and prioritized the projects based on vulnerable areas with reoccurring problems resulting in continuing losses.

West Warwick submitted a completed draft plan to FEMA in 2002. In response to comments received from FEMA and due to the elapsed time since the original draft was created, in 2005, the Town Manager elected to re-format and re-write portions of the original plan, update all projects, and resubmit the plan for public comment followed by formal town adoption. Under the leadership of the Town Manager the LHMC consisted of the Emergency Management Director, the Police Chief, the Fire Chief, the Town Planner, the Town Engineer, the Building Official, the Department of Public Services Director, and the

Town Clerk. Each committee member was encouraged to identify and develop relevant actions based on town hazard history and current town needs as they relate to their functional responsibilities. The plan was adopted in 2005.

The committee has reconvened to produce the 2011 update. Maguire Group, Inc. provided support for structuring and writing the plan as well as producing the GIS maps that are included. The committee met several times to discuss the hazards, vulnerabilities, and mitigation actions. The LHMC ranked the particular hazards that should receive the most attention during the planning process and it was determined to add and profile pandemic as the Town experienced the H1N1 pandemic in 2009-2010 with the rest of the nation. The update also includes a more thorough profile of the hazards listed to include location, timing and duration, severity, and frequency. The LHMC also felt that the vulnerabilities needed to be re-evaluated and it was determined to move Non-residential and Residential Properties to Vulnerable Area One and to remove Critical Roads from the Vulnerable Area list as the mitigation action listed had been completed. The LHMC reviewed the action items and indicated the status of each project. Through discussions the LHMC decided which mitigation strategies were the highest priority for the Town of West Warwick and the LHMC also discussed which strategies may yield the greatest benefits for mitigation efforts. They added one new mitigation action that was determined to be important after experiencing the March 2010 floods.

1.5.1 PUBLIC PROCESS

In order to maximize the effectiveness of this LHMC, the Team sought continual public engagement. Public input was encouraged during two phases of the document development. The first opportunity for involvement was at the public meeting, held in the Town Hall on January 13, 2011. The public meeting provided more information about community knowledge and the existing vulnerabilities and capabilities. Finally, after the Town of West Warwick reviewed the HMP update, the document was available for public comment. The document was posted on the Town's web page and at several locations with opportunities for anonymous feedback. Public inputs from all phases of the Plan development were incorporated into the final document.

1.5.2 PUBLIC PROCESS GOALS

The goal of the public process was to solicit "ground-level" information about West Warwick. The intent was to gauge household and business preparedness and awareness of personal mitigation techniques, identify areas where people were particularly vulnerable, and get feedback on potential mitigation strategies. When possible, we provided respondents with information that would be useful in personal preparedness activities.

1.5.3 PUBLIC MEETING PROMOTION

The meeting was promoted via notice in The Kent County Times, the local weekly newspaper and on the Town of West Warwick website.

1.5.4 PUBLIC MEETING ACTIVITIES

The public meeting was sparsely attended. A presentation was prepared to discuss the plan updates, which included a more thorough analysis of hazards and a review of vulnerable areas and mitigation activities.

1.5.5 DOCUMENT REVIEW

After the Project Team completed the final draft of this HMP update, it was sent through several review phases. The public was given the opportunity to comment on the HMP, prior to sending it to the State and FEMA for approval. The document was available on the Town of West Warwick's web page and at public locations. Physical copies of the document were available at Town Hall and the Public Library. Copies were also sent to the neighboring communities for comment.

The document review process followed the schedule below:

December 2010: Town of West Warwick Department Review

January 13, 2011- First Public Meeting

February 9, 2011 – February 11, 20100 – Town of West Warwick Department Review of updated plan

February 14, 2011 – February 21, 2011 Public Review

February 22, 2011 - Rhode Island State Review

February 2011 – July 2011 – FEMA Review

July 2011 – November 2011 – Revisions and Dialogue with FEMA

1.5.6 SCENARIO

For planning purposes, and for HAZUS modeling, the following scenario was used:

A large and powerful hurricane was first detected northeast of the Leeward Islands on September 9. It moved west-northwestward through the 12th, then turned northward on a track that brought the center near Cape Hatteras, North Carolina on the 14th. The cyclone accelerated north-northeastward, moving across eastern New England. This hurricane was of Category 3 intensity at landfalls at Cape Hatteras, Long Island, and Point Judith, Rhode Island. The track of the storm takes it west of the City of Woonsocket, similar to Hurricane Donna in 1960.

2.0 HAZARD RISK ASSESMENT

Risk includes the characteristics of the hazard and takes into account the magnitude, duration, distribution, area affected, frequency and probability of an event. This section focuses on assessing the community's risk to natural hazards by identifying which natural hazards affect West Warwick, by reviewing West Warwick's and the State of Rhode Island's hazard history. This section also takes a look at West Warwick's capabilities and the mitigation efforts that the town currently has in place.

2.1 HAZARD PROBABILITY

Table 3 identifies the hazards posing the greatest risk to West Warwick, including their probability over a five year period and potential estimate of monetary impact. The LHMC discussed other hazards such as drought and extreme heat and deemed them to be of negligible risk to the community based on historical data and a low probability of occurring within the next five years.

Table 3 – Hazards Affecting West Warwick

Hazard	Historical Dates	Probability*	Potential $ Impact***
Severe Weather**	1978, 1993, 1996, 1997, 1999, 2001, 2005, 2010, 2011	High	$250,000 +
Hurricanes	1938, 1944, 1954, 1960, 1985, 1991	Low	$500,000 +
Flooding and Dam Failure	1991, 1993, 1998, 2000, 2008, 2010	High	$1,000,000 +
Earthquake	1925, 1929, 1935, 1940, 1944, 1963, 1973, 2003	Low	$250,000 +
Conflagration	1992, 2005	Low	$1,000,000 +
Pandemic	2009-2010	Low	Unknown

* Probability is based on historical occurrences and climate change predictions. Low is defined as every 10-50 years, Medium occurs between 1 and 10 years, and High occurs with regularity
**Severe Weather Includes: Nor'easters, Winter Storms, Severe Thunderstorms, and Tornadoes
*** Amounts based on past disasters and repetitive losses

2.2 WEST WARWICK: GEOGRAPHY, HAZARDS AND HISTORY

West Warwick is located in the center of Rhode Island and is part of Kent County. The town is bordered by the communities of Cranston, Coventry, East Greenwich and Warwick. The north and south branch of the Pawtuxet River join in West Warwick and other tributaries bisect the community.

2.2.1 SEVERE WEATHER

Severe Weather Profile

Severe weather and hurricanes are the primary hazards affecting Rhode Island. Severe weather includes nor'easters, winter storms, ice storms, severe thunderstorms, and tornadoes. These hazards can result in flooding and high winds causing damage to residential homes, businesses, historical buildings, dams, bridges and other critical infrastructure.

The trajectory of these systems determines the local effect. Storms with a southern origin bring heavy rain. Storms coming from the north bring cold air and the potential for snow and ice. Any winter storm, regardless of its trajectory, can be accompanied by high winds. Storms with sustained winds above 30 mph generally cause low impact, widespread damage, while winds above 50 mph are powerful enough to cause significant damage.

Climate change predictions indicate that storms in the Northwest are likely to occur more frequently and be more severe. Although West Warwick does not typically experience more than a week of snow each year, it is likely that these events will become more common. West Warwick can expect to receive more ice and snow in the winter months.

Location

The entire Town of West Warwick may be affected by a severe storm; however, microclimates within the Town may increase the vulnerability in specific areas. Narrow culverts are vulnerable to ice jams and hilltops are subject to lightning.

Timing and Duration

Most severe storms in West Warwick occur between November and April when the jet stream moves over the East Coast, low-pressure systems are more frequent. Storms can last anywhere from a few hours to several days. Weather forecasting abilities will provide West Warwick, at minimum, a few hours warning prior to an extreme weather event.

Severity

Storms in West Warwick are likely to have a severity of low to moderate. Historically, storms have been relatively short in duration and have had mostly localized impacts. The main concern about a severe storm in West Warwick is the potential to isolate citizens and businesses if roads are blocked by snow or ice. This may cause some financial hardships for the Town, but it is unlikely to cause widespread, permanent damage or loss of life.

Frequency

Severe storms are not common in West Warwick. Snow, ice, rain, and wind do occur but do not typically rise to the level of severe. Providence County has reportedly experienced at least one serious windstorm per calendar year.

Severe Weather History

The majority of Rhode Island lies outside the heavy snow and ice regions of the northeast. Due to its maritime climate, Rhode Island generally experiences cooler summers and warmer winters than inland areas. However, snow and ice do occur and can result in more extensive damage than one would expect. The two major threats from these hazards are loss of power due to ice on electrical lines and snow loading on rooftops. One of the most memorable winter storms was the "Blizzard of '78" which stalled over Lincoln, RI. The stormed delivered 24 to 38 inches of snow. Motorists abandoned their cars on Interstate Highways and local roads. The governor declared a state of emergency, closing highways and businesses for the week required to remove snow.

Recent blizzards and major snowstorms occurred in 1993, 1996, 1997, 2001, 2005, 2010, and 2011 causing millions of dollars in damage, many collapsed roofs, the loss of power in some areas for days and the loss of life. The Blizzard of '96 brought 27 inches of snow, the largest accumulation recorded, to West Warwick. This severe storm disrupted transportation systems, closed schools/businesses, and damaged commercial and residential property throughout the town. During the following week, several commercial and residential roofs collapsed. The Blizzard of '05 brought over 24 inches of snow in a relatively short period of time. No serious structural damage was reported in West Warwick. The Town allocated $100,000 for snow removal. The Governor declared a state of emergency closing all Town and State facilities. Roads remained open for emergency vehicles. Businesses and public services returned to normal operations within 48 hours.

Table 4 – Precipitation in Inches for the Town of West Warwick

Year	Total Precipitation	Total Snow Accumulation
2007	42.81	28.7
2008	57.09	30.7
2009	54.85	52.1
2010	53.54	20.1

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

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 hurricane winds.

West Warwick and Kent County have experienced ten significant windstorms over the past ten years. Exact amounts of property damage are unknown for Kent County and West Warwick, however, damage to vehicles and buildings was reported. Major wind damage has been related to tree and branch damage. On occasion the trees and branches have caused structural damage.

Tornado History

Tornadoes are generally produced by severe thunderstorms and occasionally by hurricanes;

Rhode Island, however, ranks 49th out of 50 states for the occurrence of Tornadoes. Based on data from 1950 through 1995, the State had 8 tornadoes; there were 23 injuries and no fatalities. The total cost of tornadoes between 1950 and 1995 was $1,979,656.00. There were four reports of tornadoes as Hurricane Bob came ashore. A devastating tornado occurred across the border in Worcester, MA in 1953. More than 90 people were killed and over 1,300 injured. Damage estimates were over $52 million.

Table 5 - Major Rhode Island Tornadoes

Year	Tornadoes	Injuries	Adjusted Cost
1971	1	None	None
1985	1	None	None
1986	3	20	$1,731,170
1989	1	3	$127,511
1990	1	None	$120,975
1994	1	None	None

In 1996 a tornado touched down briefly in the town causing only minor tree damage. No other recorded tornado history or damage is known to exist for West Warwick.

2.2.2 HURRICANES

Hurricane Profile

"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'"[2]. 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 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 Woonsocket.

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 6.

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 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."[3]

TABLE 6 - SAFFIR-SIMPSON HURRICANE SCALE

	Millibars	Inches	(mph)	(kts)	
1	>980	>28.9	74-95	64-83	Minimal
2	965-979	28.5 - 28.9	96-110	84-96	Moderate
3	945-964	27.9 - 28.5	111-130	97-113	Extensive
4	920-944	27.2 - 27.9	131-155	114-135	Extreme
5	<920	<27.2	155+	>135	Catastrophic

[2] Neumann, C.J., et al. Tropical Cyclones of the North Atlantic Ocean, 1871-1986 (Washington, D.C.: U.S. Department of Commerce, NOAA, 1987).
[3] http://www.weather.com/encyclopedia/charts/tropical/saffirscale.html

Wind damage is a concern with hurricanes and tropical storms. Wind pressure, and not wind speed are 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 the windbore debris that causes most of the damage. Flying objects such as tree limbs, outdoor furniture, signs, roofs, gravel, etc.

Location

The entire Town of West Warwick may be affected by a hurricane; however, microclimates within the Town may increase the vulnerability in specific areas. The majority of the damage, however, will be the flooding of the Pawtuxet River.

Timing and Duration

Hurricane season is between June 1 and November 1 each year. Hurricanes typically affect the northeast from August through October when the waters are the warmest. Statistically the peak of the season is September 10. Depending on 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 allows typically a few days advanced warning of the onset of a hurricane that will affect West Warwick.

Severity

Hurricanes in West Warwick are likely to have a severity of low to moderate. This would depend on the location of the eye of the hurricane or tropical storm. The rain and winds could cause severe damage depending on the severity of the winds and amount of rain. Debris would most likely be the biggest issue if the Town was impacted by a hurricane. Downed trees and power lines could isolate people within the Town from emergency response personnel.

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

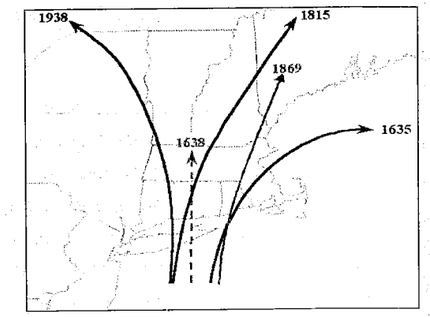


Figure 1

Hurricane History

Southern New England has been affected by 39 tropical weather systems since 1900; 25 hurricanes and 14 tropical storms. Nine of the 25 hurricanes made landfall along the southern coastline of Rhode Island and Massachusetts. In 1954, New England endured three hurricanes; Carol, Edna, and Hazel. Over the last seventy-five years Rhode Island was directly affected by six storms which had hurricane force winds at landfall. These included three Category 3 hurricanes directly impacting Rhode Island and causing millions of dollars in damage and hundreds of deaths. The most recent hurricane to directly impact Rhode Island was hurricane Bob in 1991, a Category 2 hurricane.

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 and caused $100 million dollars in property damage and took 262 lives. Hurricane Carol in August of 1954 caused similar damage dollar wise, but thankfully only resulted in the loss of 19 lives.

Table 7: Major Rhode Island Hurricanes

Hurricane	Category	Wind Speed at Landfall	Damage to Rhode Island
Hurricane of 1938	3	Sustained to 91 MPH, gusts to 121 MPH	Extensive – roofs, trees, crops; storm surge 12 to 15 ft. destroyed coastal buildings
Carol, 1954	3	Sustained to 100 MPH, gusts to > 125 MPH	Westerly to Narragansett coast communities were wiped out; downtown Providence under 12 feet of water; 14 ft. storm surge in upper bay
Edna, 1954	2	Sustained to 95 MPH, gusts to 110 MPH	Inland flooding; rivers rose several feet above flood stage; knocked out electrical power
Donna, 1960	3	Sustained to 95 MPH, gusts to 130 MPH	Moderate storm surge; extensive beach erosion; wind damage to trees and utility poles causing major power outages
Gloria, 1985	2	Sustained to 81 MPH, gusts to 100 MPH	Minor coast flooding and erosion; scattered power outages
Bob, 1991	2	Sustained to 100 MPH, gusts to > 105 MPH	Storm surge of 5-8 feet; extensive beach erosion; wind damage to trees and utility poles; 60% of southeast RI lost power

Hurricane Bob, in 1991, caused the most damage to West Warwick. The town received 7 inches of rain which caused massive flooding along Canna St., Aster St., Begonia St. and Daisy St. in the Natick section of town. Baker St. and Phenix Ave. were flooded to a lesser degree. The hurricane winds caused power outages that lasted for a period of about 72 hours. Damage from Hurricane Bob was reported in the millions. The other major Rhode Island hurricanes had little destructive impact on West Warwick.

2.2.3 FLOODING AND DAM FAILURE

Flooding and Dam Failure Profile

Flooding

As found in the Rhode Island State Hazard Mitigation Plan (2008), "A flood, which can be slow or fast rising but generally develops over a period of days, is defined by the National Flood Insurance Program as:

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

By their very nature, floodplains are the low, flat, periodically flooded lands adjacent to rivers, lakes and oceans and subject to geo-morphic (land-shaping) and hydrologic (water flow) processes. It is only during and after major flood events that the connections between a river and its floodplain become more apparent. These areas form a complex physical and biological system that not only supports a variety of natural resources but also provides natural flood and erosion control. In addition, the floodplain represents a natural filtering system, with water percolating back into the ground and replenishing groundwater. When a river is divorced from its floodplain with levees and other flood control structures then natural benefits are either lost, altered, or significantly reduced."

West Warwick is most commonly affected by riverine flooding of the Pawtuxet River and urban flooding. Riverine flooding is when a river, stream, or tributary overflows its banks due to excessive rainfall, snowmelt, or ice. Urban flooding occurs where development has occurred within stream floodplains.

Dam Failure

As defined by NOAA, a dam is "any artificial barrier that diverts or impounds water." NOAA defines dam failure as a "catastrophic event characterized by the sudden, rapid, and uncontrolled release of impounded water."[4]

Location

West Warwick typically experiences flooding along the Pawtuxet River. The streets most commonly affected in the Natick area are Aster, Begonia, Canna, Daisy, Elk, Providence, River, and Sheldon Streets; and in the River Point area are Clyde, Main, and East Main Streets, and Arlington, Garrett, Industrial, and Nunes Lanes. The dams that are of concern in West Warwick are the Arctic Dam, Natco Pond Dam, and the Centreville Pond Dam.

Timing and 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. Dam failure can happen over several years or it can happen in a matter of moments. With proper inspection and maintenance, a dam will be less likely to fail.

Severity

The severity of flooding in West Warwick, can be moderate to severe. Typically, there is flooding along the Pawtuxet and urban flooding throughout the Town with some regularity. This flooding is of these events is usually manageable and causes limited damage. However, as experienced in the March 2010 floods, the impact can be extreme. Municipal infrastructure and residential properties were impacted from the March 2010 floods. The Town received a total of $882,031.84 from the FEMA Public Assistance program and residents were given $1,684,838 for housing damages during the disaster and $452,717 for other needs assistance. In Table 3, the LHMC determined that from historical data, flooding can have a potential impact of over $1,000,000.

The severity of a dam failure is based upon the amount of water that the dam is holding back. A dam failure may not cause any problems downstream, or it could cause catastrophic issues.

[4] http://www.nws.noaa.gov/glossary/index.php?letter=d

Frequency

In West Warwick the areas along the Pawtuxet River flood more frequently than other areas in the town. It is not known the frequency of dam failure for the Town of West Warwick.

Flooding and Dam Failure History

March 2010 Floods

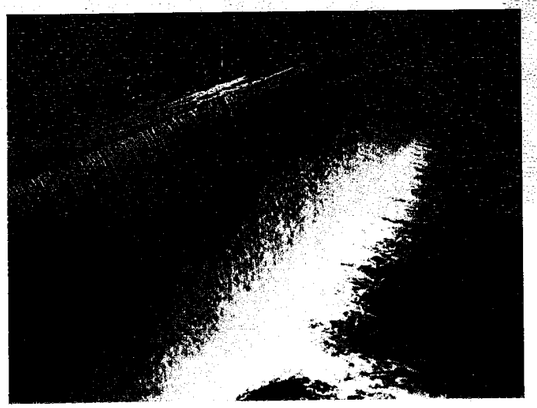
The State of Rhode Island experienced torrential rain fall that affected the entire state between March 12, 2010 and March 31, 2010. The Pawtuxet River crested at 20.79 feet setting a record which had previously been 14.5 in 1982. The Town of West Warwick experienced town-wide impacts from rains and flooding neighborhoods requiring sandbags, sheltering and other emergency protective measures. The floods and subsequent standing waters prior to receding damaged paved roads and associated facilities on road rights-of-way in the Town due to both sinking and heaving actions caused by the excessive flood waters (static and dynamic) causing flood washout. Multiple roads and bridges were impassable. The Natick section of town had to be completely evacuated and it took months to gain some normalcy in the area. Almost a year later, many homes and businesses are still undergoing cleanup and renovations and the river is filled with storm generated debris which will cause future flooding.

Historically, torrential rainfall, severe thunderstorms, large snowmelts, and hurricanes (rainfall and/or storm surge) are the primary causes of flooding in Rhode Island. These hazards can result in urban street, basement, and riverine flooding. Since 1993, the National Climate Data Center has reported 48 floods in Rhode Island. There are also many dams throughout the state that are rated by the RI Department of Environmental Management as high hazard, significant hazard, and low hazard. The high hazard and significant hazard dams generally pose a risk of flooding in the event of failure.

The primary causes of flooding in West Warwick are torrential rainfall, thunderstorms, and snowmelt resulting in urban street, basement and river flooding. Torrential rainfall resulted in the September 16, 1999 flood caused by 7.12 inches of rain. By the morning of September 17th the Pawtuxet River overflowed in Warwick and Cranston. Historically, flood damage in West Warwick primarily affects low-

lying bridges, those homes located in a 100-year flood zone along the Pawtuxet, and low lying areas in Natick.

In 1991 Hurricane Bob brought 7 inches of rain causing massive flooding and millions of dollars in damage. In 1993 a flash flood was reported in the village of Natick. In March of 1998 a powerful storm coming from the Ohio Valley brought 3.4 inches of rain to West Warwick within 30 hours. An accompanying thunderstorm resulted in a lightning strike to a garage. The garage and the nearby house caught on fire causing $50,000 in damage. In 2000 a low pressure system brought 2-3 inches of rain to the region within a 6-12 hour period. Widespread urban flooding was reported in West Warwick, where flood-prone roadways were covered with 10-12 inches of water. The Baker Street Brook has flooded nearby basements on a number of occasions. Exact damage amounts are not available.



West Warwick has a total of 12 dams, with 8 of them located on the south branch of the Pawtuxet River. There are two high hazard dams, the Arctic and the Natick Pond dams, located on the south branch of the Pawtuxet River, one significant hazard dam, the Centerville Pond dam, also located on the south branch of the Pawtuxet and nine low hazard dams. All of the dams in West Warwick are privately owned. Within the last five years both the Natick Pond Dam and the Riverpoint Pond Lower Dam (a low hazard dam at Bradford Soap Works) experienced gate failures causing the ponds to rapidly empty out. The only damage caused by the failure of the Riverpoint Pond Lower Dam was localized minor flooding at Bradford Soap Works. Exact damage amounts are not available. The Natick Pond Dam failure did not cause any flood damage.

This has led town officials to believe that the depth of the mill ponds has been greatly reduced over the years, possibly due to soil deposits and other debris.

The towns brook drainage system empties into the Pawtuxet River and Warwick.

2.2.4 CONFLAGRATION

Conflagration Profile

Conflagration is a large destructive fire. Triggers that cause fire can be natural, such as lightning, or human induced. Downed power lines during can cause fires. Fire is a secondary hazard following an earthquake. Fires are influenced by the amount and condition of available fuel, slopes, wind and ambient temperature. Fires tend to be more prevalent from mid-May to October; however they can occur at any time.

Location

Conflagration can happen anywhere within the Town of West Warwick. Fires are more prominent in the Arctic, Phenix, Crompton, and Natick sections of town where there is older mill housing structures and it is densely populated.

Timing and Duration

Fires cannot be predicted and their duration is dependent on the size and severity of the fire.

Severity

The overall severity of a fire depends on the sources of heat, the characteristics of the fuel, and the products of combustion.

Frequency

Conflagration History

West Warwick experienced 46 fires from January 2010 to December 2010. This included buildings, food on the stove, and electrical fires. The fire department made a total of 6,592 runs, 2,168 were non-EMS and 4,424 (67%) were EMS calls.

In the past five years Rhode Island has experienced 100 to 215 wildfires a year. On average the fires consumed between one to two acres of land. The probability of a major fire is considered to be low; however Rhode Island has experienced some major fires in the past. The most devastating wildfire was the Coventry fire of 1941 which consumed 18,000 acres of forest. A wildfire in Exeter in 1951 consumed 5,000 acres. A fire in an empty mill complex in Pawtucket, fed by gale force winds, spread to 17 homes in the nearby area. In Woonsocket, a single electric wire spark destroyed an entire mill block. Recent wild and urban fire events in Rhode Island point out the necessity for considering conflagration in mitigation planning.

The most devastating urban fire, in terms of loss of life, took place in West Warwick when the Station Nightclub caught fire during a rock band's performance involving pyrotechnics. One hundred people lost their lives. In August of 1992 the Crompton Mill caught on fire and burned for a week. Fortunately the fire was contained and did not spread to any other structures. Exact damage amounts are not available. The most recent fire in West Warwick started on the night of

March 30, 2005 at the vacant Phenix Mill. Seventy fire fighters from four communities battled the fire which wound up gutting the mill. The mill had been sold to a developer and was slated for condo development. About 20 nearby homes were evacuated and five homes had their electrical power shut off as a precaution. Some houses across the street from the mill had damage to the aluminum siding. Homes that could have been in jeopardy were spared due to the calm winds. More than 400 phone lines were severed by the heat. The fire caused approximately $400,000 in damages.

2.2.5 EARTHQUAKES

Earthquake Profile

The Rhode Island Hazard Mitigation Plan (2008) discusses earthquakes as follows:

> An earthquake is caused by a sudden displacement within the earth. Displacement at relatively shallow depths may be caused by volcanic eruptions, or even by avalanches. The resultant earthquakes are usually light and do little damage. Strong and destructive earthquakes usually result from the rupturing or breaking of great masses of rocks far beneath the surface of the earth. The ultimate cause of these deep ruptures has not been established. All earthquakes produce both vertical and horizontal ground shaking. This ground movement begins at the focus or hypocenter, deep in the earth, and spreads in all directions. The motion we feel is the result of several kinds of seismic vibrations.
>
> Geologists have found that earthquakes tend to reoccur along faults, which reflect zones of weakness in the Earth's crust. *A fault* is a fracture in the Earth's crust along which two blocks of the crust have slipped with respect to each other. Faults are divided into three main groups, depending on how they move. *Normal faults* occur in response to pulling or tension; the overlying block moves down the dip of the fault plane. *Thrust (reverse) faults* occur in response to squeezing or compression; the overlying block moves up the dip of the fault plane. *Strike-slip (lateral) faults* occur in response to either type of stress; the blocks move horizontally past one another. Most faulting along spreading zones is normal, along subduction zones is thrust, and along transform faults is strike-slip. Even if a fault zone has recently experienced an earthquake there is no guarantee that all the stress has been relieved. Another earthquake could still occur.
>
> The *focal depth* of an earthquake is the depth from the Earth's surface to the region where an earthquake's energy originates (the *focus).* Earthquakes with focal depths from the surface to about 70 kilometers (43.5miles) are classified as shallow. Earthquakes with focal depths from 70 to 300 kilometers (43.5 to 186 miles) are classified as intermediate.
>
> *Liquefaction,* which happens when loosely packed, water-logged sediments lose their strength in response to strong shaking, causes major damage during earthquakes.

<u>Location</u>

If an earthquake occurred it would likely impact the entire Town of West Warwick.

<u>Timing and Duration</u>

Earthquake shaking can last from less than 30 seconds to a few minutes. Secondary hazards could make the event last longer such as a fire or hazardous materials issue.

Severity

The severity of an earthquake would vary depending on the magnitude. An earthquake could have a very high impact for the Town. The structures within the Town are not built to withstand earthquakes, as earthquakes are not a common New England occurance, therefore, if an earthquake did strike, the results could be catastrophic for the residential and commercial structures within the Town. However, the severity of earthquakes that the Town has experienced, has an anticipated impact of $250,000 as listed in Table 3.

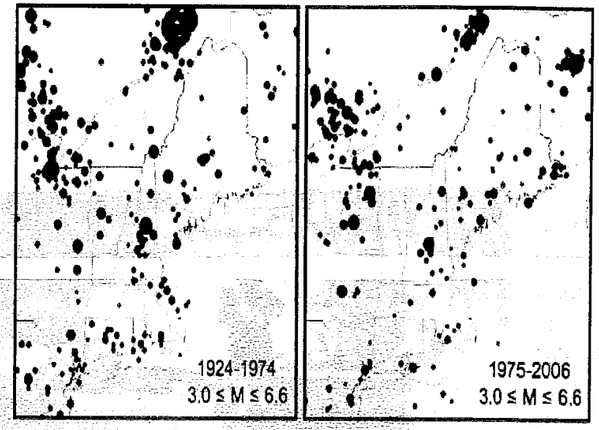


Figure 2 – Earthquake History in the Region

Frequency

Earthquakes affect West Warwick approximately once every thirty years. See Figure 1 for a graphic representation of earthquakes that have affected New England.

Earthquake History

Earthquakes in New England are a greater risk than most people realize. There have been 31 recorded earthquakes in this state over the last 220 years. Rhode Island can feel the effect 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.

Two earthquakes are believed to have had their epicenters in Rhode Island:

- The February 1883, earthquake was felt from New London, Connecticut, to Fall River, Massachusetts. It was felt with an Intensity V from Bristol to Block Island.
- Another earthquake with a magnitude of 1.8 occurred in October 2003. The epicenter was determined to be 15 Miles SSW of Providence.

According to the RI 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.

No recorded earthquake history or damage is known to exist for West Warwick.

2.2.6 PANDEMIC

Pandemic Profile

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.

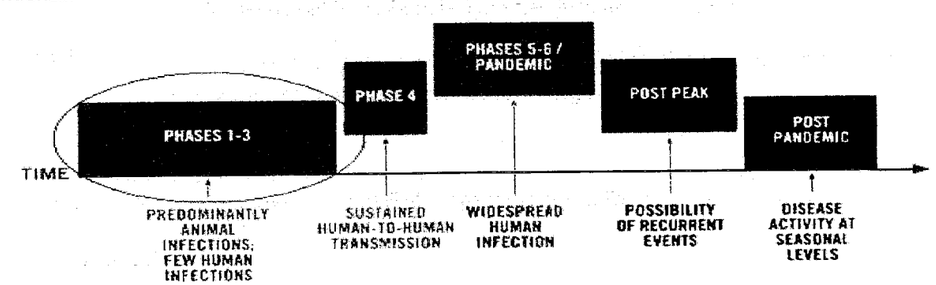


Figure 3 – Cycle of a Pandemic

The World Health Organization defines a pandemic in six phases. Figure 3 illustrates the cycle of a pandemic Table 8 defines the different phases.[5]

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

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.

Table 8 – Phases of a Pandemic

Location

The entire Town of West Warwick 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.[6]

Timing and 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.

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

Severity

It is estimated that 30% of the population would be affected with a potential for a 3% fatality rate. Table 9 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 9 - Influenza in Rhode Island – A Pandemic Model[7]

	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

Pandemic History

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.

- 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.

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

2.3 CAPABILITY ASSESSMENT

West Warwick has initiated many studies and activities over the years that have laid the foundation for the development of this mitigation strategy. In 1992 the town developed its first comprehensive plan, but the plan was not state approved until 2005. Due to the time lapse between the development and approval of the plan the town will soon be undergoing an update process to ensure the plan reflects present day West Warwick. This will be complete in May 2011. The comprehensive plan outlines goals, policies, issues, and actions to provide a framework for everyday operations within the town. The town recognized that incorporating mitigation initiatives (both pre-disaster and post disaster) into the comprehensive plan would not only benefit the community by reducing human suffering, damages and the cost of recovery, but would also assist in building and maintaining the economic health of the town.

West Warwick implements and enforces the state building code and is currently in the process of participating in the Community Rating System (CRS). West Warwick is not currently rated in the CRS. West Warwick works annually with Cranston to keep the creek in the Janet Drive area clear of debris to prevent flooding in West Warwick and downstream in Cranston. West Warwick also works with Coventry to ensure that subdivisions located in Coventry do not discharge more runoff water than they have been. This protects the low lying areas in West Warwick from being flooded by the adjacent higher elevation areas in Coventry.

West Warwick revised its Emergency Operations Plan (EOP) in 2004. The plan details the town's responsibilities and actions in the event of an extraordinary emergency situation associated with natural, man-made and technological disasters. As part of the EOP update, the hazards identified have been reviewed, assessed, and prioritized so they may be linked to mitigation actions identified in this plan. West Warwick's EOP offers pre- and post-disaster strategies and measures designed to utilize emergency response organizations for protection of West Warwick's population and infrastructure, thus reducing the loss of life and limiting damage to private and public property.

West Warwick has identified 3 Red Cross approved emergency mass care facilities throughout the town. The American Red Cross (ARC) requires 40 square feet of usable space per person in each mass care facility. According to FEMA, in the event of a natural disaster that requires mass care facilities, twenty percent of an evacuated population will seek public mass care facilities. The mass care facilities are free of flood risk and the total mass care facility capacity is 1094 for short term accommodations and 383 for long term accommodations. In the event of overcrowding at the designated ARC mass care facilities the town will also open the West Warwick Senior Center which can accommodate 30 people and the high capacity West Warwick Civic Center which can accommodate 383 people.

The ARC mass care facilities in West Warwick are:

1. Wakefield Hills Elementary School (Approved for overnight occupancy)
2. West Warwick High School
3. John F. Deering Middle School

West Warwick looks for opportunities to improve other essential services and critical facilities and has recently made a number of improvements. The town purchased newer snow removal trucks and liquid calcium in order to improve snow and ice removal during storms. The sewer plant, lift stations, Department of Public Works garage, Police Station and Fire Stations all have emergency generators, allowing them to function during a power outage. The town worked with a consultant from the U.S. Soil Conservation Service who provided a report focusing on major flooding issues with the Baker Street Brook. This gave the town a better handle on the problems that exist and the long term solution options. Another report, completed by Fuss and O'Neil, focused on drainage issues on Main Street. West Warwick and Warwick received an $800,000 Homeland Security Grant, in 2004, to upgrade their communications systems. This grant allowed them to purchase 30 portable radios and some fire alarm equipment. Several years ago the Fire Department received a $36,000 Homeland Security Grant to upgrade their communications system to include a second radio frequency. The grant helped to pay for a much needed fireground repeater frequency for the department. The Police Department, Fire Department, DPW, Engineer, Town Planner and Building Official attend job specific training and awareness programs on an annual basis including FEMA and Department of Homeland Security training sessions.

West Warwick's Public Works Director created a debris management program for the removal of debris after a natural disaster. There is a designated emergency coordinator, from the DPW, who will be on hand throughout the clean-up. All debris will be removed by the Public Works staff. If necessary, additional contractors will be hired. Debris will be placed on the 6 acres of land behind the public works department. Once collected some will be chipped to create mulch for the town and the rest will be hauled to the landfill.

The West Warwick Sewer Department holds an annual open house to educate the public about the plant. The open house teaches visitors that the plant is protected from major flooding and that the effluent cleaning process is not interrupted during periods of flooding. The Sewer Department also provides tours for students to teach them about the environmental and mitigation issues that the department faces in order to protect the plant from interruptions.

The town has completed many smaller drainage projects that when combined, have eliminated drainage problems in some areas of town. The projects were centered on Pawtuxet Terrace, Judy Terrace, Kinney St., Regnaire Ct., Vincenzo Dr. and Horta St.

West Warwick has access to modeling tools, to assess risks associated with some of the most severe natural hazards, through RIEMA. Maguire Group assisted the Town in running the HAZUS models for flooding and hurricanes to include the maps in the appendices.

3.0 ASSESSING VULNERABILITY

Vulnerability indicates what is likely to be damaged by the identified hazards and how severe that damage could be. This section focuses on West Warwick's vulnerable areas in regards to the identified hazards, what is at risk in these areas (structures, population, natural resources) and what the impacts will be (loss of life, environmental damage, inconvenience to residents). The Risk Assessment Matrix (Table 11) summarizes the major vulnerable areas in West Warwick. Section 3.0 Assessing Vulnerabilities also takes a look at West Warwick's population at risk, the potential economic losses and future development trends to enhance the Town's hazard mitigation planning capabilities and articulate other vulnerabilities within the Town.

Vulnerability is defined as low, medium and high as determined by the LHMC.

- Low= mitagtion measure is in place or there is no significant history of the town being affected.
- Medium= some measures are in place to reduce vulnerability, however vulnerability still exits
- High= minimal mitigation measures in place and the town is significantly vulnerable

The Maguire Group created maps for the Town of West Warwick 2011 Hazard Mitigation Plan update. The maps portray the community facilities, population by census block, transportation networks, water supply and sewer infrastructure, flood zones, areas vulnerable to flooding, and anticipated peak wind speeds during a hurricane. The maps can be found prior to the appendices.

Vulnerability – Severe Weather

West Warwick rates its vulnerability to severe weather as medium. Due to the size of the town there are no areas in West Warwick that are more susceptible to severe weather than others. In general winter storms, severe thunder storms, nor'easters and ice storms have a similar effect throughout the entire town.

Vulnerability – Hurricanes

West Warwick rates its vulnerability to hurricanes as low. Due to West Warwick's geography, hurricane storm surge does not pose a threat to the community. However, heavy rains from hurricanes can cause flooding along the Pawtuxet River and in the low lying areas in Natick, and hurricane winds can cause damage to property and infrastructure throughout the town. The sewer plant is located in a flood zone, but is slightly elevated which has protected it from flooding. West Warwick does not have any mobile homes.

According to the HAZUS model run for a hurricane scenario, it is anticipated that 1,185 buildings will experience at least moderate damage. This is 12% of the building stock in the Town of West Warwick. Table 10 displays the data for Damaged Buildings by Occupancy.

Table 10 – Expected Building Damage by Occupancy*

Occupancy	None		Minor		Moderate		Severe		Destruction	
	Count	%	Count	%	Count	%	Count	%	Count	%
Agriculture	12	57.40	5	25.60	2	10.75	1	5.39	0	0.87
Commercial	267	61.18	100	22.89	57	13.13	12	2.77	0	0.02
Education	8	62.53	3	22.72	2	12.55	0	2.21	0	0.00
Government	4	57.39	2	23.52	1	15.81	0	3.28	0	0.00
Industrial	109	61.34	37	20.92	24	13.27	7	4.12	1	0.36
Religion	19	61.93	8	25.45	3	10.89	1	1.72	0	0.00
Residential	5,642	59.26	2,805	29.47	941	9.88	85	0.90	47	0.49
Total	6,061		2,960		1,030		107		48	

*Table as found in HAZUS

Vulnerability – Flooding and Dam Failure

West Warwick rates its vulnerability to flooding and dam failure as low. The north and south branch of the Pawtuxet River join in West Warwick and its tributaries bisect the community, passing through the most densely populated areas and some sites of economic significance. The Pawtuxet contains almost consistent A-zones along its entire length, making any structures located in these zones vulnerable to flooding. There are three areas in town that are very prone to flooding, the Canna and Aster Street areas in Natick and Baker Street Brook in Arctic. The Canna and Aster Street areas are located in a low lying area on the banks of the Pawtuxet and contain a number of auto repair facilities and body shops. Flooding of these businesses could cause contamination of the Pawtuxet. Baker Street Brook's flooding issues are due to the size of the brook and culvert constraint along the East Coast Bike Way. A study by the U.S. Army Corps of Engineers found both the brook and the culvert to be under capacity. A cost benefit analysis determined that the cost of fixing the problem would be higher than removing the vulnerable homes from the area. In addition repetitive claims in the Baker Street area are not high enough to justify removing the homes. The area flooded in July 2008; however, since then it has not flooded again, due in part to vigilant monitoring and cleaning of the culverts by the town. Other areas prone to flooding include Phenix Ave. and low lying areas in Natick, including businesses on Daisy and Begonia Streets and the creek area located behind the homes on Janet Drive. A portion of Main Street is prone to flooding due to an inadequately sized drainage system. Winthrop Street is also an area that floods, however the last instance was in July 2008 and in the later part of 2009 a new pipe was installed and the problem has been resolved.

There are 18 repetitive loss properties in the Town, which is up from 6 in the 2005 Hazard Mitigation Plan. The Natick area which is a mix of residential and commercial properties and Industrial Lane which is all commercial and industrial property.

As seen in Table 11, FEMA estimated that the value of property insured by the NFIP in West Warwick is $33,906,700. This is an increase since our last update of $25,547,800.

Table 11: Summary of National Flood Insurance Program Activity in West Warwick

NFIP Information	Value
NFIP Policies in Effect	210
Total Premium	$200,142
Number of Policies in A* Zone	118
Number of Policies in V* Zone	0
Total Coverage	$33,906,700
Total Claims Made Since 1978	155
Total Claims Paid Since 1978	$5,219,010

Table 11 – NFIP Information for the Town of West Warwick as of January 21, 2011

* V-zone refers to the velocity zone, where waves greater than 2.9 feet are feasible during a 100-year flood. A-zone refers to other areas within the 100-year flood zone with less than 2.9-foot waves (FEMA, 1997).

The biggest issue in regards to dam vulnerability is private ownership. All of the twelve dams located in West Warwick are privately owned. A lack of understanding on the dam owners' part, regarding the need for maintenance and inspections, leaves dams within the town at risk for failure. Two dam gate failures prior to 2005, one at a high hazard dam and one at a low hazard dam, did not result in any major flooding, indicating that a total dam failure would not be as severe as had been previously expected. In March 2010, the State inspected these dams and found them to be in good condition.

Vulnerability – Conflagration

West Warwick rates its vulnerability to conflagration as low. West Warwick is a densely populated mill town. Most of the villages that were built around the mills still exist today. The close proximity of the mill buildings and houses to each other makes them extremely vulnerable to a fast spreading fire. West Warwick's abandoned mill buildings used to be very vulnerable to fire. These days most of the old mill buildings are either currently in use by businesses or are in the process of being renovated for housing, which will bring them up to current fire codes and lessen their vulnerability to break-ins and/or arson. Any abandoned mill buildings that do not get renovated will be torn down. The Royal Mill has been converted into 300 housing units.

The Crompton Mill is currently in the early stages of conversion. The completed project will contain 200 units which will include office space, businesses, and potentially restaurants. An application process to convert the Centerville Mill into approximately 200 housing units has begun, but has not yet been approved. The developers asked the town for an extension in February 2011 for their planning efforts because the economy has slowed the process.

There is very little open space in West Warwick and no large forested acreage that would be vulnerable to wildfire.

Vulnerability – Earthquakes

West Warwick rates its vulnerability to earthquakes as low. The buildings most vulnerable to earthquakes are those constructed of masonry, cinder block, un-re-enforced concrete, and any buildings

built on filled/made soils. In West Warwick these buildings include the Town Hall, a number of commercial buildings, churches, schools and old textile mills. While West Warwick is in an area of low probability for a seismic event, a moderate earthquake could also cause significant damage to sewer lines, water lines, other underground infrastructure, communication and power lines, dams, and bridges.

Vulnerability – Pandemic

West Warwick rates its vulnerability to pandemics as low. 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 the people spread a lot more germs amongst one another. 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.

Population at Risk

According to FEMA, in the event of a natural disaster that requires mass care facilities, twenty percent of an evacuated population will seek public mass care facilities. Currently West Warwick is capable of providing mass care for approximately 1500 people in the event of a natural disaster.

According to the 2000 U.S. Census West Warwick has a population of 29,581 people. This could result in a current deficit of 4,416 mass care spaces for the town. West Warwick will open other town facilities, including the West Warwick Senior Center and the high capacity West Warwick Civic Center, for mass care in the event of overcrowding at the designated mass care facilities.

West Warwick has established evacuation routes but has not posted evacuation signs. In addition, if the natural disaster is localized, other shelters in surrounding towns will be available.

It is important to note that West Warwick experienced a 1.07 population increase from 1990 to 2000. This plan recognizes that residential development continues to occur and has proposed actions that not only address the current needs of the town in the event of a natural disaster but also the future needs of the town.

Potential Losses to the Local Economy

Since property taxes account for 55 percent of West Warwick's revenues, it is imperative that the community and its residents take precautions to protect their investments. According to West Warwick's Finance Department, the current budget for West Warwick is $79 million per year and the local Tax Assessor reports that approximately $52 million comes from all taxes with $45 million being from the real estate taxes.

About 15 percent of the taxes collected in West Warwick come from commercial and industrial properties. As seen in Table 10, FEMA estimated that the value of property insured by the NFIP in West Warwick is $33,906,700. Table 3 lists the potential monetary impact that severe weather, hurricanes, flooding, conflagration and earthquakes can have on West Warwick. Any one of these hazards could also cause the loss of local business, furthering the community's loss.

Future Development Trends

West Warwick has experienced an increase in population figures going from 29,268 in 1990 to 29,581 in 2000. West Warwick is characterized by a mix of urban land uses including industrial, commercial, high and medium density residential and open space.

West Warwick's old mills are either converted, in the process of being converted into housing units, or are in the application stage for conversion. The Royal Mill is completed and is approximately 300 housing units. The Crompton Mill is currently in the early stages of conversion. The completed project will contain 200 units with office space, businesses and potential restaurants. An application process to convert the Centerville Mill into approximately 200 housing units has begun, but has not yet been approved. The majority of the mills are located in flood zones, either an A-zone or an X-zone. A portion of the Royal Mill sits above the dam and another portion sits below the dam. All new construction is being developed to meet flood plain standards.

In addition to the mills, the Providence Street School is in the process of being sold and converted into office space. This structure is not located in a flood zone or other vulnerable area. The structure will be brought up to current fire codes before occupation.

The West Warwick Zoning Ordinance provides that flood hazard areas be treated as overlay districts for purposes of development regulation (Section 4.12 of the Ordinance).

West Warwick does not have a lot of buildable land left. It is expected that some demolition will occur with new construction replacing existing buildings. Any future development would be subject to strict zoning regulations, building codes and flood plain standards.

3.1 RISK ASSESSMENT MATRIX – VULNERABLE AREAS

The LHMC has met regularly to discuss the town's vulnerability to natural hazards, select projects and develop actions that will help to meet West Warwick's mitigation goals.

Organization of projects and actions were accomplished by thoroughly reviewing the hazards, identifying areas, essential services, critical facilities and infrastructure in West Warwick which are at risk and identifying present dangerous situations to West Warwick's population which are susceptible to costly damage. The LHMC committee discussed different ways to identify and define vulnerability and the committee ultimately decided this was the best for the Town. The result of these efforts was the Risk Assessment Matrix (Table 11) that follows. Vulnerable areas have been prioritized and ordered as such.

Table 12 – Risk Assessment Matrix

	Vulnerable Area (in order of priority)	Location	Ownership	Natural Hazard	Primary Problem/Effect	Mitigation Objective	Risk H – Historical P – Potential
1	Non-residential and Residential Properties	J.P. Murphy Bascues Park, Brookside Ave., Main St., Phenix, Natick Area	Private	Flooding	- Property loss - Public safety - Economic loss	- protection of property and public safety - Prevention of economic loss	P
2	Sewer System (including 9 lift stations)	Town-wide	Town	Flooding, Severe Weather, Wind, Hurricane	- Structural damage - Disruption of services - Public health risk - Environmental risk	- Prevent structural damage - Prevent disruption of services - Protect public health - Prevent pollution	H
3	Rivers, Streams, and Creeks	Baker Street Brook, north and south branches of the Pawtuxet River and the creek in the Janet Drive area	Town	Flooding	- Loss/damage of property	- Prevent loss/damage of property	H
4	Dams	Arctic, Natick Pond, Centerville Pond, Riverpoint Pond Upper & Lower, Riverpoint Mill Pond, Bouchar Farm Pond, Clyde Pond, Crompton Lower, Di Martino Farm Pond, Phenix Mill Pond and Lombardi Farm Pond. (All along the Pawtuxet River, the south and north branch)	Private	Flooding, Earthquakes	- Incomplete dam ownership and inspection information - Dam failure causing flooding of low lying areas	- Update ownership information - Review inspection reports - Protection of low lying areas	P
5	Roads and Adjacent Property	Canna St., Baker St., Main St., Janet Dr., Aster St.,	Town	Flooding, Severe Weather,	- Debris blocked roads - Poor drainage - Damage to private	- Identify evacuation and alternate routes - Decrease financial	P

	Subject to Drainage Problems	Begonia St., Daisy St.		Hurricane	property	impact on residents - Alleviate poor drainage	
6	Essential Public Services	Town-wide	Town	Flooding, Severe Weather, Wind, Fire	- Public safety and health risk - Disruption of essential public services	- Protect public safety and health - Prevent disruption of essential public services	P
7	Public Buildings	Mass care facilities (Wakefield Hills Elementary, West Warwick High School, John F. Deering Middle School), Fire Station, Police Station, Town Hall, DPW Garage and Senior Center	Town	Severe Weather, Wind, Fire, Earthquake	- Structural integrity of buildings - Essential services functionality	- Maintain structurally sound buildings to protect public safety and essential services	P
8	Bridges	Main St., Natick, Providence St. (2 incl. Royal Mills), Factory St., and Pulaski St.	State and Town	Flooding, Severe Weather, Earthquake	- Structural damage - Disruption of traffic flow	- Protection of infrastructure - Maintain traffic flow	P
9	Water Supply	Town-wide	Public	Earthquake, Flooding	- Interruption of water supply - Public health and safety risk	- Public Safety	P

4.0 MITIGATION ACTIONS

4.1 MITIGATION ACTIVITIES

Municipal officials in West Warwick assessed the risks to the town and developed mitigation actions that address a mix of structural initiatives (building code enforcement, repair and retrofit of existing structures, and removal of vulnerable structures) and nonstructural initiatives (educational programs, preventing construction in high-hazard areas, enforcing regulations) to minimize the effect of future hazards. By creating this strategy and incorporating it into the town's comprehensive plan and the site plan review process, West Warwick has established an ongoing process that will make hazard mitigation a routine part of municipal government.

In completing the risk and vulnerability analysis, the LHMC considered projects and actions that would reduce West Warwick's vulnerability to the identified hazards. The Risk Assessment Matrix is the basis for the mitigation actions presented in Section 4.2. The LHMC considered the goals of this plan (section 1.3, page 10) and prioritized the matrix and the associated actions based on historical damage, safety of the population, property protection, and consistency with town-wide goals and objectives. Objectives were aligned to public health risks, evacuation and mass care considerations, disruption of essential services, and potential economic losses to West Warwick.

The LHMC also felt that the vulnerabilities needed to be re-evaluated and it was determined to move Non-residential and Residential Properties to Vulnerable Area One and to remove Critical Roads from the Vulnerable Area list as the mitigation action listed had been completed.

The LHMC used a cost-benefit review in the prioritization process to maximize benefits. The LHMC prioritized the vulnerable areas in order of vulnerability which indicated that more damage could be sustained to these areas thus more costs could be incurred by the Town in damages and repairs. The mitigation actions identified would maximize the use of funding and reduce loss to people and property. In early 2011, the Town submitted two applications to the Hazard Mitigation Grant Program for acquisition of residential and non-residential properties. The residential application benefit-cost analysis came back with a 1.1 benefit-cost result and the non-residential property represented a 6.8 benefit-cost result. The project would be $3.3 million, but would have a benefit of $22.6 million.

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

- Planning and Regulations
- Property Protection (including acquisition and elevation), Structural Projects, Maintenance, and Repair
- Public Information and Outreach, Incentive Programs
- Protection of Essential Services (including critical facilities)
- Post Disaster Opportunities

This committee has worked to set goals and objectives that are bound 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 statewide goals and objectives. The time frames used for these strategies 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 12) 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 town 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.

4.2 ACTION PLAN

Vulnerable Area One

Non-Residential and Residential Properties

Action 1 – Property acquisition and structure demolition for open space of non-residential and residential properties located in the floodplain.

- Action Type – Property Protection (including acquisition and elevation), Structural Projects, Maintenance, and Repair
- Pre or Post Disaster – Pre Disaster
- Priority – High
- Lead – Town Manager's Office
- Support Departments – Building Department, Planning
- Time Frame - Short Term
- Funding – Grant funding
- Cost Estimate – $5 million
- Benefit - Protection of property and safety of residents. Prevention of economic loss.

Project Status: This is a new project. An application has been prepared and submitted for consideration for the HMGP.

Action 2 – Encourage commercial/industrial building and property owners to flood proof any structures located in a flood zone. Flood proofing commercial/industrial buildings and or property will protect the property, prevent economic loss and ensure public safety.

- Action Type – Public Information and Outreach
- Pre or Post Disaster – Pre Disaster
- Priority – Medium
- Lead - Building Department
- Support Departments - Planning, EMA Director
- Time Frame - Short Term
- Funding – Town budget
- Cost Estimate – Staff time
- Benefit - Protection of property and safety of residents. Prevention of economic loss.

Project Status: This is an ongoing project. This project is behind schedule as per the 2005 plan. Funding and staff prevented the Town from moving forward in the past few years. In order to keep the project on schedule for this plan, the Town has submitted a grant application to the Economic Development Agency for Supplemental Disaster funds to raise Industrial Lane and increase flood storage capacity. They have also submitted an application for the design of a floodwall for the Natick area of town. Both of these projects would help reduce flooding in these commercial and industrial areas. The Town is continuing to educate businesses on floodproofing techniques and is continuing to seek grants to increase the capacity of this project.

Action 3 - Discourage variances from flood regulations for new construction located within a flood zone. Require all new construction to meet FEMA regulations for floodplain construction.

- Action Type – Planning and Regulations
- Priority – High
- Lead – Building Department
- Supporting – Planning, Fire Chief
- Financing Options – Private funding
- Cost Estimate – Undetermined
- Time Frame – Short term
- Benefit – Protection of property and increased safety for residents.
- Preservation of FEMA flood insurance rating for the Town of West Warwick. Prevention of economic loss.

Project Status: This is an ongoing project. The Town is behind schedule as per the 2005 plan. Since West Warwick was significantly impacted by the 2010 floods the Town understands the importance of The Town will work with RI Department of Environmental Management to discuss the importance of this initiative.

Action 4 – Enforce NFIP guidelines. As required by NFIP standards, after flooding or storm surge damage to a structure, the undertaking of renovations to a structure in excess of 50% of the structure's market value, change of land use, or construction of new structure, it is necessary to bring the structure up to current flood regulations per state and federal code. Require that any renovations, change of land use or new construction to flood damaged structures meet NFIP guidelines.

- *Action Type – Planning and Regulations*
- *Priority – Medium*
- *Lead – Building and Planning Departments*
- *Supporting – Fire Chief, Fire Department, CRMC, FEMA, RIEMA*
- *Financing Options – Town budget*
- *Cost Estimate – Staff time*
- *Time Frame – Short term*
- *Benefit – Protection of property and increased safety for residents. Prevention of economic loss.*

Project Status: This project is complete. This is currently enforced by the Building Department.

Vulnerable Area Two

Sewer System (including 9 lift stations)

Action 5 - Continue to monitor sewer lines, plant and lift stations via camera recording and other electronic and visual means in order to determine maintenance/repair/replacement needs. The town has replaced some of the sewer lines but many are almost 100 years old and have been invaded by tree roots, experienced cracking, or are over capacity. The plant and lift stations are relatively new, but could be damaged by West Warwick's identified hazards and should be monitored. It is cost prohibitive to replace all of the sewer lines town-wide, and it has been found to be costly to repair and replace pipes as emergency projects, therefore continued monitoring and maintenance is essential.

- Action Type - Property Protection (including acquisition and elevation), Structural
- Projects, Maintenance, and Repair
- Pre or Post Disaster – Pre Disaster
- Priority – Medium
- Lead Department - Sewer Department
- Supporting Department - Town Manager, Consultant, Private Contractors
- Financing Options – Town budget
- Cost Estimate – $250,000 or higher as needed
- Time Frame - Medium Term
- Benefit – Avoid costly emergency repair/replacement projects and disruption in service. Protect West Warwick residents and the environment from risks associated with accidental discharge of waste during system failure.

Project Status: This project is ongoing. The project is behind schedule per the 2005 update due to funding limitations. The town will continue to look for funding opportunites to keep the project on schedule. Town owns camera truck that is monitoring the identified areas. The Town will seek grant funding to complete this project.

Action 6 - Prioritize/repair/replace infrastructure based on findings from Action 2.

- Action Type - Property Protection (including acquisition and elevation), Structural Projects, Maintenance, and Repair
- Pre or Post Disaster – Pre Disaster
- Priority – Medium
- Lead Department - Sewer Department
- Support Department - Consultant and contract labor
- Financing Options - Sewer Department Budget, bond issues as needed
- Cost Estimate - $3M
- Time Frame - Medium Term
- Benefit – Protect West Warwick residents and the environment from health/environmental risks associated with accidental discharge of waste during system failure. Prevent disruption in service.

Project Status: This project is ongoing. This project is behind schedule per the 2005 plan due to funding issues, however siginificant steps have been taken to complete this project. $8 million has been spent on upgrades and repairs to mitigate some of the issues. The Town will continue to implement this action as grant funding is available.

Vulnerable Area Three

Rivers, Streams and Creeks

Action 7 – Hire a consultant to create a town-wide drainage plan. There are rivers, streams and creeks in West Warwick that cause repeated flooding and road closures during heavy rain events. To address this problem the Town needs to complete a town-wide drainage plan documenting all main roads and adjacent properties subject to flooding from rivers, streams and creeks. The plan will enable the town to compare the priority issues with their costs in order to determine a cost benefit analysis.

- Action Type - Planning and Regulations
- Pre or Post Disaster – Pre Disaster
- Priority – High
- Lead Department – DPW, Town Engineer
- Support Department – Department of Public Services
- Financing Options – FEMA, RIEMA
- Cost Estimate - $200,000
- Time Frame - Medium
- Benefit – Determine priority issues in order to develop a basis on how to spend funds available for drainage issues. Prevent property loss and damage.

Project Status: No funding has been available to complete this project. This project is behind schedule per the 2005 plan due to funding issues. The Town will continue to explore funding opportunities to have this project complete by the next update.

Action 8 – Ensure creeks are clear of debris. West Warwick works annually with Cranston to keep the creek in the Janet Drive area clear of debris. This helps to prevent flooding in West Warwick and downstream in Cranston. West Warwick also monitors and clears Flat Top Pond, Baker Street Brook, NATCO Pond, Phenix Brook and waterways in the vicinity of Judy Terrace and Grady's Pub.

- Action Type – Property Protection (including acquisition and elevation), Structural
- Projects, Maintenance, and Repair
- Pre or Post Disaster – Pre Disaster
- Priority – High
- Lead Department – Department of Public Services
- Support Department – Town Engineer
- Financing Options – Town budget
- Cost Estimate – Staff time, $1.5 million
- Time frame – Long Term
- Benefit – Protection of infrastructure and private property. Decreased financial impact.

Project Status: This is a continuous project. The Town is working with the U.S. Army Corps of Engineers and NRCS to dredge. The Town applied for funding through the Community Development Block Grant – Disaster Recovery to dredge NATCO Pond. The Pawtuxet River Watershed Council conducts river cleanup two to three times a year and coordinates this effort with the Town's Public Works Department. This project is on schedule from the 2005 plan. This project will be continous as funding is avaible.

Action 9 – Educate property owners, adjacent to identified vulnerable rivers, streams and creeks, on property protection from flooding. The town has identified properties that are subject to flood damage due to rivers, streams and creeks. By educating the property owners on flood protection and the National Flood Insurance Program (NFIP), damage amounts can be reduced along with the financial impact to the property owners.

- Action Type – Public information and outreach, incentive programs
- Pre or Post Disaster – Pre Disaster
- Priority – Medium
- Lead Department – EMA Director
- Support Department - Town Engineer, DPW Director, Planning Department, Town Manager
- Financing Options – Town budget
- Cost Estimate – Staff time plus material costs
- Time frame – Long Term
- Benefit – Protection of private property and decreased financial impact

Project Status: The Town is working to provide educational materials regarding flooding at the planning and building offices. This project is behind schedule as per the 2005 plan. Staff shortages delayed this project however it will be implemented within the next six months.

Action 10 – Acquire properties which experience repeated flood damage. There are six properties located near the Baker Street Brook that have experienced repeated flood damage. The town would like to purchase these properties and demolish them to create a storm detention basin.

- Action Type - Property Protection (including acquisition and elevation), Structural
- Projects, Maintenance and Repair
- Pre or Post Disaster – Pre Disaster
- Priority - Low
- Lead Department – Town Manager
- Support Department – Town Engineer
- Financing Options – RIDEM, RIEMA
- Cost Estimate – $1-2M
- Time frame - Long term
- Benefit - Prevention of continued repetitive loss damage to identified properties.

Project Status: The Town is currently working to do this. This project is behind scheulde as per the 2005 plan. There has been a tax roll issue that is trying to be resolved.

Action 11 – Co-ordinate with the RI Department of Environmental Management (RIDEM) and RIEMA to negotiate funding assistance. The town needs funding assistance to acquire the properties in action 7 and to hire the consultant for the drainage plan in action 4.

- Action Type – Planning and Regulations
- Pre or Post Disaster – Pre Disaster
- Priority – Medium
- Lead Department – Sewer Department
- Support Department – Town Engineer, Department of Public Services
- Financing Options – Town budget
- Cost Estimate – Staff time
- Time frame – Long Term
- Benefit – Necessary funding for actions is acquired.

Project Status: There has been no changes to this project since the 2005 plan. No funding has been available to complete this project. The Town will continue to explore different funding options.

Vulnerable Area Four

Dams

Action 12 – Review, with the assistance of DEM, all Dam inspection reports, ensuring that there is a current report for each dam. Research all ownership information to link each dam to a responsible party. Compile files of the towns' dams, their owners and the inspection reports to be kept on file in the Town Engineers' office. West Warwick does not currently have a complete list of the towns' dam owners or the dam inspection reports.

- Action Type – Planning and Regulations
- Pre or Post Disaster – Pre Disaster
- Priority – Medium
- Lead – Town Engineer
- Supporting – DEM, Assessor, Town Manager, Planner
- Financing Options – Town budget
- Cost Estimate – Staff time
- Time Frame – Short Term
- Benefit – Updated dam ownership information and inspection information.

Project Status: The Town is working with Rhode Island Department of Environmental Management (RIDEM), Rhode Island Emergency Management Agency, and surrounding communities to identify owner of the dams and regulate the water height. This project is behind schedule as per the 2005 update. Funding and staff limitations have made this project difficult to complete.

Action 13 – Notify dam owners of their responsibility for inspection, maintenance and repair of their dams. After reviewing the current dam inspection reports, contact any dam owners whose dams are in need of maintenance. Proper maintenance can help prevent future dam failures.

- Action Type – Property Protection (including acquisition and elevation), Structural
- Projects, Maintenance and Repair
- Pre or Post Disaster – Pre Disaster
- Priority – Medium
- Lead – Town Engineer
- Supporting – Assessor, Town Manager, Planner
- Financing Options – Dam owners
- Cost Estimate – Staff time
- Time Frame – Short Term
- Benefit – Dam owners' awareness is raised. Protection of low lying areas.

Project Status: The project is behind schedule as per the the 2005 plan however the town is currently working with RIDEM on this project.

Vulnerable Area Five

Roads and Adjacent Property Subject to Drainage Problems

Action 14 – Compile a complete list including all secondary roads and adjacent property that have experienced repeated damage or closure from flooding due to severe weather or a hurricane. The town has compiled a partial list of vulnerable secondary roads including Main Street from Providence street north to the Pawtuxet River , the Baker Street area, Janet Drive, the Canna Street area, Aster Street, Begonia Street and Daisy Street.

- Action Type – Planning and Regulation

- Pre or Post Disaster – Pre Disaster
- Priority – Medium
- Lead – Town Engineer, DPW, Planning and Building Inspections
- Supporting – DPW, Planning and Building Inspections
- Financing Options – Town budget
- Cost Estimate – Staff time
- Time Frame – Short Term
- Benefit – The town will have a current list of all vulnerable roads and adjacent property

Project Status: This is an ongoing project that is behind schedule from the 2005 plan due to staffing issues. The Public Works Director is working with the Town Planning Department to develop GIS maps and a list of all roads and properties.

Action 15 – Identify evacuation and alternate routes for vulnerable secondary roads. There are secondary roads and adjacent properties in West Warwick that could experience damage and road closures due to heavy rain events. Alternate evacuation routes need to be identified for all of the vulnerable roads.

- *Action Type – Planning and Regulation*
- *Pre or Post Disaster – Pre Disaster*
- *Priority – Medium*
- *Lead – Town Engineer*
- *Supporting – DPW, Planning*
- *Financing Options – Town budget*
- *Cost Estimate – Staff time*
- *Time Frame – Short Term*
- *Benefit – Ensure safe evacuation of all vulnerable secondary roads and adjacent property*

Project Status: This project is on schedule per the 2005 plan and has been completed.

Action 16 – Co-ordinate with the Rhode Island Department of Transportation (RIDOT) to negotiate funding assistance. The town will need funding assistance to complete projects that arise from the findings of action 11.

- Action Type – Planning and Regulation
- Priority – Medium
- Lead – Town Engineer
- Supporting – Department of Public Services, Town Manager
- Financing Options –Town Budget
- Cost Estimate – Staff time
- Time Frame –Long Term
- Benefit – Necessary funding for actions is acquired.

Project Status: This project is behind schedule per the 2005 plan. The Town continues to have discussions with RIDOT, however there has been no funding available.

Action 17 – Co-ordinate with the Rhode Island Department of Transportation (RIDOT) during the Main Street drainage project. RIDOT will install more inlets and larger drainage pipes on Main Street. The installation of larger drains and more inlets will alleviate flooding by increasing the drainage capacity on Main Street. Main Street is a state owned road.

- Action Type – Planning and Regulation
- Priority – Medium
- Lead –RIDOT
- Supporting – Town Engineer, Police, Department of Public Services
- Financing Options – RIDOT Funds
- Cost Estimate – Staff time
- Time Frame –Long Term
- Benefit – Flooding on Main Street is alleviated.

Project Status: This project is behind schedule per the 2005 plan. RIDOT has not completed this project as there has been no funding available. This is still a necessary project.

Vulnerable Area Six

Essential Public Services

Action 18 – Review response organizations capabilities. Determine where response organizations fall short in regards to emergency response and what additional training can be provided.

- Action Type – Planning and Regulation
- Priority – High
- Lead – Town Manager
- Supporting – All department heads with focus on police, fire and DPW services
- Financing Options – Town budget
- Cost Estimate – Staff time
- Time Frame – Short term
- Benefit – Understand shortcomings prior to next emergency response.

Project Status: This project is behind schedule per the 2005 plan due to staffing and funding issues. The Town has met with the American Red Cross and surrounding communities and acknowledged that there is a shortfall in regional sheltering. The Town is working with this group of individuals to address the problem.

Action 19 – Acquire a new pumper truck for the Fire Department. The town currently owns five pumpers, one new one and four old ones. One of the old pumpers is 34-year-old and needs to be replaced.

- *Action Type – Property Protection (including acquisition and elevation), Structural Projects, Maintenance and Repair*
- *Pre or Post Disaster – Pre Disaster*
- *Priority – High*

- *Lead – Fire Department*
- *Supporting – Town Manager*
- *Financing Options – Town budget*
- *Cost Estimate – $300,000*
- *Time Frame – Medium term*
- *Benefit – Updated fire equipment to provide protection to West Warwick citizens.*

Project Status: This project is on schedule from the 2005 plan and is complete. The Town was able to acquire two trucks.

Action 20 – Continue the annual tree trimming program. The DPW annually trims and removes any hazardous trees to prevent damage from severe weather and high winds. Narragansett Electric periodically trims town trees in an effort to limit damage to their infrastructure.

- Action Type – Property Protection (including acquisition and elevation), Structural Projects, Maintenance, and Repair
- Pre or Post Disaster – Pre Disaster
- Priority – High
- Lead – DPW
- Supporting – Narragansett Electric
- Financing Options – Town budget
- Cost Estimate – $25,000 annually
- Time Frame – Annually
- Benefit – Reduce damage to power and communications lines and public and private property. Minimize traffic disruption on roadways.

Project Status: This project is on schedule per the 2005 plan. This is an ongoing initiative that occurs annually. The Town maintains this as a mitigation action even though it is a constant, ongoing initiative because of its importance to mitigation.

Action 21 – Maintain the town's existing program for efficient snow removal on town streets and roads. The DPW's personnel and snow removal equipment helps to keep the roadways clear during the multiple annual snow events. Cleared roads provide safe passage for emergency vehicles and residents.

- *Action Type – Property Protection (including acquisition and elevation), Structural Projects, Maintenance, and Repair*
- *Pre or Post Disaster – Pre Disaster*
- *Priority – High*
- *Lead – DPW*
- *Financing Options – Town budget*
- *Cost Estimate – $250,000 annually*
- *Time Frame – Annually*
- *Benefit – Cleared roads for public safety and emergency vehicles.*

Project Status: The LHMC decided to delete this mitigation action as it is a response action that is addressed as the storms occur. The Town will continue to maintain their existing program.

Vulnerable Area Seven

Public Buildings

Action 22 – Hire a consultant to survey town owned buildings to determine their structural integrity. Develop a priority list with cost estimates for determined repair requirements based on the consultants' findings. West Warwick needs to make sure that town owned buildings are structurally safe to ensure public safety and continued operation of essential services.

- Action Type – Protection of Essential Services
- Priority – Medium
- Lead – Town Manager with architectural consultant
- Supporting – EMA Director, Police Chief, Fire Chief, DPW Director, Building Official and various other staff members.
- Financing Options – Grants, bond issues and Town budget appropriations
- Cost Estimate – $25,000
- Time Frame – Long term
- Benefit – Ensure safe, functional public buildings.

Project Status: This project is behind schedule as per the 2005 update. The Town has been working to identify energy efficiency but there has been lack of funding to move forward. This is a priority for the Town.

Vulnerable Area Eight

Bridges

Action 23 – Replace the Royal Mills and Natick bridges. Both bridges are deteriorating and will be replaced by RIDOT. RIDOT is currently in the planning stages for both projects. The East Avenue Bridge was closed and damaged in the March 2010 floods. It is also necessary to fix this bridge as well.

- Action Type – Property Protection (including acquisition and elevation), Structural Projects, Maintenance, and Repair
- Pre or Post Disaster – Pre Disaster
- Priority – High
- Lead – RIDOT
- Supporting – DPW Director, Town Engineer
- Financing Options – RIDOT
- Cost Estimate – $8.5M
- Time Frame – Medium term
- Benefit – Sound bridge infrastructure for safe passage through the town.

Project Status: This project is on schedule as per the 2005 plan. The cost for this project has increased from $6 million to $8.5 million but there is an estimated completion date of May 2013. $5 million has already been spent on this mitigation action.

Action 24 – Obtain and review RIDOT bridge inspection reports to determine the structural integrity of the town's bridges. West Warwick is responsible for the maintenance of the bridges that connect the various villages and main roads in town and are critical to ensuring safe passage through the town. The bridge inspection reports will help the town determine which bridges need maintenance and which will need to ultimately be replaced by the state.

- Action Type – Planning and Regulations
- Pre or Post Disaster – Pre Disaster
- Priority – Medium
- Lead – Town Engineer
- Supporting – DPW Director, RIDOT
- Financing Options – Transportation Improvement Program
- Cost Estimate – Staff time
- Time Frame – Medium term
- Benefit – Obtain a better understanding of current bridge conditions

Project Status: This project is behind schedule per the 2005 plan. At this time, RIDOT has not responded to inquiries.

Action 25 – Prioritize and prepare plans for the repair and retrofit of bridges based on the findings from action 24.

- Action Type – Planning and Regulations
- Pre or Post Disaster – Pre Disaster
- Priority - Medium
- Lead – Town Engineer
- Supporting – DPW Director, RIDOT
- Financing Options – Town Budget
- Cost Estimate – Staff time
- Time Frame – Medium term
- Benefit – Bridge repairs and retrofits are prioritized

Project Status: This project is behind schedule per the 2005 plan. At this time, RIDOT has not responded to inquiries.

<u>Vulnerable Area Nine</u>

Water Supply

Action 26 – Obtain a copy of the Kent County Water Authority's (KCWA) mitigation plan for review. The KCWA supplies water to all of West Warwick's businesses and residents. The town needs to ensure that

the KCWA has a mitigation plan in place that takes into account the public safety and health of West Warwick's citizens.

- *Action Type – Planning and Regulations*
- *Pre or Post Disaster – Pre Disaster*
- *Priority – Medium*
- *Lead – Town Engineer*
- *Supporting – Town Manager and Fire Chief*
- *Financing Options – Town budget*
- *Cost Estimate – Staff time*
- *Time Frame – Short term*
- *Benefit – Protect the health and safety of West Warwick's citizens*

Project Status: This project is on schedule per the 2005 plan and is complete.

Previous Vulnerable Area

This was a vulnerable area in the 2005 Hazard Mitigation Plan update. The mitigation action was completed over the past several years and the LHMC does not think that this is still a vulnerable area/priority so it has been removed from the Risk Assessment Matrix.

Critical Roads

Action 27 – Identify evacuation and alternate routes for high traffic roads. There are critical roads in West Warwick that could experience damage and road closures due to flooding, severe weather, wind, or a hurricane. The Town has completed a survey of all critical roads that have experienced repeated damage or closure and has also considered the possibility of closures due to highway accidents, especially on the Interstate Highway System (I-95 and I-295), both of which intersect the town. The Town needs to work with the Rhode Island Department of Transportation (RIDOT), the Rhode Island Emergency Management Agency and adjoining towns to determine alternate routes and jurisdiction issues for potential interstate closures. Alternate evacuation routes need to be identified for all affected roads.

- *Action Type - Planning and regulations*
- *Pre or Post Disaster – Pre Disaster*
- *Priority - Medium*
- *Lead Department - Town Engineer and Department of Public Works Director*
- *Support Department - Planning Department, Town Manager*
- *Financing Options - Town budget*
- *Cost Estimate – Staff time*
- *Time frame – Medium term*
- *Benefit – Ensure alternate evacuation routes in case of critical road closures due to a major natural hazard event.*

Project Status: This project is on schedule per the 2005 plan and has been completed.

5.0 PLAN MAINTENANCE

"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

The Town of West Warwick and the Hazard Mitigation Committee realize that successful hazard mitigation is an ongoing process that requires implementation, evaluation, and updated revisions to this plan. Also realized is the importance of integrating appropriate sections of the plan into the town's Comprehensive Plan, Emergency Operations Plan, and site plan review process. It is intended that this plan and the ongoing efforts of the Hazard Mitigation Committee will preserve and enhance the quality of life, property, and resources for the Town of West Warwick.

The plan was formally approved by the Town Council on September 6, 2005 and was formally adopted by the Town Council on November 15, 2005. Formal adoption of this hazard mitigation strategy gains West Warwick credit points under the Federal Emergency Management Agency's (FEMA) Community Rating System (CRS) which provides discounts on National Flood Insurance premiums. Adoption of this mitigation strategy also increases West Warwick's eligibility for federal hazard mitigation grants. These grants originate from FEMA's Pre-Disaster Flood Mitigation Assistance (FMA), Pre-Disaster Mitigation (PDM) and post-disaster

Hazard Mitigation Grant (HMGP) Programs. (Refer to Appendix B for further information.)

5.1 IMPLEMENTATION

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

In order to establish the authority and accountability for implementation, West Warwick 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.

5.2 MONITORING

The Local Hazard Mitigation Committee, under the leadership of the Town Manager, will meet annually to monitor the actions contained in the plan. At each meeting the committee members will discuss the progress of their actions to ensure that they are on schedule.

5.3 EVALUATION

The Local Hazard Mitigation Committee, under the leadership of the Town Manager, will meet annually to evaluate the actions contained in the plan. The LHMC will base its evaluation on whether or not the actions have met the following criteria: increased public awareness/education, reduction in hazard damage, actions being implemented in the designated time frames, and actions staying within the cost

estimate. The committee will document and report its findings to the Planning Board and Town Council. The Town Council will involve the public in the action evaluation process by holding an annual advertised public meeting in order to review the evaluation and solicit input.

5.4 REVISION

The Local Hazard Mitigation Committee, under the leadership of the Town Manager, will also evaluate and update the plan annually, after a disaster, as funding opportunities arise for the actions and projects identified in the plan, or as actions are completed in order to re-prioritize.

The LHMC will conduct the five-year update as required. The Town will apply for federal funding in 2014. The required update will be 2016. This will give the Town and the LHMC ample opportunity to competitively bid the plan update and convene as a committee to update the plan. The Committee will initiate the plan update process in January 2015 and will assemble all committee and stakeholders and will hold the first public meeting no later than Feburary 2015. The committee will initiate at least 3 more meetings in the next few months having all meetings completed by May 2015. The Town will make sure the public is involved by advertising all meetings in local newspapers and on the town's website at least 2 weeks prior to each meeting. The LHMC will also specifically identify individuals they would like to attend the public meetings such as neighboring communities, community groups within the Town, and local and state officials. The draft plan will be available at the town's library and the town's website for public comment no later than June 2015. The plan will also be sent to neighboring communities for review by this date. The plan will be submitted for RIEMA and FEMA review no later than July 2015.

Any updates to the plan will be reviewed and submitted to RIEMA upon local approval. The Town Council will involve the public in the plan revision process by holding an annual advertised public meeting to present recommended revisions and solicit input. Revised plans will also be sent to Cranston, Warwick, Coventry and East Greenwich.

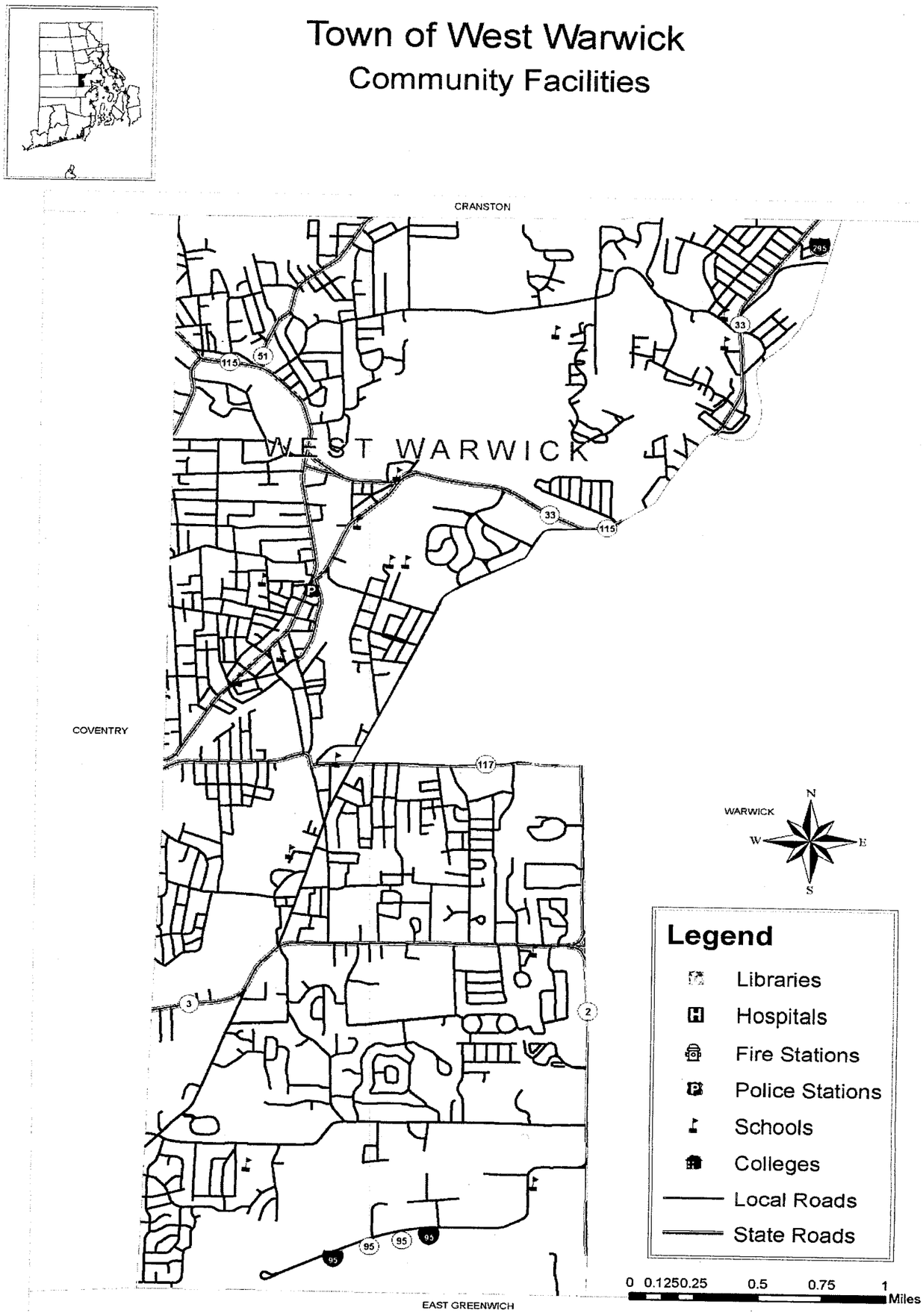
5.5 INCORPORATION INTO EXISTING PLANNING MECHANISMS

The updated hazard mitigation plan will be utilized where appropriate into other existing planning mechanisms. These plans include, but are not limited to the Town of West Warwick Comprehensive Plan, the Town of West Warwick Emergency Operations Plan (EOP), land use plans, and capital improvement plans. The HMP will be referenced when these plans are updated if it is applicable to the plan. In the current revision of the EOP, the 2005 HMP was incorporated to illustrate the hazards the Town faces. The HMP may also be incorporated into mutual aid agreements, evacuation plans, storm water management plans, and/or zoning ordinances.

In order to establish the authority and accountability for implementation, West Warwick includes amendments to its comprehensive plan that incorporate the theme of hazard mitigation. These amendments will be based on the mitigation actions addressed within this HMP. As part of the annual update to the EOP, the Town will also utilize the HMP for necessary updates.

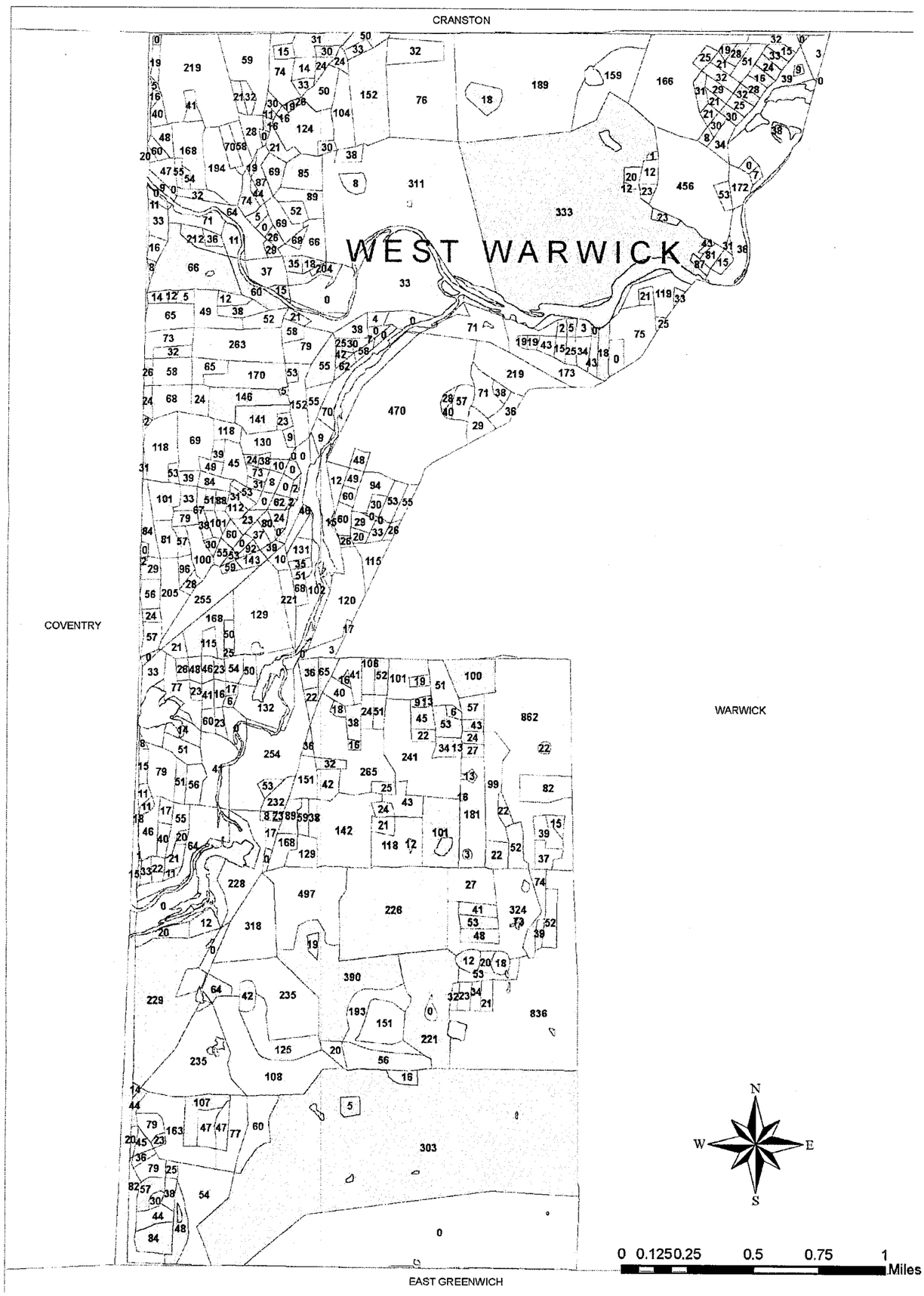
Maps

Map 1 – Community Facilities

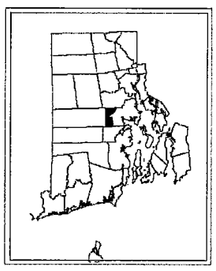


Map 2 – Population by Census Block

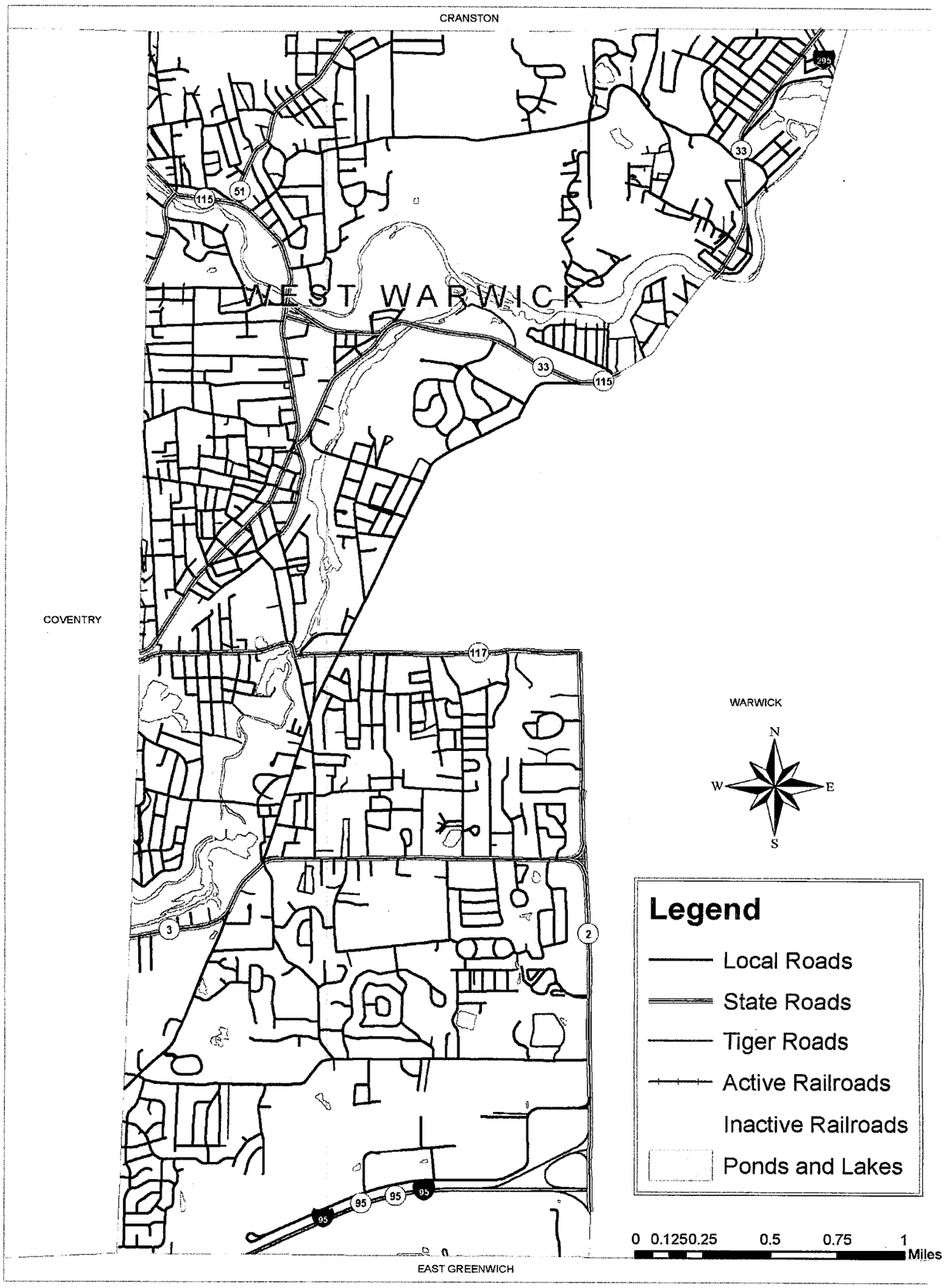
Town of West Warwick
Population by Census Block



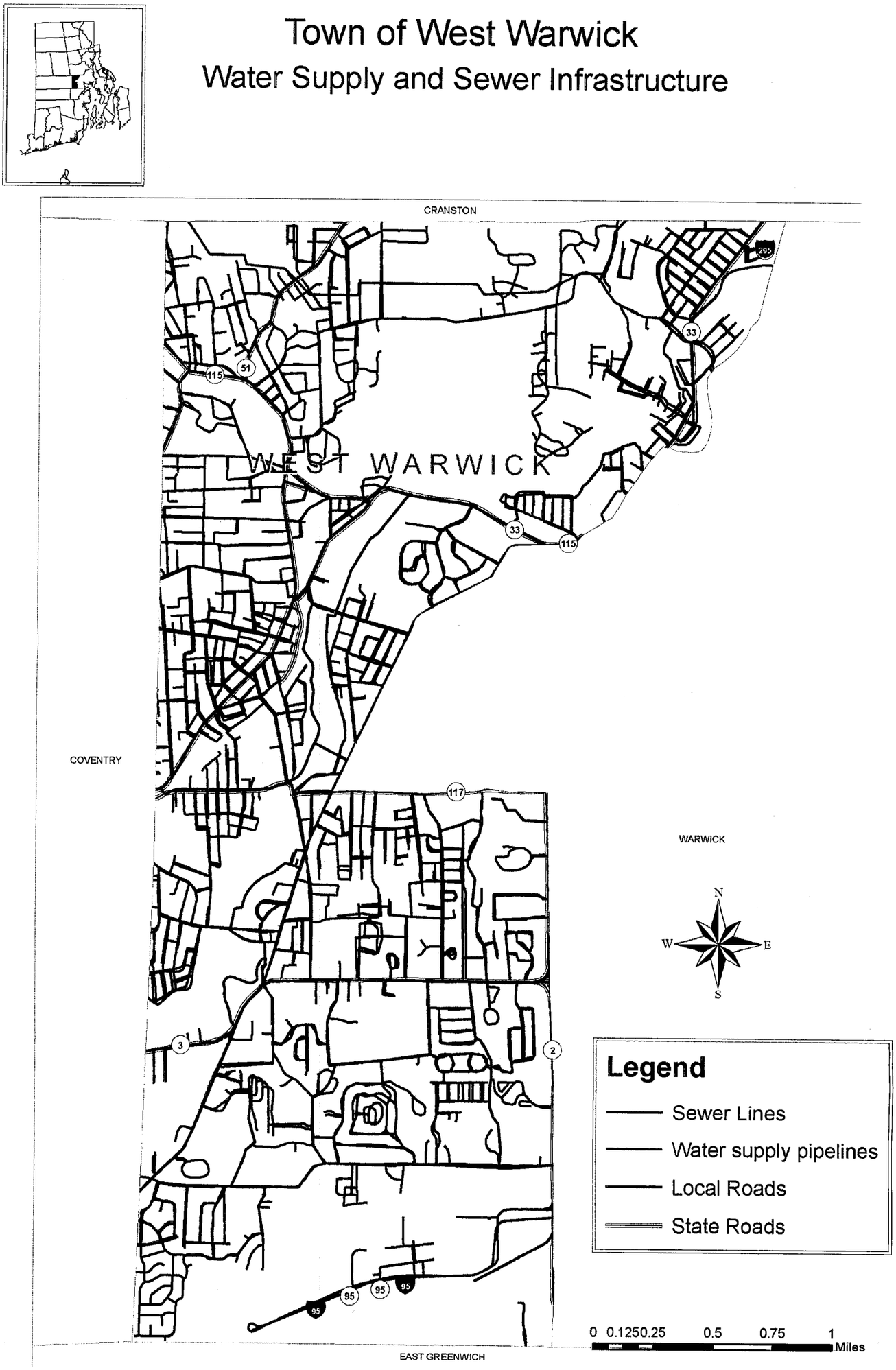
Map 3 – Transportation Networks



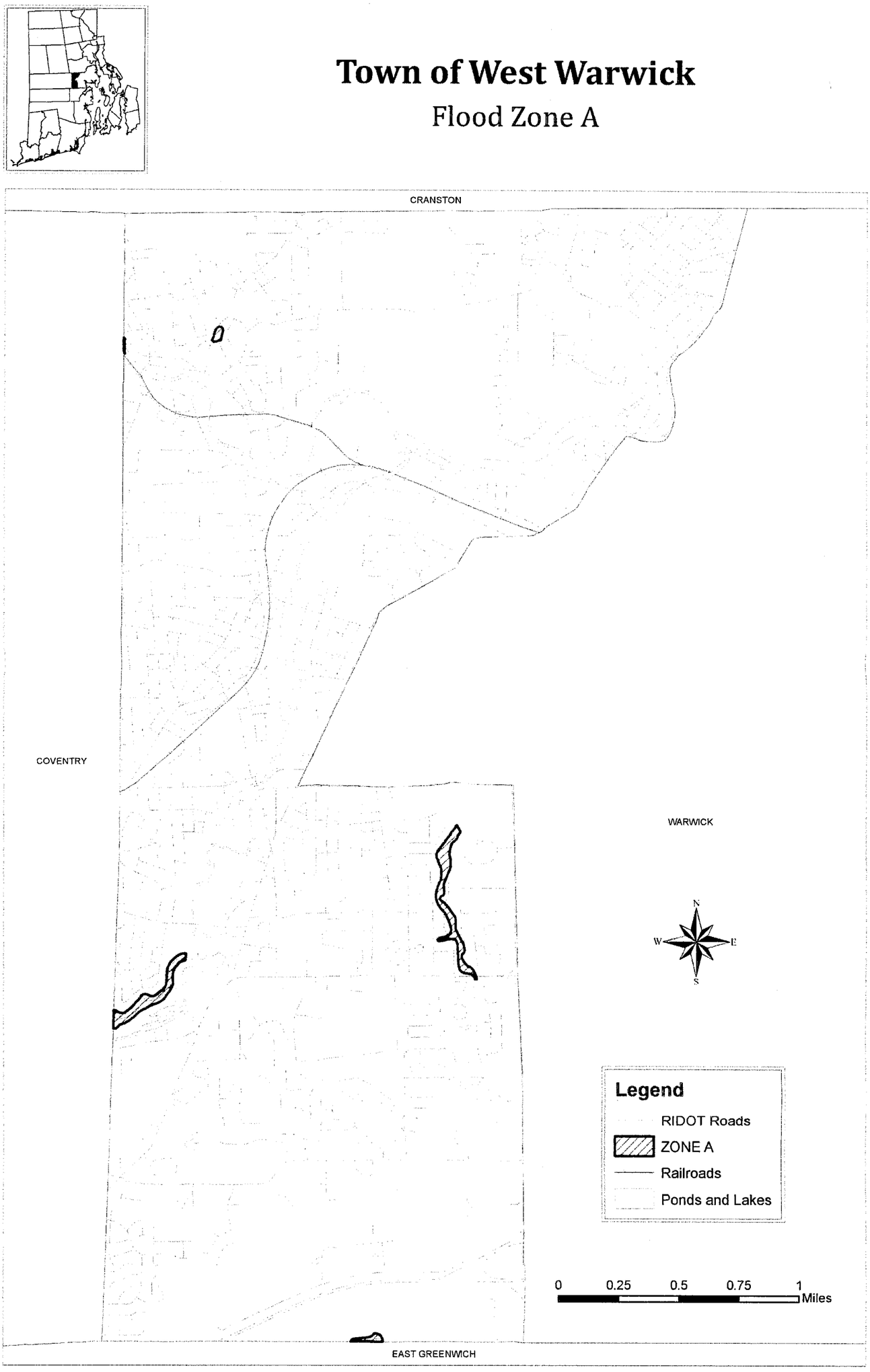
Town of West Warwick
Transportation Networks



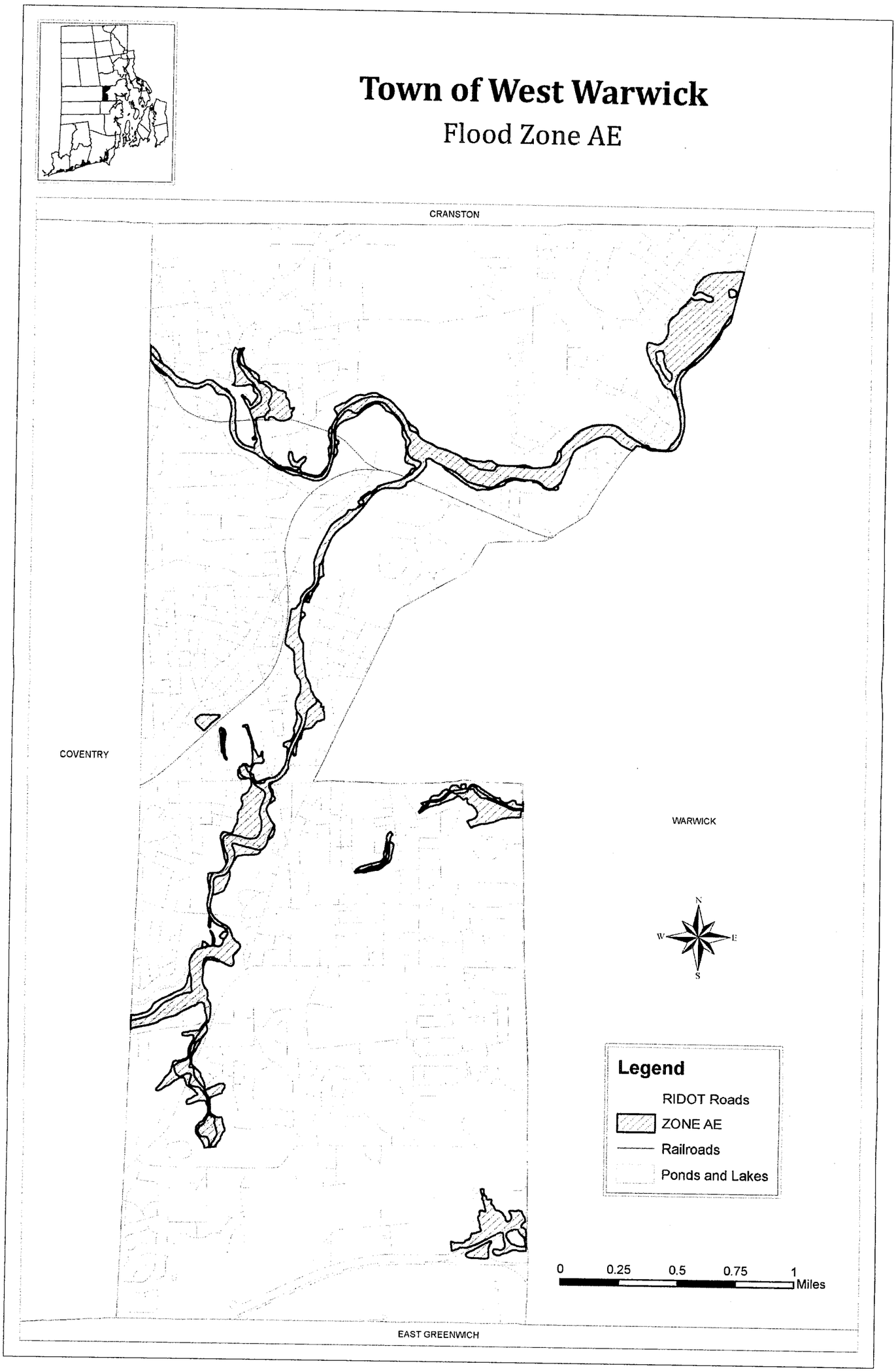
Map 4 – Water Supply and Sewer Infrastructure



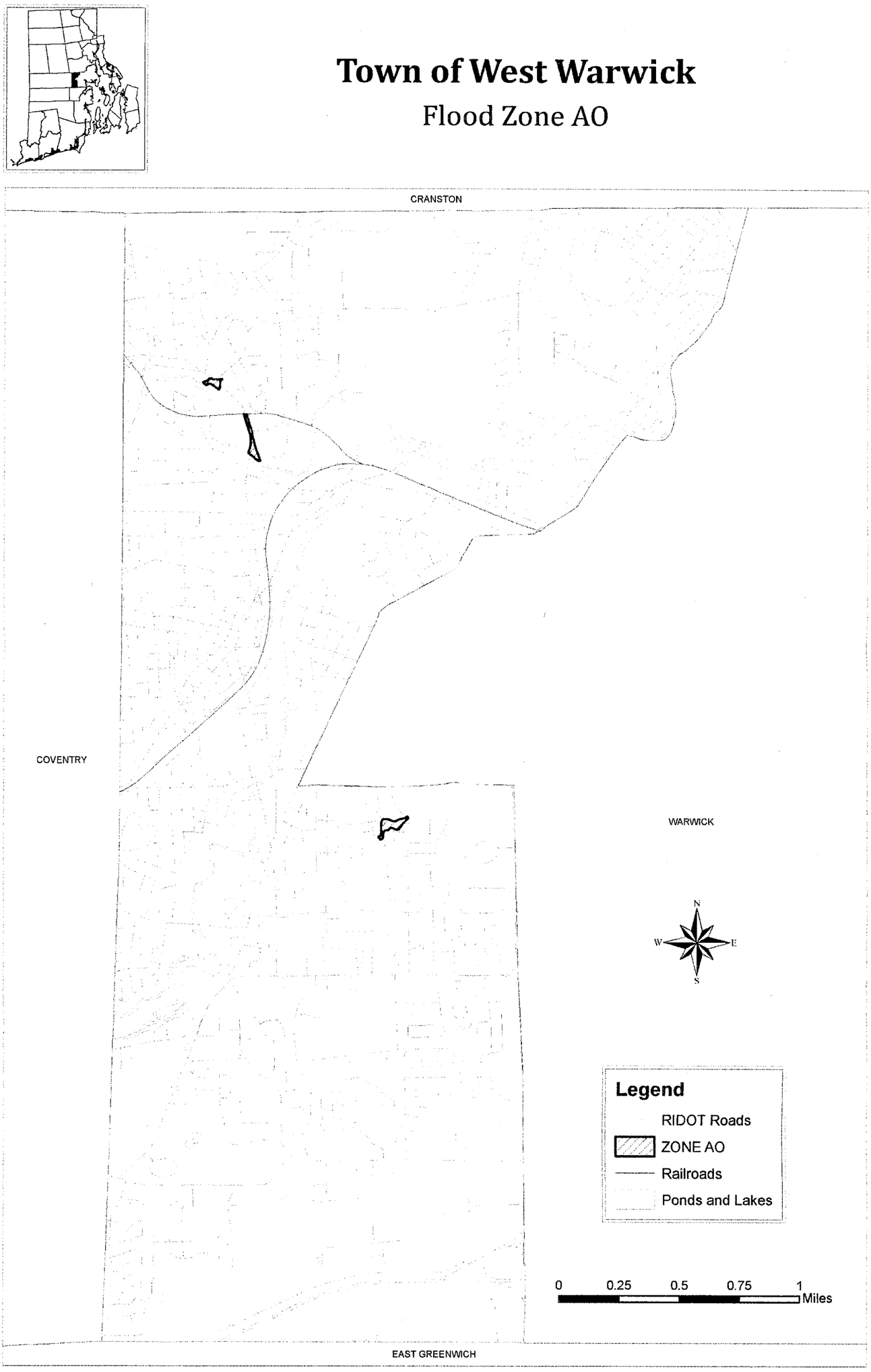
Map 5 – Flood Zone A



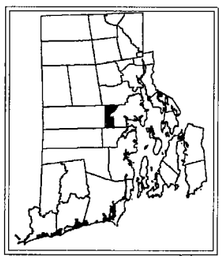
Map 6 – Flood Zone AE



Map 7 – Flood Zone AO

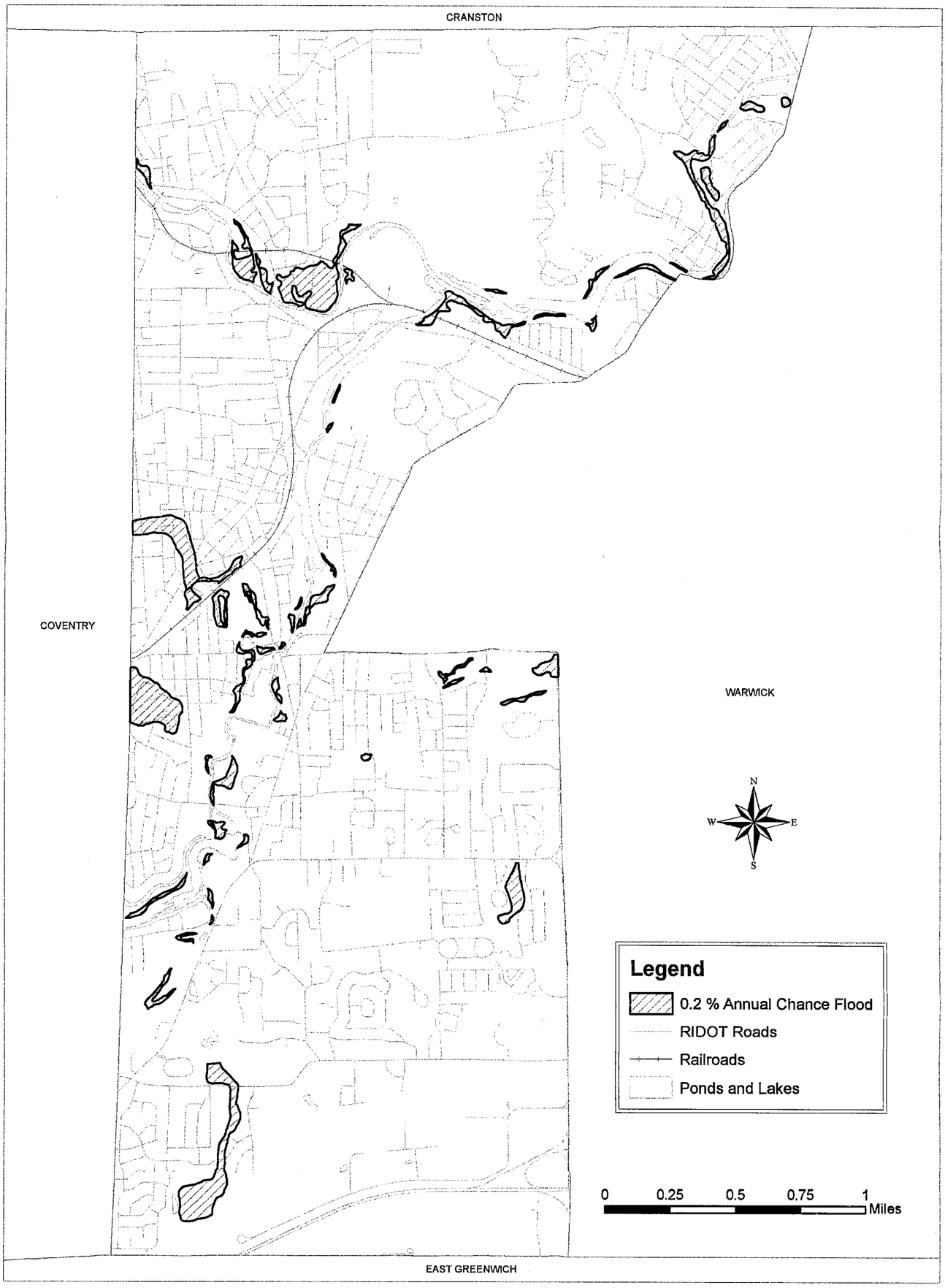


Map 8 – 500-Year Flood Zone

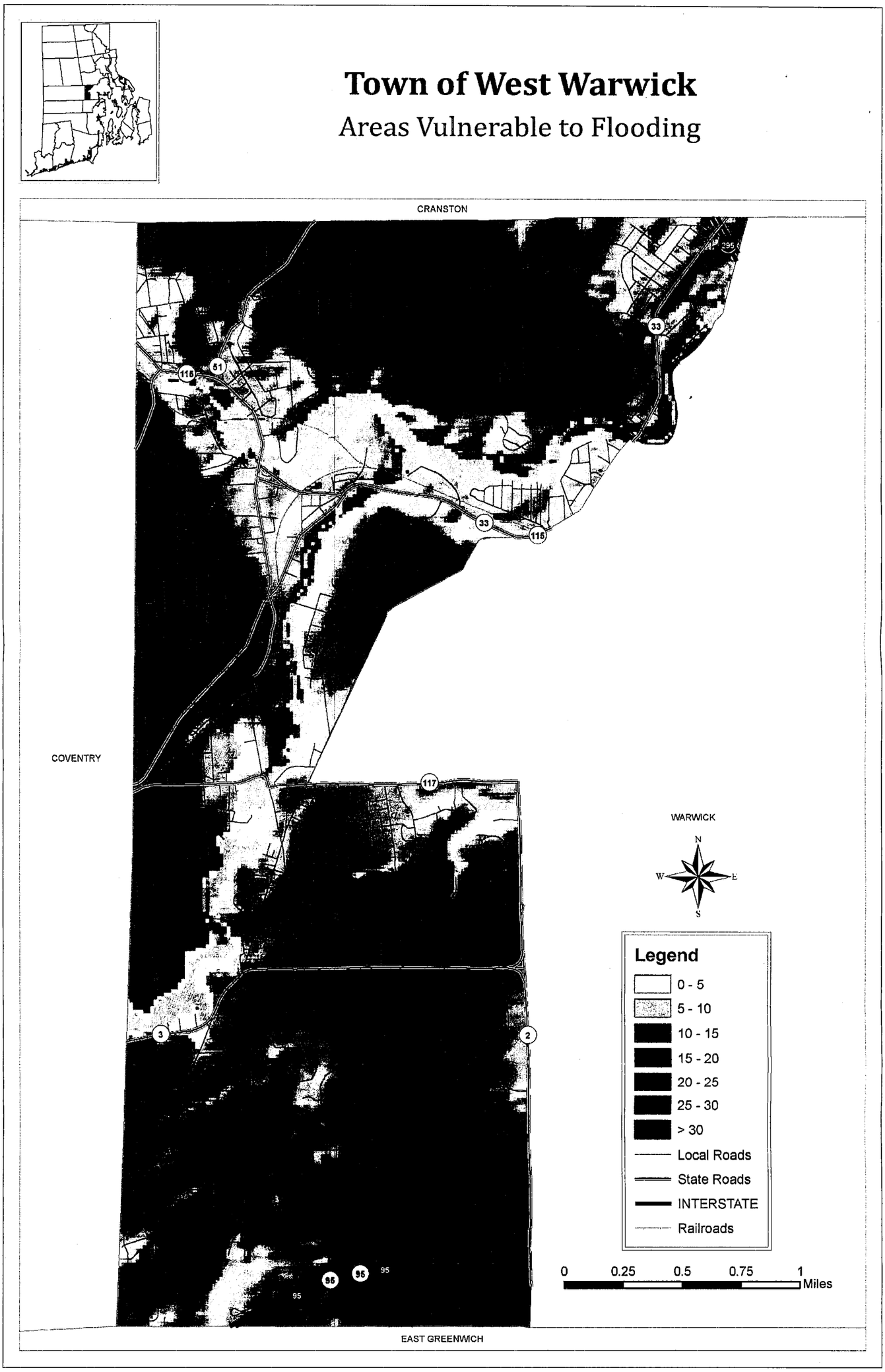


Town of West Warwick

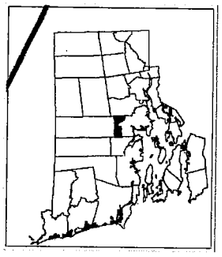
0.2 % Annual Chance Flood
500-year Flood Zone



Map 10 - Areas Vulnerable to Flooding

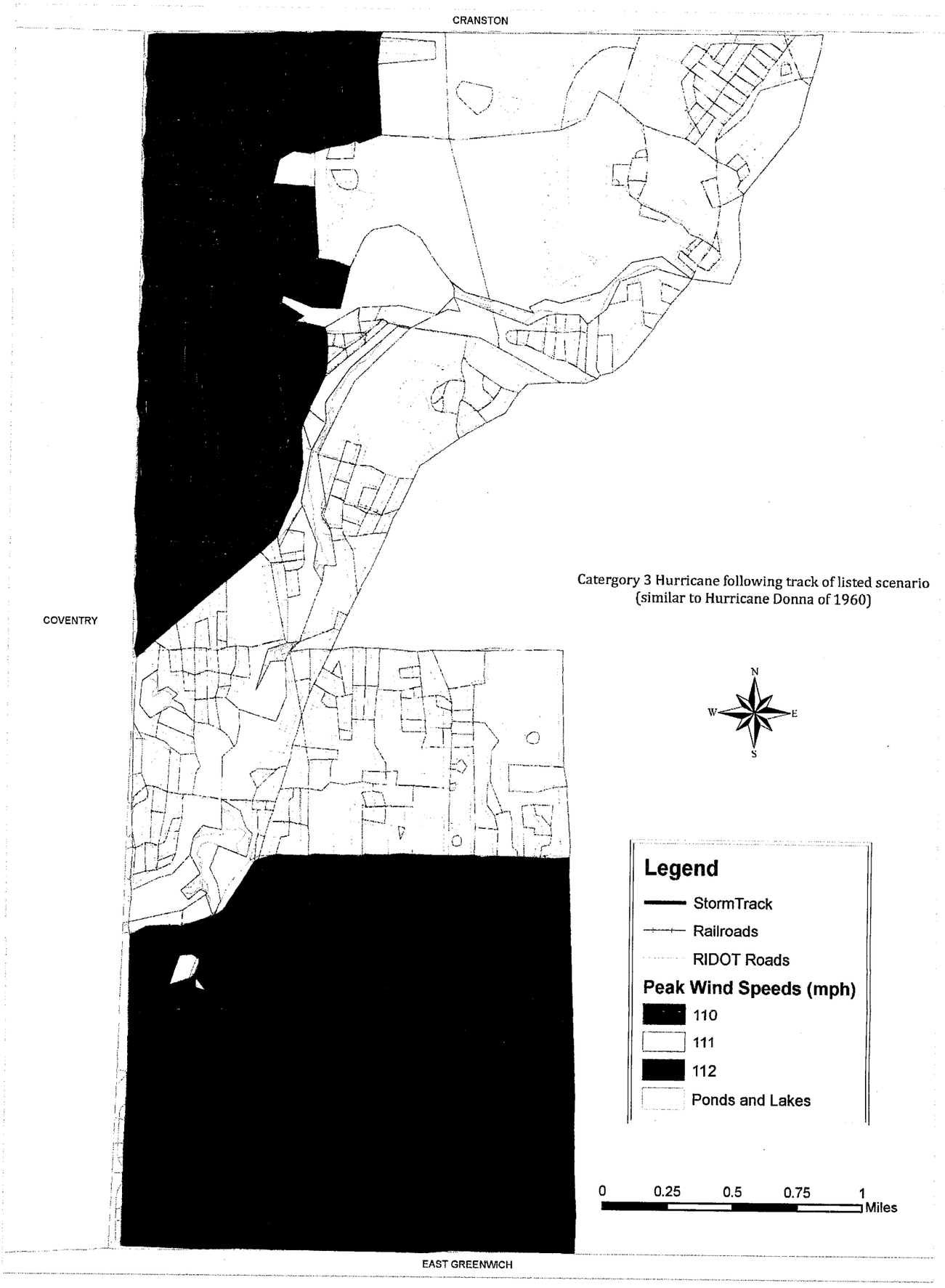


Map 11 – Anticipated Peak Wind Speeds during Hurricane



Town of West Warwick

Anticipated Peak Wind Speeds during Huricane



References

West Warwick Comprehensive Plan, 2005

"Strategy for Reducing Risks from Natural Hazards in Pawtucket, Rhode Island - A Multi-Hazard Mitigation Strategy" City of Pawtucket, February 12, 2004.

"Strategy for Reducing Risks from Natural Hazards in Providence, Rhode Island" City of Providence, March 23, 2000

"Town of Warren Rhode Island Hazard Mitigation Plan" Town of Warren, Drafted 2004

"National Hazard Mitigation Strategy For Reducing Risks From Multi-Hazards In Woonsocket, Rhode Island August, 2000" City of Woonsocket, August, 2000

National Flood Insurance Program, Program Description. Federal Emergency Management Agency, 2002

"Natural Hazard Risk Assessment & Mitigation Strategy" Town of Westerly, Rhode Island, July 2004

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

Pandemic Flu Plan. Rhode Island Department of Health, 2006.

State and Local Mitigation Planning how –to guide

Getting Started - building support for mitigation planning, September 2002 FEMA 386-1 State and Local Mitigation Planning how – to guide

Understanding Yours Risks - Identifying Hazards and Estimating Losses, August 2001 FEMA 386-2

State and Local Mitigation Planning how – to guide

Developing the Mitigation Plan - identifying mitigation action and implementation strategies, April 2003 FEMA 386-3

Web references

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

NESEC – Northeast States Emergency Consortium - http://www.serve.com/NESEC

NOAA Satellite and Information Service, National Climatic Data Center - http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~storms

Town of West Warwick Website - http://www. westwarwickri.org

Red Cross - http://www.redcross.org

"Blaze guts Phenix Mill" Alice Gomstyn and Daniel Barbarisi, Projo.com, March 31, 2005 "Phenix from the ashes" Zachary R. Mider, Projo.com, April 1, 2005

"Fire Dept. wins $36,000 Homeland Security grant" Benjamin N. Gedan, Projo.com, April 4, 2005

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

http://www.nws.noaa.gov/glossary/index.php?letter=d

Appendices

Appendix A: Technical and Financial Assistance for Mitigation

State Resources

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

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

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

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

State of Rhode Island Building Committee Office
Building Commissioner's Office
One Capitol Hill
Providence, RI 02903
(401) 222-3529

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

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

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

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

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

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

Department of Environmental Management
Division of Parks and Recreation
2321 Hartford Avenue
Johnston, RI 02919
(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

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

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

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

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

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

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

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

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

U.S. 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 assists communities with the NFIP. ASFPM has developed a series of technical and topical research papers and a series of proceedings from their annual conferences. Many mitigation "success stories" have been documented through these resources and provide a good starting point for planning.

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

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 home page 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 the NEFSMA home page on the Web at http://www.seacoast.com/~nefsma.

Appendix B: Existing Protection Systems - State and Federal

State

Earthquakes and Hurricanes

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

Economic/Community Development

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

Evacuation Plans and Systems

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

Land Use Restrictions

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

Septic Systems

If there are areas in the community not served by a public sewer system, state septic system regulations influence development and may be a consideration for mitigation alternatives that include rebuilding and elevation of structures. Specific design requirements must be met for any construction in coastal velocity zones or river floodways. Generally, an inspection of a septic system is required if there is a change in use of the structure, an increase in flow, or a failed system. Limited inspections are required if the footprint of the structure is being changed. Upgrades are required by the state if an inspection reveals a failed system. However, local regulations may be more restrictive than state requirements, requiring inspections or upgrades in other cases.

State Barrier Beaches
Your community may have barrier beaches, as defined by the state's Coastal Resources Management Program. The regulations applying to these areas are enforced by CRMC. These regulations restrict alteration of the beach and/or dunes and the construction of coastal engineering structures. New or substantially reconstructed buildings generally must be elevated to a minimum of 1 foot above base flood elevation. No new commercial development is allowed on barrier beaches. If a structure is damaged more than 50 percent, it cannot be rebuilt.

Warning Systems and Emergency Operations Plans
Your community may have a flood warning system in place and should have a plan for response to flooding. In addition, RIEMA has offices throughout the state that maintain area-wide plans for flood events.

Federal

Coastal Barrier Resource Act
Administered by the U.S. Fish and Wildlife Service, this program has mapped public and private land identified as undeveloped coastal barrier areas. These areas may be denoted as "Otherwise Protected Areas" if they are owned by public entities. In the coastal barrier areas shown on FEMA's flood insurance rate maps, structures newly built or substantially improved after the date shown on the maps are ineligible for federal flood insurance. This serves to restrict new development in these areas because the purchase of flood insurance is required to obtain federally backed mortgages and improvement loans for structures located in special flood hazard areas.

Community Rating System (CRS)
A voluntary initiative of the NFIP, the CRS was developed to encourage communities to perform activities that exceed the minimum NFIP floodplain management standards. If a community participating in the CRS performs activities that include maintaining records for floodplain development, publicizing the flood hazard, improving flood data, and conducting 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 will help communities gain additional credit under the CRS.

Hazard Mitigation Grant Program
Also known as the 404 Program or HMGP, this program is available only after a federally declared disaster occurs. It represents an additional 15 percent of all the infrastructure and individual assistance funds that are provided to states to repair damages and recover from losses, and is administered by the state in partnership with FEMA. Having a plan or completed mitigation action matrix prior to a disaster event is extremely helpful in meeting the state's deadlines for applications and ensuring the project is eligible and technically feasible. It provides 75/25 matching grants on a competitive basis to state, local, and tribal governments, as well as to certain nonprofit organizations that can be matched by either cash or in-kind services. The grants are specifically directed toward reducing future hazard losses, and can be used for projects protecting property and resources against the damaging effects of floods, earthquakes, wind, and other hazards. Specific activities encouraged under the HMGP include acquiring damaged structures to turn the land over to the community for open space or recreational use, relocating damaged or damage-prone structures out of the hazard area, and retrofitting properties to resist the damaging effects of disasters. Retrofitting can include wet- or dry-flood-proofing, elevation of the structure above flood level, elevation of utilities, or proper anchoring of the structure. 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. A certain amount of funding is allotted to each state per year based on a risk formula for floods. Each state has the discretion to award funds to communities or to state government agencies. States may use whatever criteria or method they choose to award the funds as long as the applicant and the proposal are eligible. The program may fund up to 75 percent of the 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." Funds can also be granted to communities to help them prepare local flood mitigation plans. The same match requirements apply. Once a community receives a planning grant, however, it is not eligible to receive additional planning grants for another five years. For further information on the FMA program or ICC coverage contact RIEMA at (401) 946-9996.

National Flood Insurance Program (NFIP)

All of Rhode Island's 39 municipalities participate in the NFIP. This program is a direct agreement between the federal government and the local community that flood insurance will be made available to residents in exchange for community compliance with minimum 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) flood-proofed to the identified flood level on the maps
- Require design techniques to minimize flood damage for structures being built in high hazard areas, such as floodways or velocity zones

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

West Warwick

- Welcome
- Town Government
- Town Departments
- About the Town
- Interact
- I would like to...
- Employment Opportunities
- Community Calendar

Search

GO

Full Site

This Section

Search Tips

Hazard Mitigation Plan Committee

Thursday, January 13, 2011 at 1:30 PM
to Thursday, January 13, 2011 at 2:30 PM

TOWN OF WEST WARWICK

PUBLIC INFORMATIONAL MEETING

THURSDAY, JANUARY 13, 2011 BEGINNING AT 1:30 PM, WEST WARWICK TOWN HALL, TOWN COUNCIL CHAMBERS.

The Town of West Warwick will hold a PUBLIC HEARING on Thursday, January 13, 2011 at 1:30 pm at the West Warwick Town Hall, Town Council Chambers, 1170 Main Street, West Warwick, RI 02893.

AGENDA: DISCUSSION REGARDING UPDATING OF THE TOWN'S LOCAL HAZARD MITIGATION PLAN

If any citizen has any questions or comments regarding this matter, they should contact the Office of the Town Manager at (401)822-9219.

The West Warwick Town Hall is handicapped accessible. Anyone requiring TDD services or other assistance to handicapped individuals is requested to notify the Town Clerk's Office at least 72 hours in advance of the hearing.

1170 Main St. West Warwick, Rhode Island 02893 | Phone: 401-822-9200 | Fax: 401-822-9266

Welcome | Town Government | Town Departments | About the Town | Interact | I would like to... | Employment Opportunities | Community Calendar

Powered by gov