Strategy for Reducing Risks from Natural Hazards in Charlestown, RI

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Strategy for Reducing Risks from Natural Hazards in Charlestown, Rhode Island:

A Multi-Hazard Mitigation Strategy

by: Pam Rubinoff

September 1997

Adopted by Charlestown's Town Council and Planning Commission on October 21, 1997

Written in cooperation with:

University of Rhode Island Coastal Resources Center
Charlestown Town Council
Rhode Island Sea Grant
Rhode Island Emergency Management Agency

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Section 1.0 Goals and Objectives

Hazard mitigation is any sustained action taken to reduce or eliminate long-term risk to people and their property from the effects of natural hazards (e.g. wind, fire, floods, nor'easters, hurricanes, earthquakes, etc.).

1.1 What Mitigation Can Do for Charlestown

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

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

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

Box 1: Developing a Mitigation Strategy

1) Issue Identification: What is at Risk?

The first step in deciding what a community wants to do about hazards is to identify the problem—that is, identify the areas at risk. The Charlestown Planning Commission and local officials, also referred to as the Local Hazard Mitigation Committee (LHMC), with assistance from the Hazard Mitigation Project used a matrix (Table 1) to identify their risks in a roundtable meeting with community officials, emergency response personnel and others. Issue statements were then developed for each major risk area to articulate these concerns. The priority areas at risk for Charlestown (Figure 2) are:

- Residential and commercial structures subject to flooding, coastal erosion, fire and earth quakes
- Coastal processes and coastal storms subjecting the beaches to erosion
- Roads, bridges and dams subject to flooding, erosion and earthquakes
- Environmental resources vulnerable to forest fires, flooding, earthquakes and coastal erosion

Box 1 continued...

2) Fact-finding: What is the Existing Condition? What is Already in Place?

After identifying the general areas at risk, facts about population, property and resources at risk need to be gathered. In addition, data on the potential magnitude and probability of a natural hazard event should be collected—a community may be at risk of wind damage from a hurricane, but not storm surge, or it may be vulnerable to earthquake damage, but so far removed from forested areas that risk of exposure to forest fires is minimal. Finally, it is important to gather information on the types of protection systems, both physical and regulatory, in place in the community.

In the Charlestown planning process, information was gathered from a variety of sources to document the vulnerability of areas described in the issue statement. Resources included local documents from the planning department and tax assessor, studies performed by the U.S. Army Corps of Engineers, state reports and research conducted by URI/Coastal Resources Center and Rhode Island Sea Grant, URI's Geology Department, Resource Economics Department, and Environmental Data Center, as well as information from the Charlestown building inspector, public works director and emergency response personnel.

3) Mitigation Activity Identification: Brainstorming Alternatives - What Actions Can Be Taken?

After using the above steps to develop a clear picture of the areas at risk and an understanding of what this risk entails, the community has a number of options from which to choose to reduce its vulnerability to natural hazard losses. If the community focuses first on how to strengthen its existing plans, programs and procedures, and incorporates mitigation as part of the ongoing process of town management, it can avoid duplication of efforts, save time and money, and achieve multiple objectives. Actions should be incorporated into the emergency operations plan, the comprehensive plan, and other pertinent planning and implementation tools available to the town such as the local zoning, building and subdivision ordinances.

4) Implementation Strategy for Mitigation Activities

Using the mitigation matrix (Table 2) Charlestown officials recommended actions for each of the topical areas at risk. At minimum, it is recommended that communities develop mitigation actions to address the following:

- Revision of implementation actions in comprehensive plan
- Incorporation of hazard mitigation into project review
- Development and implementation of public education, outreach and incentives for mitigation
- Determination of post-disaster mitigation opportunities

Additional actions were also developed that pertain to specific issues. Each recommended action should include pertinent information for implementation: who will implement the action, when it will take place and what resources and models are available. There are existing models available for many initiatives. Recommended resources, either technical or financial, may also be available. In this document, resources and models useful for Charlestown have been referenced.

1.2 Risk Assessment

This section focuses on assessing the community's risk and vulnerability. It will identify what areas are at risk, how vulnerable those areas (e.g., structures, population or natural resources) are, and what the impacts (loss of life, environmental damage or inconvenience to residence)will be if those areas are affected by a natural disaster. The risk matrix (Table 1) summarizes the major risks to Charlestown.

Issue Identification

On March 21, 1996, South County officials (including building inspectors, planners, emergency managers and public works directors) from five communities initiated their hazard mitigation planning process at a workshop with the Rhode Island Emergency Management Agency (RIEMA), URI/CRC and Rhode Island Sea Grant, and other state and federal agency representatives. This workshop facilitated the process of identifying risks and developing local hazard mitigation recommendations using the risk assessment and mitigation strategy matrices as tools.

As an oceanfront community, Charlestown faces many threats from natural disasters, risking potential loss to the local economy, natural resources, quality of life and community character. The town's shorefront barriers were decimated by both the 1938 and 1954 hurricanes, and in many instances have been heavily redeveloped in spite of similar risks today. The coastal environment defines the character of the town and is a major attraction for tourists and year-round residents. Following a major storm, however, the benefits of living and working in a coastal area can be outweighed by the damage to people, property and natural and economic resources. Ongoing issues that must be considered in developing coastal areas include erosion, water quality, health of fisheries, and public access to recreational areas along the ponds and oceanfront beaches.

Fire is also a risk since Charlestown's inland areas are largely forested. In years of drought, water supply and accessibility of fire-fighting equipment are inadequate to protect against potential forest fires and insure safety for new development.

Other natural hazards that pose a risk to the town are earthquakes, which have a low probability, but a high risk. That is, they are unlikely, but if they happen they would inflict a great deal of damage. According to the RIEMA, Charlestown faces seismic risk since much of the town is located on outwash soils. These soils, subject to liquefaction, make the town particularly susceptible to damage should an earthquake occur.

The town's vulnerability to natural disasters must be measured in terms of the population, property, and natural and economic resources at risk, and the probability and magnitude of the event. As a result of the March, 1996 workshop, the Charlestown Planning Commission and other local officials developed the matrix (Table 1) that outlines several risks within the community. After identifying these primary threats, the town summarized these risks and determined that there are four major areas at risk in the community:

- Residential and commercial structures subject to flooding, coastal erosion, fire and earthquakes
- Beaches subject to erosion from coastal processes and coastal storms
- Roads, bridges and dams subject to flooding, erosion and earthquakes
- Environmental resources vulnerable to forest fires, flooding, earthquakes and coastal erosion

Box 2 highlights the issues and concerns raised by the town, and the maps in this section depict areas of risk. Although many in Charlestown have indicated that oil spills, such as the January, 1995 North Cape disaster, can seriously damage the town's natural resources and economic viability, this plan deals only with hazards caused by natural events. The community may choose to incorporate other risks into their hazard mitigation strategy in the future.

Box 2: What is at Risk in Charlestown?

Residential and commercial structures subject to flooding, coastal erosion, fire and earthquakes

Many of the residential neighborhoods adjacent to the salt ponds are low-lying and are in flood hazard areas, which make them vulnerable to hurricanes and nor'easters. Many seasonal cottages are being converted to year-round homes. Despite currently being zoned as two-acre lots with setbacks from resource areas, many are non-conforming uses on substandard lots. Although many residential structures have been brought up to current floodplain standards, the U.S. Army Corps of Engineers estimates that a high percentage would be impacted during less intense storms. These structures are on individual septic systems with increased potential impact from failure during flood events and increased potential for failure with sea level rise, posing additional concern for water quality.

Beaches eroding due to coastal processes and coastal storms

The barrier spits act as natural wave barriers, protecting landward resources and property, and providing recreational opportunities for residents and visitors. These dynamic features are vulnerable to erosion, flooding and overwash. Flooding of the barriers during a 100-year storm would overwash the barriers and cause extensive erosion. The existing residential structures in the area or near the beach are vulnerable to storm damage and erosion ranging from 0.1 - 3.7 feet per year. Town and state beach facilities are moderate in size, and are not built to current flood resistant construction standards. The comprehensive plan indicates that access to the shore is limited both by lack of sites and lack of parking and that the public demand for access to the shore continually increases.

Quonochontaug and Charlestown are stabilized inlets/breachways which provide a stable opening from Block Island Sound to Quonochontaug and Ninigret ponds. These coastal salt ponds are important ecological and economic resources for the community and the state. They provide habitat for fisheries, recreational boating and a buffer to landward shores from direct storm attack. The inlets are considered flood tidal deltas, and shoaling of sediments occurs directly landward of the jetties, which may reduce the ability of the pond to drain adequately during high storm activity and increase flooding potential. Additionally, the shoaling of these areas makes navigation difficult and extremely dangerous. The town considers the incremental shoaling of these breachways to be a natural hazard that increases their risk ofeconomic losses over time.[1]

[1] Research and models indicate that the shoaling does not reduce the ability of the pond to drain adequately. Therefore the shoaling does not increase the potential of low lying areas adjacent to the pond and does not contribute to poor circulation or water quality impacts (Boothroyd, Jon; URI Department of Geology, Personal Conversation, 1996).

Box 2 continued...

Table 1: Risk Assessment Matrix for Charlestown.

RISKS/TYPES OF PROJECTS	Location (PLATE)	OWNERSHIP	NATURAL HAZARD	PROBLEM	PRIMARY PROBLEM/ EFFECT	MITIGATION BENEFITS
Barrier beaches	1 2 6 8	mixed town state private	hurricanes winter storms flooding	erosion overwash	loss of property safety recreation affects tax base and tourism	protection of property
Beach erosion	1 2 6 8	mixed town state private	winter storms hurricanes	erosion loss of beach and dunes	loss of property safety recreation affects tax base and tourism	protection of property and public access
Blue Shutters Beach	2	town	hurricanes winter storms flooding	erosion overwash	loss of property safety and loss of revenue	protection of property
Burlingame State Park and Reservation Residential property	15 16 17 18 19 21	state private	forest fire	adjacent residential property lack of access and fire breaks	loss of property safety excavation affects tax base and ecological base	protection of life, property and environment
Charlestown Beach Road	9 11	town	flooding winter storms evacuation	evacuation traffic control falling limbs creating storm surge channels destroying barrier erosion and overwash	safety flooding orderly evacuation	saves lives helps mitigation and recovery
Charlestown Breachway	8	state	flooding hurricanes wall weakening winter storms	sedimentation and backshore flooding collapse	flooding navigation danger ecological and business impact	protection of life, property and environment increased safety
Charlestown state beach	9	state	hurricanes winter storms flooding	erosion and overwash evacuation	flooding erosion safety ecological and business impacts	protection of life, property and environment increased safety
Charlestown town beach	9	town	hurricanes winter storms flooding	erosion and overwash	flooding erosion loss of revenue and tourism	protection of property and environment
Coastal properties	Various	mixed	hurricanes winter storms flooding	beach erosion flooding wind/wave impacts	property damage beach erosion evacuation problems	protection of life, property and environment increased safety
Cross Mills Brook and other river and brook crossings	12	state	flood	road crossing	safety emergency response time	protection of life, property and environment increased safety
Inland residential properties	Various	private	fire	property damage	loss of property safety risk	protection of life, property increased safety
Intersections West & East Beach roads	4	state DOT	hurricanes winter storms	lack of traffic control and signs	safety risk orderly evacuation	saves lives

RISK/TYPES OF [illegible]	Location (PLAT #)	OWNERSHIP	NATURAL HAZARD	PROBLEM	PRIMARY PROBLEM/ PROJECT	MITIGATION BENEFITS
Pawcatuck River Dams and others	Various	Public and private	flooding of Pawcatuck River	old and unsurveyed	safety	protection of life, property and environment increased safety
Quonochontaug Breachway	1	State	floods hurricanes winter storms wall weakening	sedimentation and backshore flooding collapse ISDS failure	safety flooding navigation danger ecological and business impacts loss of property	protection of life, property and environment increased safety
Residential structures and ISDS	1 2 3 4 5 7 8 9 10 11 12	Private	hurricanes winter storms	flooding and overwash buildings in velocity and A flood zone ISDS failures	loss of property ecological impacts	protection of property and environment
Roads subject to flooding	Buckeye Brook Road Burdickville Road Kings Factory Road Klondike Road Old Mill Road Ross Hill Road Route 91 Route 112 Shannock Road Sherman Avenue	State	flooding of Pawcatuck River and stream crossing winter storms	road crossing falling limbs	safety emergency response time	protection of life, property, and environment increased safety

This matrix was developed by the Charlestown Planning Commission and the University of Rhode Island's Coastal Resources Center and Rhode Island Sea Grant, in collaboration with the Rhode Island Emergency Management Agency.

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Roads, bridges and dams subject to flooding, erosion and earthquakes

The primary threat to infrastructure is the flooding of secondary roads, which could limit or curtail evacuation during times of natural disaster and cause a public safety problem. In many areas of the community, detours caused by flooded roads could also adversely impact evacuation routes. Several roads flood where they cross brooks. There are many old culverts in place that require maintenance, replacement or an increase in size to prevent backlog during storms.

Environmental resources vulnerable to forest fires, flooding, earthquakes and coastal erosion

Charlestown has large parcels of undeveloped forested land. With increased development within and adjacent to the forested areas, there is a greater risk of forest fires and resulting damage to people, property and natural resources. These developed areas have inadequate public water supply and water pressure for fire protection.

A population at risk

The risk to the people of Charlestown from natural disasters has increased over the years, with the increase of development in vulnerable areas (both year-round and seasonal). A study conducted by the U.S. Army Corps of Engineers estimated that over 20 percent of Charlestown's permanent population is vulnerable to a weak hurricane, while almost 40 percent of the population is vulnerable to a strong hurricane.[2] The study revealed that 2,500 residents, year-round and seasonal, reside in areas recommended for evacuation during hurricanes. The study highlighted the need to evaluate existing shelter capacity to insure that the town has sufficient resources to accommodate that part of the population that may require shelter during a disaster. The primary American Red Cross shelter, located at the Charlestown Elementary School, has a capacity of 300 persons. The secondary Red Cross approved shelter is the Chariho Middle School, which has a capacity of 665. These have been sufficient to date for Charlestown's projected demand of 630 during a severe hurricane.

Property at risk from flood and wind events

Given the pressures of growth in South County, communities there must consider the increased risk to people and their property from wind and flood events when approving new development in vulnerable areas. A 100-year flood has a one percent chance of happening in any given year. The 100-year floodplain incorporates almost 9,300 acres in Charlestown (approximately 34 percent of the town).[3] It has been estimated that a coastal storm with the intensity of a 100-year flood would cause over $16 million in repetitive losses in Charlestown, resulting primarily from structural losses and the cost of evacuating.

Currently, state and local regulations specify enhanced building code provisions within the 100-year floodplain. The U.S. Army Corps of Engineers' 1996 report stressed that the town should consider less severe storms for planning and design purposes, since over 150 houses in the floodplain would experience substantial flood losses during the 25-year storm, which has a greater frequency and less intensity than the 100-year flood. The flood waters of a 25-year event—which has a four

[2] U.S. Army Corps of Engineers, Rhode Island Hurricane Evacuation Study, May 1995
[3] U.S. Army Corps of Engineers, New England Division, Planning Directorate, Study of Coastal Flooding Charlestown, R.I. January 1996

percent chance of occurring in any given year—could rise to 9.9 feet above sea level. The damages incurred by a five-year event (20 percent chance of occurring in any given year) would cause $338,000 in damages.

In addition to flood hazards, property in Charlestown is also at risk from wind. The Rhode Island Building Code indicates that the entire town is in a high wind area, denoting a significant risk of wind damage during a hurricane or nor'easter.

Potential losses to the local economy

Since property taxes account for approximately 74 percent of the town's revenues[4] (residential taxes contributing the greatest amount), it is imperative that the community and its residents take precautions to protect their investments.

Approximately 85 percent of the properties prone to a 100-year flood are covered by flood insurance.[5] FEMA estimated that there was approximately $82 million worth of property in Charlestown insured by the NFIP in May 1996. In addition to the 458 policies within the stipulated 100-year flood zones, over 100 households took out policies to address losses from flooding normally not covered by homeowner insurance (Table 2).

In addition to property values, the Charlestown beaches and coastal ponds are both a natural and an economic resource for the community. Two of Charlestown's attractions are its beaches and coastal ponds. The town's potential for future economic growth through tourism will depend on sustaining its rural character, and its rich coastal, cultural and historic resources. In order to maintain these valuable assets, the town must insure that this economic base is not compromised by excessive risks from natural hazards.

Additional growth within Charlestown's coastal and riverine floodplains poses an increased risk of private property loss and public infrastructure maintenance and repair costs following a natural hazard event. Flooding and erosion will be exacerbated with the increase in sea level rise over the next century.[6] Although short-term shoreline change may not affect tax revenues, long-term (spanning 100 years) shoreline change could severely alter the landscape and existing use of the barriers.[7] The natural tendency for the barriers to migrate landward and cause erosion of the shorefront, combined with potential coastal flood damages, could impact approximately 300 residential structures. Protection of the existing barriers with dune walkovers, beach nourishment or acquisition should be pursued. In addition, the town should investigate free snow fencing for dune rebuilding. As development in the Pawcatuck River Valley increases, natural flood storage areas could be lost and existing water control structures (culverts and dams) proven inadequate. Additionally, as development expands into the undeveloped forested areas of the town, the risk of forest fires increases and the problems of water supply and water pressure become an important consideration. Attention must also be given to transportation infrastructure and appropriate signage, which could prove to be inadequate to accommodate additional growth and to support evacuation needs for year-round and seasonal populations.

Capability assessment

"This capability assessment is the critical link between the process of evaluating hazards and developing mitigation strategies" —Tennessee Emergency Management Agency

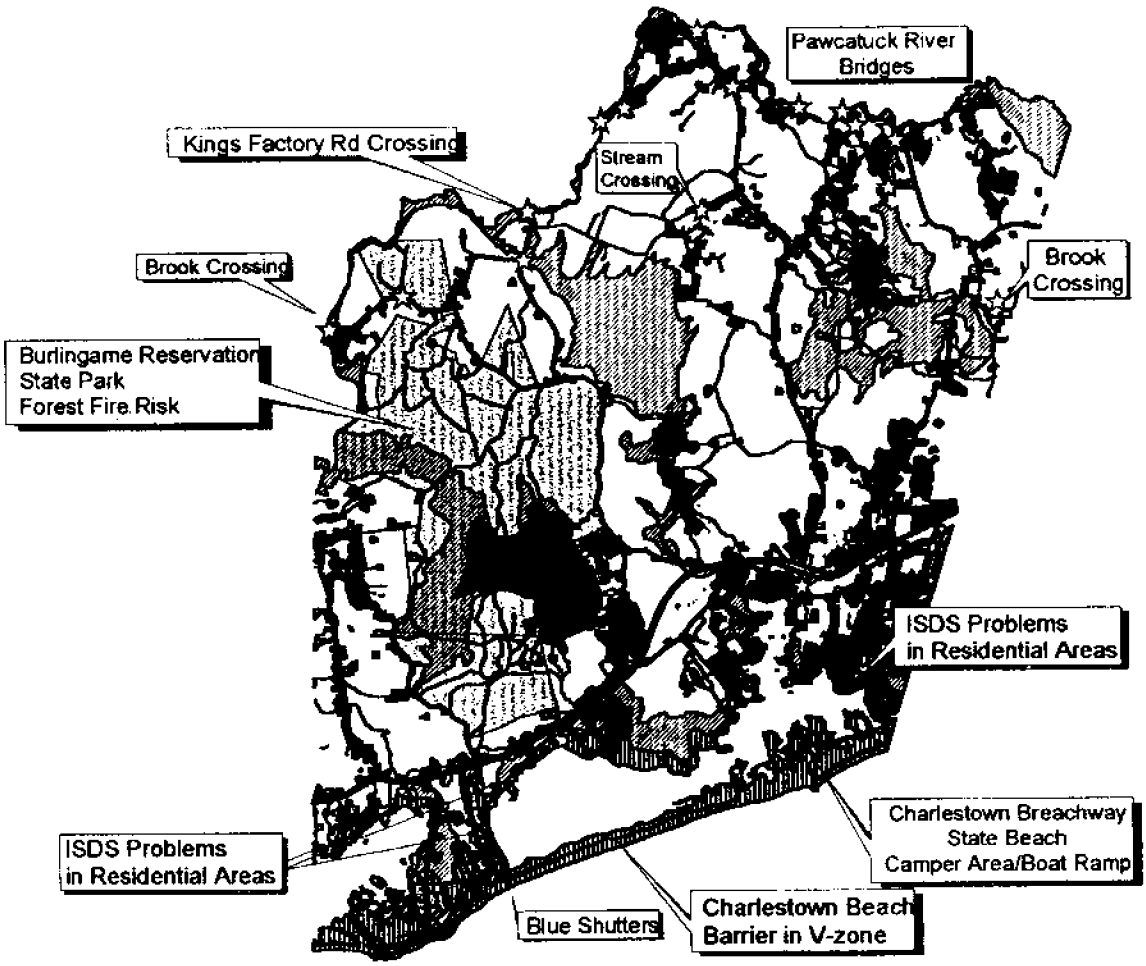
[4] "Town of Charlestown *Comprehensive Plan*," 1991, Services and Facilities-6

[5] U.S. Army Corps of Engineers, New England Division, Planning Directorate, Study of Coastal Flooding Charlestown, R.I.: January 1996

[6] Gallagan, Chris, "Effect of Future Sea Level Rise along the Southern Rhode Island Coast," 1990, University of Rhode Island.

[7] U.S. Army Corps of Engineers, New England Division, Planning Directorate, Study of Coastal Flooding Charlestown, R.I.: January 1996

Risks To Charlestown



☆ Vulnerable Bridges and Stream Crossings

Flood Zones
- 100 Year Flood (A Zone)
- 100 Year Flood and High Velocity Zone (V Zone)

Roads
- Secondary
- Primary

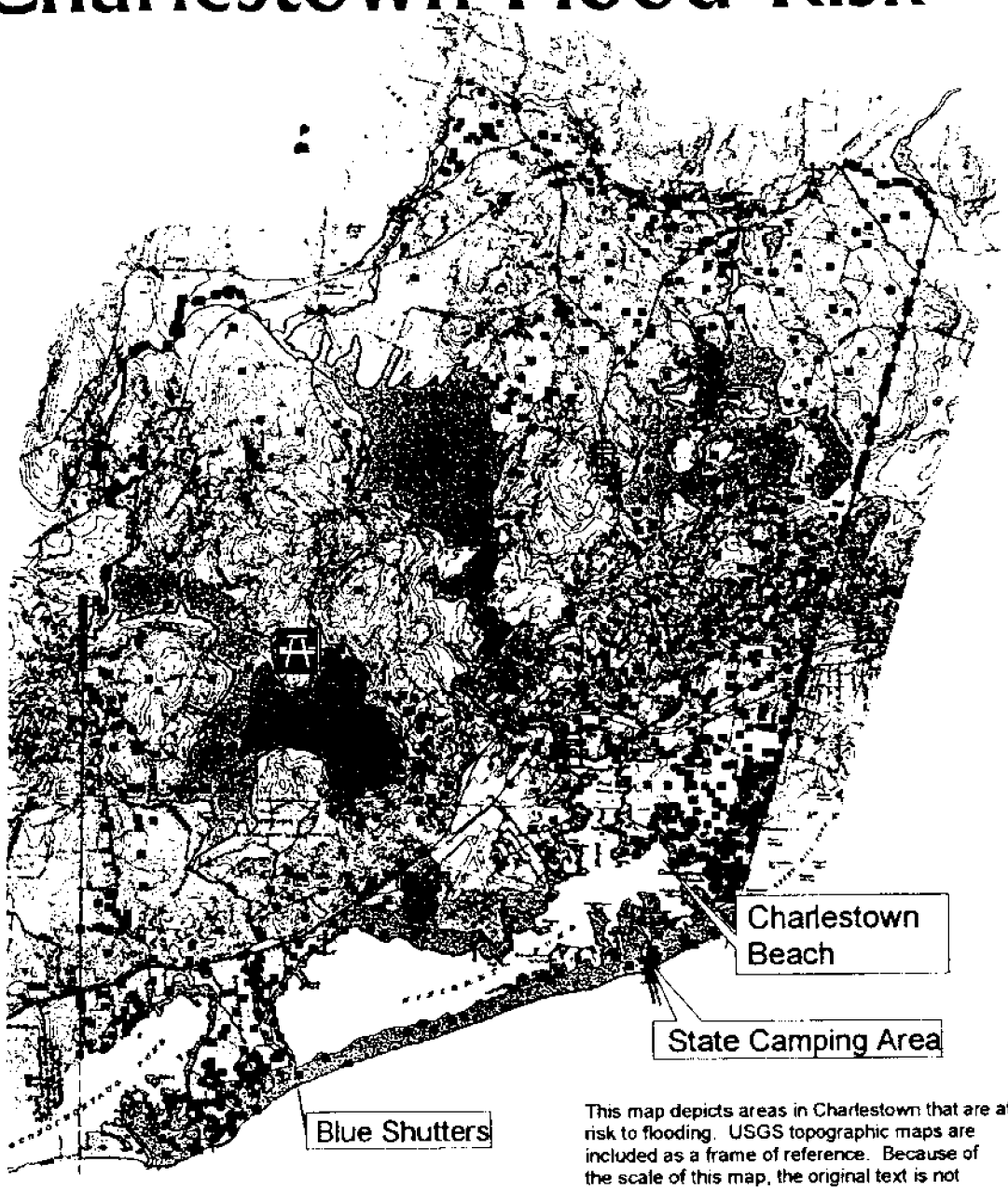
Land Use (Hazard)
- Airports (and associated facilities)
- Commercial (sale of products and services)
- High Density Residential (< 1/8 acre lots)
- Industrial (manufacturing, design, assembly)
- Institutional (schools, hospitals, churches)
- Low Density Residential (>2 acre lots)
- Medium Density Residential (1 to 1/4 acre lots)
- Medium Density Residential (1/4 - 1/8 acre lots)
- Medium Low Density Residential (1 to 2 acre lots)
- Burlingame Reservation / State Park/Large Forested Areas
- Inland Water

N W E S

0 1 2 3 4 Miles

P.R. & R.J.D. 5/97

Charlestown Flood Risk



This map depicts areas in Charlestown that are at risk to flooding. USGS topographic maps are included as a frame of reference. Because of the scale of this map, the original text is not legible. See the actual USGS maps for further detail.

- Boat Ramps
- Schools
- Dams

Charlestown Places

- Burlingame State Park
- Charlestown Breach Way
- Charlestown Fire District
- Fire Department
- Police Department

Bridges

- Approximately 5 Housing Units

Open Water

Town Boundary

FEMA Flood Hazard Areas

- A - Zone
- V - Zone

(A zone = 4,690 Acres)
(V zone = 1,283 Acres)

0 1 2 3 4 5 Miles

RJD 4-97

This capability assessment refers to the existing plans, programs and policies that have incorporated hazard mitigation or other pro-active tools. The town implements and enforces the state building code and participates in NFIP, as do all the communities in Rhode Island. Charlestown has initiated many studies and activities over the years that have laid the foundation for the development of its mitigation strategy. In 1992, the town adopted a comprehensive plan that outlines the vision of the community and sets forth a progressive agenda for implementing actions to address increased development pressures, economic stability, open space and recreation issues, public infrastructure and facilities. The planning commission is in the process of revising its zoning ordinances to correspond to the land use plan and has instituted a site plan review process to enhance the development review process.

Table 2: Summary of National Flood Insurance Program Activity[8]

Total Policies	Value of Property Covered	Policies in V Zone*	Policies in A Zone*	Total Premium Paid	# Claims since 1978	$ Paid since 1978	Average Yearly Premium	Average Claim Paid since 1978
594	$82 M	180	278	$417 K	93	$510 K	$702	$5,484

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

Charlestown's comprehensive plan reflects the overall vision for the town. The plan outlines goals, policies, issues and actions to be taken by the community to fulfill that vision, providing a framework for everyday operations within the town. The town determined that the potential impact of natural hazard events could be integrated into many elements of the plan. The town recognized that inclusion of mitigation initiatives—both pre-disaster and post-disaster—would not only benefit the community by reducing human suffering, damages and the costs of recovery, but it would also help build and maintain sustainability and economic health of the community over the long run.

Several of the town's goals, policies and programs already incorporate hazard mitigation, implicitly or explicitly. The town may feel that it is necessary to develop and implement some additional guidance to further integrate hazard mitigation into town management and practices. For instance, the town is looking toward incorporating hazard mitigation measures into the site planning review process. The mitigation section of this strategy identifies recommendations for inclusion in the plan that would support hazard mitigation initiatives. Many recommended actions however, will remain independent of the comprehensive plan.

The town revised its emergency operations plan in 1992. This plan addresses response procedures for extraordinary emergency situations associated with natural disasters, technological incidents and nuclear emergency operations. Developed in conjunction with RIEMA, the plan predetermines, to the maximum extent possible, actions for the community to take to prevent or minimize disasters.

The plan primarily addresses response and recovery operations associated with catastrophic incidents. The state is actively working with communities to incorporate within their plans an annex k - municipal administration plan for hazard mitigation. Currently, the plan's focus is the administration of hazard mitigation grants which may be awarded subsequent to a federally declared disaster.

Once the town's mitigation strategy is completed, the town should incorporate specific actions and initiatives to the administration plan, including ones related to the lack of a public water system and lack of landfills for refuse from disaster cleanup. For instance, the current debris plan utilizes the Department of Transportation's garage at Cross Mills as a temporary storage site, but debris ultimately

[8] Victor Parmentier, FEMA; NFIP data. May, 1996

is disposed of in the local landfill. These specific actions will help insure that activities during the response and recovery phase of the natural disaster will address mitigation, thereby reducing potential losses in the future. At a minimum, the town should develop a list of funding priorities for incorporation into the plan, as a reference of ideas for potential mitigation grants. If the town chooses to develop a post-disaster redevelopment plan, the plan should be consistent with the emergency operations plan (and the comprehensive plan), so that actions taken in short-term recovery are compatible with and complement the long-term vision of the community.

Since the 1980s, Charlestown has actively worked on natural resource management issues highlighted by the R.I. Coastal Resource Management Council's Salt Ponds Special Area Management Plan, and has since incorporated various recommendations into town ordinance, public education campaigns and other successful programs. A local private land trust has recently been incorporated to help protect valuable natural resources.

The University of Rhode Island's Geology Department has taken over 20 years worth of beach profiles on Charlestown's ocean shoreline. These profiles have provided baseline information about erosion, which in turn has influenced the state's establishment of construction setback requirements for new structures (for details concerning erosion rates, see Appendix D). Between 1995 and 1996, Charlestown worked with the U.S. Army Corps of Engineers to study coastal flooding. The study provided findings and recommendations that address this critical issue and can be used in planning, response and recovery from natural disasters.

The town's vision for community development has been documented through the comprehensive plan. The implementation actions enhance the ongoing activities within the community and provide a framework for current and future decisions. A hazard mitigation component, identifying both pre-disaster and post-disaster actions, should be a part of this local vision, and integrated into the comprehensive plan. Post-disaster response, recovery and rebuilding requires unique policies and procedures, which should be articulated, where feasible, prior to the disaster. A post-disaster study recommendation needs to be incorporated into the comprehensive plan that can continue to be realized despite the disaster event, and can be used to make appropriate decisions to restore the sense of community character lost to a natural disaster.

2.0 Mitigation Actions

The LHMC has worked to set goals and objectives that are bounded by a time frame and are compatible and consistent with state hazard mitigation goals. The State Hazard Mitigation Committee (SHMC) has reviewed and approved these goals and objectives in order to insure consistency with the statewide goals and objectives. The time frames used for the strategy are as follows:

Short Term = 0 - 2 years
Medium Term = 2 - 6 years
Long Term = more than 6 years

2.1 Mitigation Activities

- **Identifying mitigation strategies**

The mitigation matrix (Table 3)identifies strategies to mitigate risks, based on those risks

identified in Table 1. This matrix also identifies the parties responsible to implement mitigation actions. It offers possible finance options and reflects town priorities. For all recommended actions, the lead department or agency responsible for that action is listed first and is followed by other relevant departments and agencies.

• Amending comprehensive plan policies and goals

The LHMC incorporated the theme of hazard mitigation into each of the seven elements in the comprehensive plan. These proposed amendments recognize the impact of natural hazard events and provide guidance on what can be done to protect life, property, natural resources and the economic health of the town.

The LHMC highlighted the theme of hazard mitigation in *italics* for the following comprehensive plan goals and policies:

LAND USE

- Land use goal - To protect the natural and cultural resources and the rural character of the town *in a sustainable manner* while providing the housing, economic base and services necessary for the broad range of residents to enjoy the high quality of life associated with the town.
- Land use policy - Manage growth and development to reflect the natural characteristics (resources, constraints *and natural vulnerabilities*) of the land. Insure that there is adequate mapping to make well considered land use decisions.
- Land use policy - Provide flexibility in land use management tools where appropriate, based on natural constraints to encourage alternative land use developments. *Such flexibility should encourage wise use of natural hazard-prone lands and promote the incorporation of hazard mitigation techniques in site planning.*

NATURAL AND CULTURAL RESOURCES

- Natural resource goal - To protect and encourage appropriate use of town's natural and cultural resources, *including the wise use of floodplains and hazard-prone areas.*
- Natural resource policy - Allow and encourage development that protects the natural and cultural resources and reflects the natural constraints *and natural hazard vulnerabilities* of the land.
- Natural resource policy - Promote establishing protective undeveloped zones adjacent to water resources, *areas of repetitive loss and damage*, and other habitats through the use of setbacks, design standards, exactions, open space dedication and, where necessary, the purchase of development rights or property. *Incorporate such strategies in the post-storm redevelopment plan.*

TRANSPORTATION (Circulation)

- Circulation goal - To provide for safe travel through the town *(year-round and during times of natural disaster)* while protecting the rural character, scenic nature, and natural and cultural resources.

ECONOMIC DEVELOPMENT

- Economic development policy - Promote development of appropriate recreation opportunities that focus on natural and cultural resources. *Promote multi-objectives for in hazard-prone areas, as sustainable alternatives to open space.*

SERVICES AND FACILITIES

- Services and facilities goal - Develop facilities and services that are compatible with protecting the natural/cultural resources, rural character and reasonable tax rate and *provide safety for the residents and visitors of Charlestown.*

OPEN SPACE AND RECREATION

- Open space and recreation policy - Design standards should consider visual access and aesthetics *as well as incorporate creative hazard mitigation measures* for residences, subdivisions, businesses, roads and recreational uses.

- Open space and recreation policy - *Reduction of future damage and public expenditures through acquisition of vulnerable properties* can help support efforts to preserve open space.
- Open space and recreation policy - The Harbor Management Plan identifies the need for additional public access to the shore, including boat ramp access. *Develop list of priority sites of previously damaged lots which would provide access and hazard mitigation.*
- Open space and recreation policy - *Include hazard prone areas as criteria for priority land purchases.* Initiate discussions with land owners for future purchases with state or federal hazard mitigation grant monies *following federally declared disasters.*
- Open space and recreation policy - A beach shuttle would reduce the need to build more parking lots, *which require high maintenance in areas subject to flooding and coastal erosion.*

HOUSING

- Housing policy - *Encourage outreach programs for realtors to educate them on hazards and existing regulations on building in flood zones. Residents should be encouraged to buy flood and wind insurance. R.I. housing grants and subsidies for housing should mandate that owners purchase insurance against flood and wind damage.*
- Housing policy - *Do not encourage additional housing (especially elderly and high density) in vulnerable areas.*

Action Plan - Creating a framework for implementation

Having outlined the risks and potential mitigation strategies, the town developed a framework for implementing a hazard mitigation strategy in Charlestown. Actions are developed within the four key areas of risk that have been identified and discussed previously:

1. Residential and commercial structures subject to flooding, coastal erosion, fire and earthquakes
2. Coastal processes and coastal storms subjecting the beaches to erosion
3. Roads, bridges and dams subject to flooding, erosion and earthquakes
4. Environmental resources vulnerable to forest fires, flooding, earthquakes and coastal erosion

Table 3: MITIGATION STRATEGIES FOR CHARLESTOWN

TYPE OF MITIGATION								IMPLEMENTATION		
What is at risk? What is vulnerable?	**Infrastructure improvement**	**Property protection**	**Enhancing natural resources**	**Planning & management**	**Regulatory change**	**Preparedness to reduce losses**	**Education & training**	**Responsible person/agency**	**Financing options**	**Cost**
Barrier beach	Improvement Repairs	Building elevation	Dune nourishment	Open space Acquisition Floodplain Restoration TDR	Building code Zoning revisions	Evacuation Flood warning	Home landscaping signage	DOT Town State CRMC	ISTEA/DOT Beach fees FEMA	$100,000
Beach erosion	N/A	Setbacks	Non-structural erosion control	Mapping Erosion rates	Rebuilding guidelines Property setbacks	N/A	Permitting guidelines	CRMC	FMAP	$15,000
Blue Shutters Beach	Replacement Retrofit Flood-proofing of concession stand	Elevation	Dune nourishment	Open space Local policy	Environmental regulations	Flood warning	Permitting Training officials	Town CRMC	FEMA Low interest loans	$75,000
Burlingame State Park and Reservation Residential property	Fire lanes	Maintenance fire roads	Protecting forests	Open space easements	Property setbacks	Wood chipper evacuation	Training of fire departments	DEM Fire departments	Grants	Not yet determined
Charlestown Beach Road	Elevate road Regrade road	Flood-proofing elevations Relocation Removal Acquisition	Maintain as a sand/dirt road	Limit growth	Policy in limiting new infrastructure	Signage Regular maintenance for dirt road	Planning/policy regrading	Town	Town FEMA grant	Not yet determined
Charlestown Breachway	Maintenance	Dredging	Dune nourishment	Open space Local policy	Environmental regulations	N/A	Permitting Training officials	State/CRMC	Beach fees	$1,000,000
Charlestown state beach	Improvement Relocation	Relocation Elevation	Dune and beach nourishment	Open space	Environmental regulations	N/A	Permitting Training officials	DEM CRMC	Budget FEMA	$80,000
Charlestown town beach	Replacement Retrofit Floodproofing Bathhouse	Floodproofing	ISDS	Local policy	Environmental regulations	N/A	Permitting Training officials	Town DPW CRMC	FEMA grant	$25,000
Coastal properties	N/A	Flood-proofing Elevations Relocation Removal Acquisition	Open space Dune enhancement	Demo project	N/A	Financial incentives	Pamphlets Media campaign Demo project	RIEMA/FEMA CRMC part of process for relocation	FMAP	$60,000
Cross Mills Brook and other river and brook crossings	Inspection and maintenance Post-flood stage markers	Flood proofing	Erosion control	Local policy Comprehensive plan	Rebuilding guidelines	Flood warning and forecasting evacuation	Signage Training officials	Town/DOT Army Corps of Engineers	Budget/ ISTEA	Not yet determined
Inland residential properties	Fire roads and maintenance Dry hydrants Ponds	Defensive landscaping	N/A	Open space acquisition Forestry plans	Development review	Wood chipper	Pamphlets Media Fire officials training	Town State Private homeowners Fire departments CRMC should be consulted first	Budget Private incentives Grants	$300,000
Intersections West and East Beach roads	Repairs Improvements Maintenance	N/A	N/A	Local policy Comprehensive plan	N/A	Announce evacuation	Post signs	Town DOT	ISTEA/Town	$10,000

TYPE OF MITIGATION								IMPLEMENTATION		
What is at risk? What is vulnerable?	**Infrastructure improvement**	**Property protection**	**Enhancing natural resources**	**Planning & management**	**Regulatory change**	**Preparedness to reduce losses**	**Education & training**	**Responsible person/agency**	**Financing options**	**Cost**
Pawcatuck River dams and others	Inspection Map Post floodstage markers	Floodproofing Maintenance	Floodplain restoration	Local policy comprehensive plan	Rebuilding guidelines	Communication systems	Distribute maps to emergency personnel	Town Army Corps of Engineers CRMC	Low interest loan	Not yet determined
Quonochontaug Breachway	Maintenance	Dredging	Dune nourishment	Maintenance schedule	Environmental regulations	Flood warning Evacuation	Permitting	Town State CRMC	Beach fees	$1 M
Residential structures and ISDS	Relocation repairs improvement	Relocation Elevation Acquisition Retrofit	Floodproofing	Local policy	Zoning setbacks New rebuilding codes	Financial incentives Tax credits	Permitting Building guidelines Pamphlets	Town State Private Homeowners CRMC	FEMA Private incentives Low interest loans	Not yet determined
Roads subject to flooding	Maintain river channels Investigate river hydrology Increase road elevation	Floodproofing	Erosion control of river banks	Local policy comp plan	Development review Setbacks Rebuilding guidelines	Flood warning Forecasting Evacuation	Signage Training officials	Town/DOT Corps of Eng.	Capital budget ISTEA	Not yet determined

COASTAL RESOURCES CENTER
University of Rhode Island

This matrix was developed by the University of Rhode Island's Coastal Resources Center and Rhode Island Sea Grant, in collaboration with the Rhode Island Emergency Management Agency

• CRMC (Coastal Resources Management Council) will need to review projects that take place within its jurisdiction if the project is proposing a change to existing conditions or requires a permit.

- **Mitigation Types and Examples:**
- **What is at risk?** Possible projects for mitigation
- **Infrastructure Improvement/Property Protection:** Repairs, improvements, maintenance, replacement, removal, new construction, relocation or elevation of buildings, floodproofing, retrofit for wind/earthquake, land/building acquisition, floodwalls, berms, sewer backup protection.
- **Enhancing Natural Resources:** Dune and beach nourishment, non-structural erosion control, wetlands or floodplain restoration
- **Planning and Management:** Open space acquisition, local policy development, local comprehensive plan, harbor plan, CRS plans.
- **Regulatory Change:** Zoning, building code, subdivision regulations, environmental regulations, impact fees, development moratoria, rebuilding guidelines.
- **Preparedness to Reduce Losses:** Generators, communication systems, wood chipper, flood warning and forecasting, evacuation plans, financial and insurance incentives.
- **Education and Training:** Training of officials, demo projects, signage, pamphlets, media campaign, permitting and building guidelines
- **Financing Options:** Budget item, low interest loans, grants, tax credits, land swap, match - soft or hard, direct match.
- **Cost:** Estimated cost of mitigation

Mitigation strategies, derived from the mitigation matrix and extensive consultation with local officials and community members, have been developed into 24 actions. These actions, which comprehensively address the key issues, combine to create the hazard mitigation strategy to be implemented by Charlestown.

The recommendations include local initiatives, as well as strategies to be employed at the state or regional level to improve hazard mitigation. Many of the actions have several elements, or tasks, illustrating the various methods of implementation in the town strategy.

Each of the four risk issue areas contains five to nine actions. While the number of actions will depend upon the specific issue, each issue area contains four categories that are essential in any action strategy:

- Revise implementation actions in comprehensive plan
- Incorporate hazard mitigation into project review
- Develop public education, outreach and incentives
- Implement post-disaster mitigation opportunities

Each recommended action includes pertinent information for implementation: who will do the implementing, when will it occur, what resources and models are available. This information will help Charlestown during the implementation phase of their hazard mitigation strategy.

ACTIONS FOR CHARLESTOWN: ISSUE AREA #1

Residential and commercial structures subject to flooding, coastal erosion, fire and earthquakes

EXISTING CONDITIONS

Many of the residential neighborhoods adjacent to the ponds in Charlestown are low-lying and are in flood hazard areas, vulnerable to hurricanes and nor'easters. Based on 1993 data, approximately 170 houses in the floodplain would experience flood-related losses as a result of a 25-year storm event. Many of the cottages are being converted to year-round homes, some of which are on non-conforming lots. Although currently zoned as two-acre lots with setbacks from resource areas, there are many cases of non-conforming uses on substandard lots. For instance, on Charlestown Beach Road, pre-existing lots are not wide enough to accommodate currently zoned three-acre lots or the required 50-foot front yard setback. Additionally, areas on the barrier beach are subject to eroding shorelines. Charlestown's entire barrier system, salt ponds and much of the headlands (which encompass over 2,000 feet) are subject to battering waves over 2.9 feet because these areas are in the V zone. All of these structures are on individual sewage disposal systems (ISDS) with increased potential impact from failure during flood events and increased potential for failure with sea level rise, posing additional concern for water quality.

ACTION 1 - Revise Implementation Actions in the Comprehensive Plan.
(Recommendations for hazard mitigation language are indicated in *italics)*

a) LAND USE IMPLEMENTATION - High priority. Proposed zoning amendments - Develop overlay districts to specify aesthetic design standards or natural resource protection standards *or natural hazard and risk areas. Develop a shoreline overlay.* Consider a barrier beach overlay (see Action 5).

Models: American Planning Association

b) NATURAL RESOURCES IMPLEMENTATION - High priority. Develop a planner's database and map to be used as a red flag in reviewing developments. *Incorporate locations of hazard-prone structures and areas, including historic/cultural resources at risk* (see Action 2).

c) NATURAL RESOURCES IMPLEMENTATION - Medium priority. Promote access to and appreciation of the area's natural resources. *Many of these will be in hazard-prone areas; therefore, acquisition of such land would benefit both objectives* (see Action 4).

d) NATURAL RESOURCES IMPLEMENTATION - Low priority. Identify area for increased protection through dedication or acquisition of development rights or property. *Include hazard-prone areas in decision criteria for open space purchases or transfer of development rights* (see Action 6).

e) NATURAL RESOURCES 5-YEAR IMPLEMENTATION - Medium priority. Consider the use of a land transfer fee on all land transfers to fund land trust purchases, *or a dedicated fund created with money obtained from a surcharge on local building permits within floodplain areas to fund purchases within hazard-prone areas. Incorporate hazard-prone areas into the high priority land purchases*. Pursue state and federal grants for acquisitions (see Action 6).

f) CULTURAL RESOURCES - High priority. Establish historic districts, develop design standards, and pursue a listing of recommended properties using Rhode Island Historic Preservation and Heritage Commission data. *Incorporate appropriate designs for hazard mitigation to historic structures* (see Action 6).

g) DEMOGRAPHIC AND HOUSING - High priority. Encourage development of housing that is in low supply and high demand. When encouraging new housing that is in high demand, do not encourage additional housing (especially elderly and high density) in vulnerable areas, such as 100-year floodplains (see Action 2).

ACTION 2 - Incorporate Hazard Mitigation into Project Review

a) AMEND GIS DATABASE - High priority. Incorporate locations of hazard-prone structures and risk areas into the planners database and map which have been proposed in the comprehensive plan to identify red flags for reviewing developments. Include historic and cultural resources at risk. Reference comprehensive plan natural resource section.

Who: Planner
When: Short term and ongoing
Resources available: Rhode Island GIS database
Models: Rhode Island Hazard Mitigation Project

b) AMEND DEVELOPMENT DESIGN GUIDELINES - High priority. Consider hazard mitigation issues when developing town design guidelines. Insure that visual access and aesthetics standards incorporate hazard mitigation. Incorporate appropriate hazard mitigation techniques when developing design guidelines for residences, subdivisions, businesses, roads and recreational uses. Incorporate FEMA's *Safeguarding your Historic Site* into local guidelines. Reference comprehensive plan open space section.

Who: Planning Commission, Building Official, Town Council
When: Short term
Resources available: Local universities - URI or Roger Williams College
Models: FEMA's Safeguarding Your Historic Site, Blue Sky Project

c) REVISE CURRENT SUBDIVISION REGULATIONS - Medium priority. Insure that under ground utilities are mandatory in high hazard areas. At present, underground utilities are "preferred, encouraged and may be required by the Planning Commission." In areas of high wind, potential underground utilities should be mandatory for subdivisions and should be considered for public and state roads as well.

Who: Planning Commission, Planner, Director of Public Works
When: Short term and ongoing
Models: South Kingstown Ordinance

d) ENFORCE FLOODPLAIN, BUILDING AND ZONING REGULATIONS - High priority. Develop strong criteria for variances to reduce the number issued in marginal locations. Strictly enforce 50 percent substantial improvement requirements.

Who: Building Official, Zoning Board
When: Immediate and ongoing
Resources available: FEMA, State Building Commission, Office of Statewide Planning-Floodplain Management Program, Pinellas County Post-disaster Mitigation Plan

ACTION 3 - Develop and Implement Public Education, Outreach and Incentives

a) CREATE FINANCIAL INCENTIVES FOR MITIGATION - Medium priority. Develop property tax incentives such as credits or deductions for flood-proofing measures, conservation easements or flood-aversive measures. Tax undeveloped land at a lower rate.

Who: Tax Assessor, Town Council, Town Administrator, Town Treasurer, Charlestown Land Trust
When: Long term
Models: Rhode Island Hazard Mitigation Project, Blue Sky Project

b) DISTRIBUTE INFORMATION ON THE LOCATION OF HAZARD-PRONE AREAS - High priority. Provide information to contractors and homeowners on risks of building in hazard-prone areas and to inform builders and homeowners of the benefits to building and renovating structures to current standards. Provide the public with FEMA floodplain maps and other technical information developed by FEMA, state agencies and other qualified institutions to assist the public with understanding the risks and the options for mitigation.

Who: State Agencies, private sector, Building Inspector
When: Immediate and ongoing
Resources available: FEMA, Office of Statewide Planning-Floodplain Management Program, Sea Grant Fact Sheets, Institute for Business and Home Safety, Rhode Island Hazard Mitigation Project, Blue Sky Project

c) DEVELOP PUBLIC/PRIVATE PARTNERSHIPS TO CREATE FINANCIAL INCENTIVES - High priority. Participate in public/private partnerships to develop and implement public and

private financial incentives for mitigation. Actively participate in incentive programs. Encourage low-interest loan programs by private sector.

Who: Neighborhood associations, private sector, Town Council, Town Administrator
When: Short term
Resource Available: Rhode Island Hazard Mitigation Project, local/regional private sector partnerships
Models: Rhode Island Hazard Mitigation Project, Rhode Island Marina Programs

d) PROVIDE INFORMATION ON ISDS UPGRADE OPTIONS - High priority. Target education efforts for maintaining and upgrading individual sewage treatment systems (ISDS) in flood zones.

Who: Wastewater Management Commission, Department of Environmental Management
When: Short term and ongoing
Resources available: Low interest bank loans, URI Cooperative Extension's Home *A*SYST Program
Models: Charlestown's ISDS Upgrade Program, Greenwich Bay Initiative

e) PROVIDE TRAINING PROGRAMS - High priority. Participate in training opportunities for boards and local officials regarding natural hazards and hazard mitigation.

Who: Town officials, board and commission members
When: Short term and ongoing
Resources Available: Rhode Island Hazard Mitigation Program

f) AMEND DEED TRANSFERS, LEASES OR OTHER CONTRACTS - Medium priority. Incorporate a hazard disclosure requirement in deed transfers, leases, or other contracts for sale or exchange of lots within flood or other hazard areas. Such documents should also carry a flood hazard warning. Include such provisions in subdivision and zoning approvals and expand on the provisions in the real estate disclosure law (5-20.8).

Who: Rhode Island State Legislature, tax assessors, Town Council, private sector, Town Clerk
When: Medium term
Models: Florida Model Flood Management Ordinance

g) DEVELOP A LIST OF APPROPRIATE TECHNIQUES FOR HOMEOWNERS - Medium priority. A list should be compiled to assist homeowners in self-inspection of their property and provide guidance to subsequent implementation of mitigation activities.

Who: RIEMA, Rhode Island Building Commission, Institute for Business and Home Safety
When: Medium term
Resources available: Institute for Business and Home Safety, Clemson University Fact Sheets on Internet, FEMA Internet, URI Cooperative Extensions Home *A*SYST Program
Models: Institute for Business and Home Safety Retrofit Guidelines for One- and Two-Family Residences

ACTION 4 - Determine Post-disaster Mitigation Opportunities

a) PROPERTY ACQUISITION OR LAND SWAP. (See Action 6)

b) IMPLEMENT STRUCTURAL AND NON-STRUCTURAL RETROFIT PROGRAMS- Medium priority.

Who: Planning Commission, Building Official, RIEMA, FEMA
When: Short term and ongoing
Resources Available: RIEMA, FEMA, Institute for Business and Home Safety
Models: Institute for Business and Home Safety Showcase Communities

c) DOCUMENT AREAS OF DESTRUCTION AND RISK - High priority.

Who: Town Council, citizens, Town Administrator, Building Inspector, Charlestown Land Trust, Coastal Resources Management Council
When: Medium term
Resources available: Institute for Business and Home Safety, RIEMA, FEMA, Internet
Models: Institute for Business and Home Safety: "Retrofit Guidelines for One- and Two-Family Residences"

ACTION 5 - Develop a Shoreline Overlay

a) DEVELOP A HAZARD ZONING OVERLAY - Medium priority. Include standards/restrictions and best management practices for land in vulnerable areas and limit the upgrade of seasonal structures. Standards would guide development appropriately for hazards due to flooding, shoreline erosion and barrier spit dynamics.

Who: Planning Commission, Conservation Commission, Town Council
When: Medium term
Resources available: Hazard Mitigation Grant, URI Graduate Studio Project
Models: Model overlay from other states such as Florida or North Carolina, or the American Planning Association

b) DEVELOP A PROCEDURE FOR COORDINATED REVIEW - High priority. For proposed projects within hazard areas, which would include providing officials with skills in hazard analysis/evaluation and hazard mitigation.

Who: Planning Commission, Planner, Building Official, Coastal Resources Management Center
When: Short term
Models: American Planning Association

c) CONSIDER BARRIER SPITS AS SEASONAL COMMUNITIES, WITH PROVISIONS FOR NO CHANGE IN USE, NO EXPANSIONS AND NO CONVERSION OF SEASONAL STRUCTURES TO YEAR-ROUND - Low priority.

Who: Planning Commission, Town Council
When: Medium term
Models: Cape Cod Commission Regional Policy Plan

ACTION 6 - Acquire Lands in Hazard-Prone Regions of the Community

a) ACQUIRE VULNERABLE PRPOERTIES SUBJECT TO NATURAL HAZARD RISK - Medium priority. Promote the purchase of land in hazard-prone areas as benefiting multiple objectives within the community. Utilize the open space and private land trusts purchases to acquire vulnerable lands by incorporating hazard-prone areas as priority criteria for public and private land trust, and open space purchase decisions. Develop partnerships between the town and Charlestown Land Trust to identify and purchase vulnerable land.

Who: Conservation Commission, Charlestown Land Trust, Town Council, Town Administrator, Coastal Resources Management Council
When: Medium term and post-disaster
Resources available: Trust for Public Lands, U.S. Department of Interior-National Wildlife Refuge, U.S. Fish and Wildlife Service, State-Implemented Federal Land and Water Conservation Fund, U.S. Park Service-Rivers & Trails
Models: FEMA's Property Buy-Out Program

b) ESTABLISH A REVENUE SOURCE TO PURCHASE HAZARD-PRONE PROPERTY - Low priority. Develop a local fund for the purchase of hazard-prone areas through the institution of a land transfer fee, a surcharge on recorded deeds or plats, or an additional surcharge on building permits in hazard areas to fund purchases within hazard-prone areas. Such a fund can be used to leverage state and federal grants to target buy-out of repetitive damage areas. Incorporate hazard-prone areas into the high priority land purchases.

Who: Conservation Commission, Town Council, Town Treasurer, Town Administrator, Coastal Resources Management Council
When: Long term
Resources available: Trust for Public Lands, Nature Conservancy
Models: Martha's Vineyard Land Bank, State of Rhode Island Surcharge for Building Permit, Watercrest County (FL) Program, All Hazards Protection District Fund

c) IDENTIFY OPPORTUNITIES FOR POST-DISASTER OPEN SPACE ACQUISITION IN A PRE-DISASTER TIME FRAME - Medium priority. Initiate discussions with land owners for future purchase with state and federal hazard mitigation grant funds following federally declared disasters.

Who: Conservation Commission, Charlestown Land Trust, neighborhood associations, Department of Environmental Management, Coastal Resources Management Council
When: Medium term and ongoing
Models: NFIP

d) DEVELOP LIST OF PRIORITY SITES OF WATERFRONT LOTS- Medium priority. These would provide public access, and would identify those lots that are damaged recurrently or which may be extremely vulnerable if built upon in the future. Acquisition opportunities for these waterfront lots may provide additional benefits for passive recreation or a boat ramp. The comprehensive plan and the Harbor Management Plan identify the need for additional public access to the shore, including boat ramp access.

Who: Coastal Ponds Committee, Conservation Commission, neighborhood associations, user groups, coastal resources management council

When: Medium term
Resources available: Federal/state boating or gasoline tax, public access funds, local capital improvements budget, state/Federal waterways improvements funds

ACTIONS FOR CHARLESTOWN: ISSUE AREA #2

Coastal Processes and Coastal Storms Subjecting the Beaches to Erosion

EXISTING CONDITIONS

The land south of Route 1 that is adjacent to the ocean and coastal lagoons is flat and sandy. Because of this geomorphology, the land is threatened by severe storms, beach erosion and rising sea levels. Development on Charlestown Beach has raised concerns about increased erosion and flood damage from coastal storms. The barrier spit provides storm protection for the salt ponds and the backshore, and is a unique habitat for wildlife. Therefore, it is important to maintain a healthy barrier system. Natural landward migration of barriers threatens permanent structures built upon them, since the barrier will eventually move out from under the buildings. Charlestown Beach was totally overwashed in both the 1938 and 1954 hurricanes, and many of the structures were destroyed. Structures have been rebuilt since then, many of which have been moved landward because shoreline erosion has threatened their stability. Structures were not rebuilt on East Beach subsequent to the 1954 hurricane, however.

During a 100-year storm, the barriers (with an elevation of 12 feet above sea level) are vulnerable to overwash from surge waves as large as 18 feet above sea level. During such a storm event, waves will enter the ponds. Recent storms have caused damage to the jetties. The channels landward of the jetties serve as flood tidal deltas, which deposit sand on incoming tides. The jetties do not block the longshore sand (littoral) transport occurring on the ocean side of the barriers. Some of the sand that is transported along the shore is deposited inside the salt ponds due to incoming tides.

ACTION 7 - Revise Implementation Actions in Comprehensive Plan

(Recommendations for hazard mitigation language are indicated in *italics.*)

a) LAND USE IMPLEMENTATION - High priority. Proposed Zoning Amendment - Define the seaward setbacks along the barrier beach to be the most severe erosional dune scarp (i.e. from the Blizzard of 1978 or more severe erosion after 1978). *Setbacks can be incorporated into a zoning scheme and shoreline overlay.* (See Action 11)
Who: Planning Commission, Coastal Resources Management Council
When: Medium term
Resources available: URI Geology Department's Shoreline Erosion Data
Models: Coastal Resources Management Council

ACTION 8 - Incorporate Hazard Mitigation into Project Review

a) IMPLEMENTATION HAZARD MITIGATION MEASURES - High priority. Strictly enforce floodplain standards for structures in V zone and A zone. Ensure that areas below the base flood elevations are not used inappropriately after the certificate of occupancy is received.
Who: Building Inspector
When: Ongoing

b) PROVIDE PUBLIC EDUCATION MATERIALS - High priority. Educate homeowners and contractors on appropriate methods for landscaping to reduce erosion and damage from wind.
Who: Conservation Commission, Building Inspector
When: Ongoing
Resources available: URI Cooperative Extension, Sea Grant
Models: Nantucket, MA "Guide to Indigenous Landscaping"

c) REVIEW CRITERIA FOR VARIANCE - Medium priority. Highly discourage the issuance of variances for the coastal erosion setbacks.
Who: Zoning Board, Town Council, Coastal Resources Management Council
When: Short term

d) DEVELOP A LONG-TERM MAINTENANCE PLAN FOR CHARLESTOWN BEACH ROAD - Low priority. Consider adopting a policy prohibiting bulldozing sand overwash along Charlestown Beach Road following a storm.
Who: Town Council, Coastal Resources Management Council, Director of Public Works
When: Short term and post-disaster

e) DISCOURAGE REBUILDING ON BARRIER BEACHES - High priority. Develop a policy regarding rebuilding on the barrier beach following substantial damage. Erosion setbacks should be implemented on all new or substantially improved structures in accordance with Coastal Resources Management Council regulations.
Who: Planning Commission, Town Council, Coastal Resources Management Council
When: Medium term and ongoing
Models: Coastal Resources Management Council regulations, Cape Cod Commission Regional Policy Plan

f) DO NOT DEVELOP IN HIGH RISK FLOOD-PRONE AREAS - High priority. Maintain policy of no new infrastructure on undeveloped barrier beaches, and no paving of roads/parking areas. Incorporate standards into shoreline overlay and subdivision regulations.
Who: Planning Commission, Town Council, Coastal Resources Management Council
When: Short term and post-disaster

ACTION 9 - Develop and Implement Public Education, Outreach and Incentives

a) PROVIDE PUBLIC EDUCATION MATERIALS ON HAZARDS AND TYPES OF MITIGATION FOR HOMEOWNERS (Including Seasonal Residents and Visitors) - High priority. Includes evacuation maps and signs posted along state roads, Charlestown Beach Road, Narrow Lane, Routes 1, 2, 112, 216 and East/West Beach roads.
Who: Town offices, Chamber of Commerce, Army Corps of Engineers, Conservation Commission
When: Ongoing
Resources available: Rhode Island Sea Grant, Rhode Island Chapter of the Red Cross, RIEMA, Rhode Island Hazard Mitigation Project, Institute for Business and Home Safety
Models: Florida and North Carolina programs

b) PROVIDE WORKSHOPS FOR RESIDENTS - Medium priority. Discuss the current regulations and standards on building, renovation and floodplain management.

Who: Building Inspector, Conservation Commission, Chamber of Commerce, URI Cooperative Extension
When: Medium term and ongoing
Resources available: Rhode Island Division of Planning - Floodplain Management Division, FEMA

ACTION 10 - Identify Post-disaster Mitigation Opportunities

a) PROPERTY ACQUISITION. (See Action 6)

b) ENCOURAGE RETROFIT OF DAMAGED PROPERTY. (See Action 6)

c) IMPLEMENT SETBACK PROVISIONS FOR STRUCTURES IN EROSION-PRONE AREAS. (See Action 6)

d) WORK CLOSELY WITH COASTAL RESOURCES MANAGEMENT COUNCIL TO DETERMINE APPROPRIATE STANDARDS (See Action 6)

e) IMPLEMENT NON-STRUCTURAL ALTERNATIVES TO SHORELINE PROTECTION (Nourishment or Dune Planting) WHERE APPROPRIATE (See Action 6)

f) SAND OVERWASH SHOULD REMAIN IN THIS POSITION, WHERE FEASIBLE, TO HELP BUILD THE BARRIER - Medium priority.

Who: Town Council, citizens, Town Administrator, Director of Public Works, Building Inspector, Conservation Commission, Charlestown Land Trust, Coastal Resources Management Council
When: Medium term
Resources available: Institute for Business and Home Safety, RIEMA, FEMA, World Wildlife Fund, Coastal Resources Management Council
Models: Institute for Business and Home Safety Retrofit Guidelines for One- and Two-Family Residences

ACTION 11 - Enhance Public Beach Facilities and Public Access

a) IMPROVE PUBLIC ACCESS OPPORTUNITIES - Medium priority. Develop dune/beach nourishment program for selective areas of concern to maintain appropriate beach profile for public properties on eroding barrier beaches.

Who: Conservation Commission, Department of Parks and Recreation, Department of Public Works
When: Medium term
Resources available: Beach fees, post-disaster funds, dredge material disposal

b) PROVIDE PUBLIC TRANSPORTATION TO AVOID NEED FOR ADDITIONAL PARKING FACILITIES - Low priority. Consider the implementation of a beach shuttle, which would

reduce the need to build more on-site parking lots, which require heavy maintenance (especially asphalt) in flood-prone areas.

Who: Department or Director of Parks and Recreation, Rhode Island Department of Transportation, Department or Director of Public Works, Town Council
When: Short term
Resources available: Federal Intermodal Surface Transportation and Efficiency Act grants
Models: Yarmouth (MA) Program, Dennis (MA) Program, Cape Cod National Seashore

c) UPGRADE PUBLIC BEACH FACILITIES - Medium priority. The state beach house should be elevated and relocated, while the town should consider alternatives to new permanent sanitary facilities in the future, including portable units.

Who: Department of Public Works, Department of Parks and Recreation, Rhode Island Department of Environmental Management
When: Short term or post-disaster
Resources available: Department of Environmental Management Funds for Recreational Facilities, FEMA Floodproofing
Models: South Kingstown Town Beach

Develop Open Space Acquisition Strategy - Priority acquisition should include beach front areas adjacent and near to existing public beach facilities (see Action 6).

ACTION 12 - Enhance Disaster Preparedness

a) DEVELOP POST-STORM RECOVERY PLAN FOR BARRIER SPITS - High priority. Recovery plans should include provisions for minimal issuance of variances, and review 50 percent rebuilding criteria, which states that structures which require substantial rebuilding (50 percent or greater the replacement value) shall rebuild according to current standards. Recommend that the properties that had repetitive loss damage over 50 percent be required to upgrade to current standards. Install additional flood stage markers through out the town.

Who: Planning Commission, Town Council, Building Inspector, Army Corps of Engineers, Coastal Resources Management Council
When: Medium term
Resources available: FEMA
Models: Florida Model Ordinance and Plan, American Planning Association

b) FORMALIZE MUTUAL AID AGREEMENT - High priority. Work with the Narragansett Indian Tribe, and neighboring towns and communities in Connecticut and elsewhere to provide assistance for post-disaster inspections and issuance of building permits.

Who: Building Official, Rhode Island State Building Commission, Town Administrator
When: Short term
Models: Massachusetts Building Official Mutual Aid Agreement, Rhode Island Fire Fighters Mutual Aid Agreements

c) ESTABLISH A DISASTER RECOVERY TEAM - High priority. Formalize a disaster recovery team in cooperation with RIEMA and Coastal Resources Management Council to coordinate post-disaster procedures for designation of "substantial improvement" structures, emergency permitting and rebuilding standards.

Who: Building Official, Town Administrator
When: Short term
Models: Pinealis County (FL) Program, Kill Devil Hills (NC) Program

ACTION 13 - Enhance Circulation in Coastal Ponds

a) EVALUATE OPTIONS TO IMPROVE FLOW, AND EXAMINE THE EXISTING STRUCTURAL INTEGRITY OF THE EXISTING JETTIES - High priority. Evaluate whether dredging would improve safety in the jetties or pond entrance.

Who: Department of Environmental Management, Coastal Resources Management Council, Harbormaster
When: Medium term
Resources available: U.S. Army Corps of Engineers, capital budget
Models: Hydraulic model (i.e. Corps of Engineers or Applied Sciences Associates)

ACTION 14 - Insure Continued Safety of Navigation in the Ponds

a) IMPROVE NAVIGATION FACILITIES IN CHARLESTOWN BREACHWAY - High priority. Navigation markers and flood stage markers should be installed and maintained to improve navigation landward of the Charlestown Breachway.

Who: Harbormaster, Coastal Ponds Committee, Department of Environmental Management, Army Corps of Engineers, Coastal Resources Management Council
When: Short term
Resources available: State/Federal Waterway funds

b) INSPECT SHORELINE STRUCTURES - High priority. Inspection of coastal structures and existing jetties to insure structural stability and ability to withstand wave attack during high storm activity.

Who: Department of Environmental Management, Coastal Resources Management Council
When: Ongoing

ACTIONS FOR CHARLESTOWN: ISSUE AREA #3

Roads, Bridges and Dams Subject to Flooding, Erosion and Earthquakes

EXISTING CONDITIONS

The U.S. Army Corps of Engineers identifies several low-lying roads vulnerable to flooding from storms - Shore Drive, Sea Lea Avenue, Wall Street, Meadow Lane near Ninigret Pond, Ram Island, East Beach and West Beach roads. It is important to keep in mind that 55 percent of the roads in Charlestown are privately owned. The primary evacuation routes for Charlestown are Routes 1, 2 and 112, which will also serve as the principal evacuation road for adjacent communities that may need to evacuate simultaneously. Many of the north/south arteries in the northern part of Charlestown will be

required to carry a majority of the evacuating population. These roads are the only access from the east/west connectors.

ACTION 15 - Revise Comprehensive Plan Implementation Activities

(Recommendations for hazard mitigation language are indicated in *italics.*)

a) CIRCULATION IMPLEMENTATION - High priority. Provide adequate funding for road maintenance and improvement program. Maintenance and improvement projects should consider mitigation opportunities where necessary. Funding may be available for mitigation projects through future mitigation grants.
Who: Planning Commission, Town Council
When: Short term
Resources available: RIEMA: "Resource Services Guide"

b) CIRCULATION IMPLEMENTATION - High priority. Designate scenic roads and develop standards to protect scenic qualities. Evacuation and signage during summer hurricane season should be considered when developing standards.
Who: Planning Commission, Town Council
When: Short term
Resources available: RIEMA: "Resource Services Guide"

c) CIRCULATION IMPLEMENTATION - High priority. Develop a liaison function to work with Rhode Island Department of Transportation. Improvements for state roads and bridges should consider mitigation measures. Rhode Island Department of Transportation and RIEMA should coordinate with South Shore communities regarding regional evacuation routes (i.e. Rtes. 1, 2, 91, 112 and 216).
Who: Planning Commission, Town Council
When: Short term
Resources available: RIEMA: "Resource Services Guide"

d) SERVICES AND FACILITIES - High priority. Fund hurricane damage impact study/contingency plan for coastal floodplain. Several impact studies have been conducted to date. The town should prepare post-disaster redevelopment plan and strategy for vulnerable areas, including barrier beaches.
Who: Planning Commission, Town Council, Coastal Resources Management
When: Short term
Resources available: RIEMA: "Resource Services Guide," FEMA

ACTION 16 - Incorporate Hazard Mitigation into Project Review

a) SITE PLAN REVIEW SHOULD UTILIZE PLANNER'S DATABASE - High priority. Include evaluation of the impact of the proposed development on evacuation routes. Mitigation (i.e. road upgrade, culvert upgrade, new road) should be required where new development may affect evacuation.
Who: Planning Commission, Building Inspector, Department of Public Works
When: Ongoing

Resources available: Rhode Island Geographical Information System, U.S. Army Corps of Engineers SLOSH Model, RIEMA

b) INCORPORATE BEST MANAGEMENT MITIGATION PRACTICES - High priority. Define and incorporate maintenance and improvement projects into town, state and private infrastructure.

Who: Department of Public Works, Rhode Island Department of Transportation, Charlestown Parks and Recreation Director
When: Ongoing
Resources available: Local and state public works budgets, Federal Intermodal Surface Transportation and Efficiency Act funds
Models: Vermont Local Roads Program[9]

ACTION 17 - Develop and Implement Public Education, Outreach and Incentives

a) POST EVACUATION ROUTES - High priority. Install flood elevation signs and evacuation signs on barrier beaches within flood zones and evacuation routes. Distribute maps with evacuation routes to tenants of seasonal cottages and residents.

Who: Civil Preparedness Director, Department of Public Works, Realtors Association, Chamber of Commerce, Building Inspector, Town Administrator
When: Medium term
Resources available: U.S. Army Corps of Engineers
Models: Nags Head (NC) program, CT Department of Environment Protection – Hazard Mitigation Grant Program

ACTION 18 - Determine Post-disaster Mitigation Opportunities

a) DOCUMENT PROBLEMS ASSOCIATED WITH DISASTER FOR FUTURE MITIGATION ACTIVITIES. (See Action 10)

b) EVALUATE THE APPROPRIATENESS OF REPLACING UNDER-SIZED CULVERTS WITH ADEQUATE CULVERTS. (See Action 10)

c) REEVALUATE EVACUATION PLAN. (See Action 10)

d) INCORPORATE ADEQUATE DRAINAGE FACILITIES IN DESIGN FOR ROAD REPAIR. (See Action 10)

ACTION 19 - Project Development/Capital Facilities Budget

a) INCORPORATE MITIGATION INFRASTRUCTURE IMPROVEMENTS INTO ONGOING AND NEW PROJECTS - Medium priority (i.e. new subdivision, repaving of roads). Identify other opportunities (i.e. natural resource enhancements, drainage improvements) where feasible to leverage alternate/additional funding (i.e. Intermodal Surface Transportation and Efficiency Act) and additional benefits.

[9] "Road Design and Maintenance Handbook: Techniques for Reducing Flood Damage to Local Roads," Vermont Local Roads Program, St. Michael's College, Winooski Park, Colchester, VT 05439.

Who: Department of Public Works, Town Administrator, Town Treasurer
When: Ongoing
Resources available: Project budget

b) IMPLEMENT MITIGATION MEASURES FOR EXISTING INFRASTRUCTURE - Medium priority. Maintenance and improvement projects for existing infrastructure should incorporate mitigation opportunities where necessary. Funding may be available for mitigation projects through future mitigation grants.

Who: Department of Public Works, Town Administrator
When: Ongoing
Resources available: Project budget, capital budget, grants

ACTIONS FOR CHARLESTOWN: ISSUE AREA #4

Environmental Resources Vulnerable to Forest Fires, Flooding, Earthquakes and Coastal Erosion

EXISTING CONDITIONS

The comprehensive plan states that in 1989, 60.7 percent of the town was undeveloped. Much of this area is wooded and forested. With increased development pressures and susceptibility to drought, there is an increased threat that forest fires may start. These developed areas do not have a public water supply that has sufficient quantity and pressure to provide adequate fire protection.

ACTION 20 - Revise Comprehensive Plan Implementation Activities

(Recommendations for hazard mitigation language are indicated in *italics.)*

a) NATURAL RESOURCES IMPLEMENTATION - High priority. Develop a planner's database and map to be used as a red flag in reviewing developments in conjunction with the Rhode Island Historic Preservation Commission. Incorporate locations of hazard-prone structures and areas, include historic/cultural resources at risk (see Action 5).

b) NATURAL RESOURCES IMPLEMENTATION - Medium priority. Promote access to and appreciation of the area's natural resources. Many of these resources will be in hazard prone areas; therefore, acquisition of such land would benefit both objectives (see Action 4).

c) NATURAL RESOURCES- Low priority. Identify area for increased protection through dedication or acquisition of development rights or property. Include hazard-prone areas in decision criteria for open space purchases. (See Action 4)

Who: Conservation Commission, Planning Commission, Town Council, Charlestown Land Trust
When: Short term

ACTION 21 - Incorporate Hazard Mitigation into Project Review

a) MAINTAIN ADEQUATE FIRE BREAKS AND ACCESS TO AND WITHIN FORESTS - High priority.

Who: Fire districts, Department of Public Works, Department of Environmental Management

When: Ongoing
Models: Massachusetts Department of Environmental Management Fire Annex to State Hazard Mitigation Strategy

b) SUBDIVISION PLANS SHOULD INCLUDE GRANTING OF EASEMENT FOR FIRE BREAKS AND INSTALLATION OF CONCRETE WATER TANKS - High priority. Store adequate supply of water for fire protection.
Who: Planning Commission, Fire districts
When: Ongoing
Models: Richmond Subdivision regulations

ACTION 22 - Develop and Implement Public Education, Outreach and Incentives

a) EDUCATE PUBLIC ABOUT SAFE FIRE PRACTICES - Low priority. Provide resources to the Parks and Recreation and Fire departments for staff training and public education regarding campfires and appropriate practices in times of drought.
Who: Parks and Recreation Department, Fire districts, Department of Environmental Management, State Fire Marshall
When: Ongoing
Resources available: Required local and state training budgets
Models: Department of Environmental Management

ACTION 23 - Determine Post-disaster Mitigation Opportunities

a) ACQUISITION OF LAND IN VULNERABLE AREAS. (See Action 10)

b) CLEANUP OPERATIONS SHOULD INCLUDE MAINTENANCE OF ACCESS ROADS. (See Action 10)

c) MITIGATION GRANT PRIORITIES SHOULD INCLUDE CONSTRUCTION OF WATER TANKS IN VULNERABLE AREAS. (See Action 10)

ACTION 24 - Improve Insufficient Fire Fighting Capability

a) REVIEW MUTUAL AID AGREEMENTS - High priority. Insure that mutual aid agreements between the town and the local Narragansett Indian Tribe within the region, and the responsibilities of the Department of Environmental Management, are adequate to support the needs of Charlestown in time of disaster.
Who: Town Administrator, Fire district, Department of Environmental Management, State Fire Marshall
When: Short term
Resources available: California Mutual Aid agreements

2.2 Implementation Schedule

The LHMC realized that assigning a time frame to each recommended mitigation action is important so that activities are coordinated with other key governmental functions, such as budget

hearings. Assigned time frames also provide a guideline for tracking the progress of all activities. The time frames are incorporated in Section 2.0.

2.3 Strategy Adoption

The town's hazard mitigation strategy was approved for adoption by the Planning Commission and the Town Council October 21, 1997. The next step was to gain the approval of the State Hazard Mitigation Committee (SHMC), the executive director of RIEMA and FEMA Region I.

The members of the LHMC, along with the Town Council, will recommend that these actions become amendments to the comprehensive plan which will need Town Council approval.

2.4 Implementation, Evaluation and Revision of Strategy

Implementation

In order to establish the authority and accountability for implementation, Charlestown suggested that amendments be made to the comprehensive plan to appropriately address the theme of natural hazard mitigation. The second step was to continue to implement actions that enable preventative or protective measures to be accomplished. The third step was to prioritize the recommended actions based on criteria the community established (see mitigation matrix). Charlestown is now acting to secure sufficient resources in order to carry out these recommended actions that were listed on the mitigation matrix.

Priority Mitigation projects

Funding for Implementation of Hazard Mitigation Actions:

- Purchase vulnerable property (with repetitive losses) on Charlestown Beach (near town or state facilities) for passive recreation and access.
- Purchase vulnerable property (with repetitive losses) on the backshore of the ponds for hazard mitigation and boat ramp.
- Flood-proof homes.
- Improve culverts to reduce future flooding and protect evacuation routes.
- Provide public education for local citizens.

Funding for Planning/Management Initiatives for Hazard Mitigation:

- Create post-storm redevelopment plan, examine potential for utilizing GIS development of shoreline overlay in zoning ordinance.
- Develop best management guidance for subdivision plans.
- Develop planners database utilizing GIS software.
- Develop public-private incentives for mitigation of residential structures.

Evaluation

The LHMC and other elected local officials plan to meet every six months to insure that the mitigation actions are being implemented in accordance with the assigned time frames and that the strategy is updated. They will monitor and document progress.

Revision

The local strategy will be edited/updated and printed once a year. The update should be reviewed and submitted to RIEMA upon local approval to insure that the State Hazard Mitigation Strategy also remains current.

Bibliography

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Flood Insurance Study, Town of Charlestown, Rhode Island, Washington County. Federal Emergency Management Agency. January 3, 1986.

Hazard Mitigation Planning Guidance for Local Governments. Tennessee Emergency Management Agency. December 1995.

National Flood Insurance Program's Community Rating System: Example Plans. Federal Emergency Management Agency. July 1996.

Rhode Island Hurricane Evacuation Study Technical Data Report. U.S. Army Corps of Engineers/ Federal Emergency Management Agency. 1995.

Road Design and Maintenance Handbook, Techniques for Reducing Flood Damage to Local Road. Vermont Local Roads Program, St. Michael's College, Winooski Park, Colchester, VT.

Town of Charlestown. Comprehensive Plan. 1991.

Tyrell, T.J. 1989. Economic Impacts of Sea Level Rise. University of Rhode Island Resource Economics Department.

U.S. Army Corps of Engineers. 1996. Section 206: Floodplain Management Services - Study of Coastal Flooding. Charlestown, Rhode Island.

U.S. Army Corps of Engineers/Federal Emergency Management Agency. 1995. Rhode Island Hurricane Evacuation Study. Technical Data Report.

Sources Consulted:

Alan A. Arsenault, Public Works Director

Jon C. Boothroyd, professor and coastal geologist at the University of Rhode Island

Donald DiNucci, Town Building Inspector

Martha Fitzgerald, Town Tax Assessor Office

Victor Parmentier, Rhode Island State Floodplain Manager, State Division of Planning

David Smith, Town Civil Preparedness Director

Jeffrey Willis, Rhode Island Coastal Resources Management Council

Appendices

A. Technical and Financial Assistance for Mitigation

B. Exisiting Protection Systems-Federal and State

C. Public Information and Outreach

D. CRMC Erosion rates

Technical and Financial Assistance for Mitigation

State Resources

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

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

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

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

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

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

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

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

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

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

Federal Resources

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

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

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

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

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

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

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

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.

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 floodproof 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 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 R.I. 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 federal-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-floodproofing, 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) floodproofed 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 floodprone property.

Public Information and Outreach

TOWN OF CHARLESTOWN

Sea Grant
Rhode Island

COASTAL RESOURCES CENTER
University of Rhode Island