Rhode Island's Salt Pond Region: A Post Hurricane Recovery and Mitigation Plan

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Rhode Island's Salt Pond Region: A Post Hurricane Recovery and Mitigation Plan

(Watch Hill to Point Judith)

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for the Coastal Resources Management Council by

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CONTENTS

EXECUTIVE SUMMARY iv

CHAPTER ONE. THE OBJECTIVES OF THE POST-HURRICANE RECOVERY AND MITIGATION PLAN 1

Section 110. Risk and Vulnerability 2
110.1 Hurricane Risk 2
110.2 Winter Storm Risk 2
110.3 Sea Level Rise 2
110.4 Vulnerability of Coastal Communities to Loss of Life and Property Damage 4

Section 120. Potential Actions to Reduce Vulnerability to Hurricane Damages 5

Section 130. Lessons from Other States and Communities 7
130.1 Preparedness 7
130.2 Emergency Response 7
130.3 Long-Term Recovery and Mitigation 8

Section 140. The Goals of the Plan 9

CHAPTER TWO. THE MANAGEMENT FRAMEWORK FOR RECOVERY AND MITIGATION 11

Section 210. Land Use Regulations and Flood Zone Construction Standards 12
210.1 Federal 12
210.2 State 13
210.3 Municipal 16

Section 220. Federal Assistance for Disaster Recovery 16
220.1 FEMA Procedures for Federal Disaster Assistance 17
220.2 Disaster Assistance from Other Federal Agencies 17
220.3 Hazard Mitigation under Federal Disaster Assistance Programs 17

Section 230. State of Rhode Island Emergency Management 20
230.1 Governor of the State of Rhode Island 20
230.2 Rhode Island Emergency Management Agency 20
230.3 Rhode Island Defense Civil Preparedness Advisory Council 23
230.4 State Agencies and Departments 23
230.5 Coastal Resources Management Council 23
230.6 Section 406 Hazard Mitigation Planning 23

Section 240. Municipal Responsibilities for Disaster Recovery 23

CHAPTER THREE. POST-HURRICANE RECOVERY AND MITIGATION IN RHODE ISLAND'S COASTAL REGION 26

Section 310. Coordination of Emergency Response Actions 27
310.1 Debris Removal and Disposal 27

310.2 Removal of Overwash Sand and Restoration of Temporary Inlets 28
310.3 Coordination of Emergency Response Actions 28

Section 320. Damage Assessments 29
320.1 Initial Damage Assessments 29
320.2 Hazard Mitigation Advisory Committee(s) 31
320.3 Hazard Mitigation Assessments 31

Section 330. Reconstruction after Storms 33
330.1 Reconstruction Standards 34
330.2 Emergency Procedures for Issuance of CRMC Assents 34
330.3 Coordinated Procedures for Emergency Permitting 36
330.4 Rebuilding of Infrastructure 36
330.5 Acquisition and Relocation 37
330.6 Construction Standards 38

CHAPTER FOUR. POST-HURRICANE RECOVERY AND MITIGATION IN THE SALT POND REGION 39

Section 410. Risk and Vulnerability of the Salt Pond Region 40
410.1 Hurricane Risk 40
410.2 Vulnerability to Damages 43

Section 420. Emergency Response and Recovery Actions 43
420.1 Areas for Temporary Storage of Debris 43
420.2 Removal and Disposal of Overwash Sand 47
420.3 Restoration of Overwash Channels and Temporary Inlets 48

Section 430. Damage Assessments and Short-Term Recovery 49
430.1 Initial Damage Assessments 49
430.2 Hazard Mitigation Advisory Committee 49
430.3 Permitting for Reconstruction 49

Section 440. Long-Term Reconstruction for Hazard Mitigation 49
440.1 Point Judith Pond 50
440.2 Potter Pond 51
440.3 Cards Pond 51
440.4 Trustom Pond 51
440.5 Green Hill Pond 51
440.6 Ninigret Pond 51
440.7 Quonochontaug Pond 52
440.8 Winnapaug Pond 52

APPENDIX A. REFERENCES

APPENDIX B. FEDERAL DISASTER ASSISTANCE PROGRAMS

APPENDIX C. DRAFT INTERAGENCY AGREEMENT BETWEEN CRMC AND RIEMA RECOMMENDATIONS FOR AERIAL PHOTOGRAPHY

LIST OF FIGURES

1.1 Expected Number of Tropical Storms and Hurricanes per 100 Years Impacting Rhode Island. 3

2.1 Timing of Federal Disaster Assistance Activities. 18

2.2 State Organization for Emergency Management. 21

2.3 Sequence of Local Activities in Assessing Damages and Permitting Reconstruction. 25

4.1 The Salt Pond Region. 41

4.2 High Hazard Flood Zone Areas within the Salt Pond Region of the Towns of Westerly, Charlestown, South Kingston and Narragansett. 42

4.3 The Trend in Development Around the Salt Ponds South of Route 1. 44

LIST OF TABLES

2.1 Federal Disaster Assistance Programs Aiding Directly in Repairs and Reconstruction. 19

4.1 Number of Structures in Coastal Wave Velocity (V) Zones and in 100-Year Flood (A) Zones within Rhode Island's Salt Pond Region. 45

4.2 Estimates of Property Damage within the High Hazard Flood Zones of the Salt Pond Region Based on Structures Existing in 1981. 46

EXECUTIVE SUMMARY

The entire Rhode Island coast is at risk from hurricanes and coastal storms. Buildings and infrastructure located within coastal flood hazard areas are highly vulnerable to damage from hurricanes as well as other coastal storms. Persons who live and work in these areas are vulnerable to injury and even loss of life. The presence of several large coastal ponds behind low lying and fragile coastal barriers makes the Salt Pond Region from Westerly to Naragansett particularly subject to coastal flooding.

Rhode Island now has an active and strong coastal management program administered by the Coastal Resources Management Council (CRMC). Nevertheless, much development that occurred prior to implementation of the Coastal Resources Management Program (CRMP) is vulnerable to damage, and even some recent development may be vulnerable to major storms. Further, the CRMP does not specifically address reconstruction following a major disaster. The potential exists for recovery and reconstruction after a disaster that would leave coastal areas just as -- or perhaps even more -- vulnerable to damage as they were before the disaster. In an effort to avoid this situation, CRMC decided to develop a Post-Hurricane Recovery and Mitigation Plan for the Salt Pond Region.

The goals of this Post Hurricane Recovery and Mitigation Plan are:

- To provide guidelines for resolving conflicts between recovery and mitigation actions and for achieving a balance between these actions.
- To coordinate state and municipal plans and actions for post hurricane recovery and mitigation.
- To identify mitigation actions which represent special opportunities for reducing future hurricane-caused damages, and which can and should be undertaken in concert with recovery actions.

These goals are directed toward reducing the potential adverse effects of future storms while at the same time accomplishing efficient and effective restoration of normal community functions in the aftermath of a major storm. These goals are based on recognition that it is possible to break the historical, long-term cycle of repeated destruction in which coastal development is damaged or destroyed by a hurricane, rebuilt much as it was before, and then damaged or destroyed again by the next major storm.

By establishing a framework for action -- assigning mitigation responsibilities, developing procedures for carrying out those responsibilities, instituting necessary legal authority, making sure resources are available, and developing priorities for recovery and mitigation -- state and local officials can effect rapid recovery from future disasters while simultaneously taking advantage of mitigation opportunities. Without such a framework, existing disaster recovery procedures, combined with public compassion for disaster victims, can create strong pressures for restoration to pre-disaster conditions.

To help achieve these goals, the Plan describes the existing management framework for disaster recovery and mitigation, including land use regulations and flood zone construction standards, Federal assistance for disaster recovery, state emergency management procedures and requirements, and municipal responsibilities. Any post-disaster plan must be developed with a full recognition and understanding of this existing management framework.

Many of the actions necessary for post-hurricane recovery and mitigation are needed at the state level and will apply throughout the coastal area. Therefore, the Plan includes recommendations and guidance for CRMC, other state agencies, and all coastal communities, including:

- identifying and using temporary debris storage areas, and permanent disposal of debris;
- removal of overwash sand and restoration of temporary inlets;
- development of interagency memoranda of agreements concerning emergency procedures for debris and sand removal and disposal and restoration of temporary inlets and channels (including a sample draft agreement between CRMC and RIEMA);
- conducting required damage assessments using specialized damage assessment teams;
- designation of a Hazard Mitigation Advisory Committee(s) by CRMC to evaluate opportunities for hazard mitigation and make recommendations for individual communities and state agencies.
- conducting hazard mitigation assessments utilizing post-flood aerial photographs (guidelines for photography provided), inspection of selected structures and natural features, and determination of the extent of flooding;
- participation on the Federal Interagency Hazard Mitigation Team;
- establishment of a set of emergency procedures governing issuance of CRMC assents for reconstruction, including use of temporary moratoria, establishment of priorities for processing applications, and public notification of emergency permitting procedures;
- rebuilding of infrastructure;
- acquisition and relocation of severely damaged or highly vulnerable properties;
- modification of current construction standards, including the RI Building Code and CRMP standards.

In addition to recommendations and that apply throughout the coastal area, state and local post-hurricane recommendations and guidance which are specific to the Salt Pond Region include:

- identification of suggested areas for temporary storage of debris;
- procedures for removal and disposal of overwash sand;
- procedures for restoration of overwash channels and temporary inlets;
- appointment of damage assessment teams;
- designation of the Salt Pond Action Committee as a post-hurricane Hazard Mitigation Advisory Committee;
- establishment of municipal emergency permitting procedures that parallel those of the CRMC;
- identification of areas of greatest vulnerability to damage and potential post-hurricane action for residences, commercial establishments and infrastructure in the regions of Point Judith Pond, Potter Pond, Cards Pond, Trustom Pond, Green Hill Pond, Ninigret Pond, Quonochontaug Pond, and Winnapaug Pond.

This plan can aid both the state and communities in assisting with a rapid recovery from a hurricane disaster that also leaves communities less vulnerable to damages than they were before the disaster. Because the extent and severity of damages from the next major hurricane cannot be predicted with precision, the plan cannot provide a set of detailed, site-specific decisions to be implemented in the post-disaster period, but it does provide the basis for recognizing that actions should be taken to reduce long-term vulnerability to flood damages and identifies the kinds of actions a community may take.

Chapter One.

The Objectives of the Post-Hurricane Recovery and Mitigation Plan

110. RISK AND VULNERABILITY

110.1 Hurricane Risk

Rhode Island has been directly affected by most of the major hurricanes that have reached New England during recorded history. Seventy-one hurricanes have struck the state's shore since 1635, with an average frequency of one every seven years. The high winds, storm surge and waves generated by these hurricanes have caused enormous destruction, killing hundreds of people and causing millions of dollars in property damage in the coastal area.1 Figure 1.1 provides information on the expected frequency of hurricanes and tropical storms affecting Rhode Island. During any 10 year period, there is an 80% probability of a hurricane impacting the area.2

The most devastating hurricane to strike Rhode Island in modern times was the Great Atlantic Hurricane of September 21, 1938 which caused over $100 million in property damage and 262 fatalities. The tidal gauge at Westerly measured a storm surge 15 feet above mean sea level during this storm. Between 1944 and 1955, four other damaging hurricanes struck Rhode Island, with Hurricane Carol in August 1954 causing $200 million in property damage and 19 fatalities. Hurricane Donna in September 1960 and Hurricane Esther in September 1961 caused modest damage.3

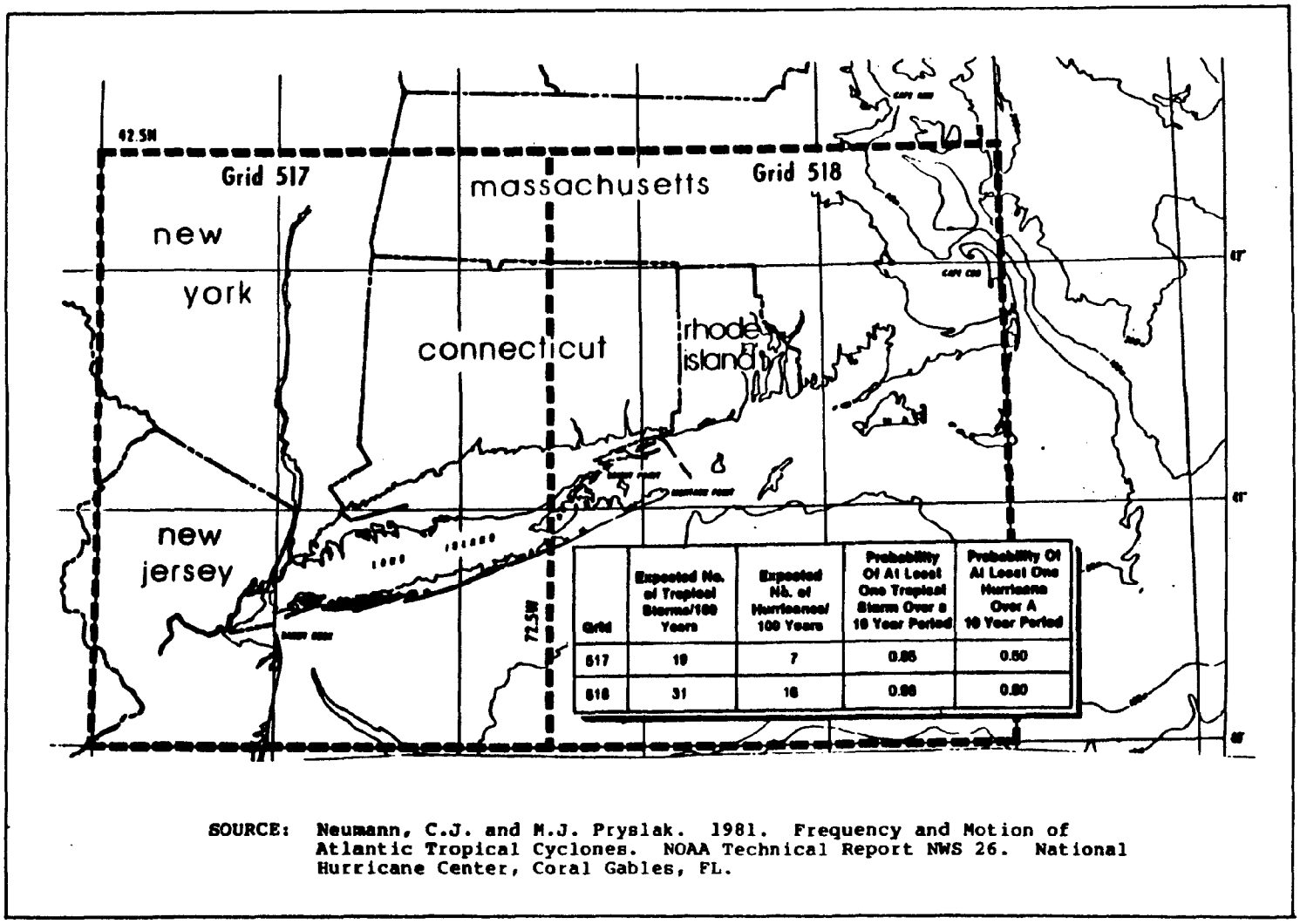
Hurricane Gloria in September 1985 was the most recent hurricane to affect the state. The eye of this storm passed about 60 miles west of Rhode Island, but sustained winds of up to 95 mph were still generated in parts of the state. These high winds uprooted trees and downed power lines, resulting in loss of power to over 334,700 homes and businesses. Although total damages were approximately $20 million, the rapid forward movement of the storm and its arrival at low tide fortunately resulted in only minor storm surge damage along the coast.4 In July 1986, Hurricane Charley approached the coast, but diminished in intensity and moved out into the Atlantic before reaching Rhode Island.5

110.2 Winter Storm Risk

Hurricanes are not the only type of storm capable of inflicting damage on Rhode Island's coastline. "Northeasters" occur on a much more regular basis and may cause severe flooding and erosion in coastal areas. These storms, which occur primarily in winter and spring, may cause great economic losses, as exemplified by the "blizzard of '78" on February 6, 1987.3 The extent of coastal damage from northeasters is highly dependent upon the duration of the storm, as these storms may linger for several days, generate high tides and waves over several tidal cycles and cause extensive coastal erosion and flooding.6

110.3 Sea Level Rise

In addition to the recognized vulnerability of coastal area development to extreme natural events such as hurricanes and winter storms, development in coastal flood hazard areas is also subject to longer term phenomena which can have profound effects on coastal area risk and vulnerability.



Grid	Expected No. of Tropical Storms/100 Years	Expected No. of Hurricanes/ 100 Years	Probability Of At Least One Tropical Storm Over a 10 Year Period	Probability Of At Least One Hurricane Over A 10 Year Period
517	19	7	0.85	0.50
518	31	16	0.96	0.80

SOURCE: Neumann, C.J. and M.J. Pryslak. 1981. Frequency and Motion of Atlantic Tropical Cyclones. NOAA Technical Report NWS 26. National Hurricane Center, Coral Gables, FL.

Figure 1.1. Expected Number of Tropical Storms and Hurricanes per 100 Years Impacting Rhode Island.

These phenomena are tied to the dynamic, constantly changing characteristics of the coastal environment, and include the long-term trend of rising sea level. In the future, relative sea level in most areas of the world, including the coastal areas of Rhode Island, is expected to rise at an accelerated rate as a result of a warming of the earth's atmosphere (the "greenhouse effect") and other factors. Although the estimates of future sea level rise remain uncertain and controversial, the U.S. Environmental Protection Agency estimates that along the Atlantic coast, sea level will rise 5 to 6 inches by the year 2000. Much greater increases are projected to occur after the turn of the century[7].

There is currently no consensus among the scientific community, federal and state policy makers and coastal area managers as to how sea level rise impacts should be addressed. Clearly though, if sea level does rise at anything approaching the projected levels, the flood and storm surge risk along coastal areas will greatly increase.

110.4 Vulnerability of Coastal Communities to Loss of Life and Property Damage

Despite Rhode Island's historical experience with major hurricanes, extensive growth has occured in the state's coastal floodplains during the past 30-40 years and the population and development at risk is now much greater than at the time of the last major storm in 1954. As a result, most people now living in the coastal area have never experienced the forces of a major hurricane.

A. Injuries and Loss of Life. During this time period, there have been modest rather than dramatic improvements in hurricane forecasting capability. The track, intensity and forward speed of a hurricane remain exceedingly difficult to forecast[8]. In contrast, mass communications have improved dramatically, and every public official and coastal resident can now be fully aware of the potential for a hurricane to affect Rhode Island. No detailed evacuation studies have yet been completed for Rhode Island's coastal area, so the time required to evacuate all residents from vulnerable coastal areas is not known.

Compounding the lack of information regarding the time needed to perform evacuations is the responsiveness of residents and visitors to storm and evacuation warnings. Some community officals are concerned that residents whose only hurricane experience was Hurricane Gloria in 1985, may feel that they have little to fear from another hurricane. These officials are concerned that a lack of concern may lessen the effectiveness of hurricane warnings. Unconcerned residents may refuse to respond to official warnings and evacuation notices, and remain in their homes until the full force of the hurricane is upon them. Under such a scenario, there is potential for significant injury and loss of life[9]. *

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* This Post-Hurricane Recovery and Mitigation Plan does not address the issues of hurricane warning and evacuation.

B. Property Damage. The hurricanes of the 1930's, 1940's and 1950's demonstrated clearly that many of the natural features of the coastal area are subject to significant damage and change during a major hurricane. Clearly also, homes, businesses and other structures built in areas subject to flooding -- and especially those built in areas subject to storm surge -- are subject to damage and even total destruction.

It is not possible to predict just what damages will occur during the next hurricane; there are too many uncertainities. The next major storm could be as strong as the 1938 hurricane or it could be less intense. The same areas could be affected or other areas could be hit harder. Differences in construction standards and practices over the years make it impossible to predict which structures will actually be damaged or destroyed or what the pattern of damages along the coast will be.

What is clear is that there are today many more structures at risk than at the time of previous hurricanes, and it can be expected that severe damage will occur to these structures during a major hurricane.

Since the coastal communities have not been affected by a major storm in recent years, most of these communities have assigned a relatively low priority to preparing for post-disaster recovery and identifying post-disaster mitigation measures that might be taken to reduce or eliminate the potential impacts of future storms.

C. The Salt Pond Region. For a number of reasons, including shoreline orientation and exposure, geologic and topographic conditions and the extent of existing development, Rhode Island's salt pond region (generally extending from Watch Hill to Point Judith) is particularly vulnerable to flooding, erosion and related damages caused by hurricanes and other coastal storms. The special problems of the salt pond region are addressed in Chapter 4.

120. POTENTIAL ACTIONS TO REDUCE VULNERABILITY TO HURRICANE DAMAGES

Actions which the state and communities can take to reduce flood damages can be summarized as follows:

(A) Limit new development that is vulnerable to damages

- Discourage development in vulnerable areas
  - o prohibit development by regulation
  - o adopt and enforce strict performance standards for construction
  - o limit public facilities and services to vulnerable areas
  - o acquire land or development rights

- Make sure that new development which is permitted in vulnerable areas is adequately constructed to prevent damages
  - o adopt and enforce strict performance standards for construction

- protect natural features that provide flood protection
    - o prevent damage to natural features through land use requirements
    - o actively restore natural features that have been damaged

(B) Reduce vulnerability to damage of existing development

- Remove existing development from vulnerable areas
    - o acquire and remove existing development
    - o prohibit redevelopment of damaged structures
    - o discourage redevelopment of damaged structures through adoption and enforcement of strict performance standards
    - o discourage redevelopment of damaged structures by not replacing damaged public infrastructure in vulnerable areas

- Increase structural resistance to damage
    - o Require all substantial improvements and reconstruction to conform to more stringent construction standards

- Protect natural features that provide flood protection
    - o prevent damage to natural features through land use requirements
    - o actively restore natural features that have been damaged

- Shield development with flood control structures

Once a community recognizes its vulnerability to storm damage and determines that the interests of the community and its residents are best served by reducing its vulnerability to damage, action should begin immediately. However, reducing coastal flood damage potential should be viewed as a long-term effort. Each of the types of actions listed above can be taken before or after the next major storm occurs. Some actions, particularly those affecting existing development may be best taken after a damaging storm rather than before. This Post-Hurricane Recovery and Mitigation Plan addresses the post-disaster period.

A post-disaster plan of action can aid the state and communities in providing a rapid recovery that also leaves the community less vulnerable to damages than it was before the disaster. However, a post-disaster plan cannot provide a detailed set of specific decisions to be made in the post-disaster period. Most of the recovery and reconstruction decisions that will be required after a flood disaster cannot be made before the disaster occurs because the uncertainities concerning the next damaging storm are too great: the magnitude of the storm is unknown; the amount, type and location of damage cannot be accurately predicted in a coastal environment; the time at which the storm will occur is unknown; and the legal, technological and financial tools available at the time of the storm may be different than today.

Instead, preparation for post-hurricane recovery and mitigation should be based on an understanding of the kinds of actions a community may take, a recognition that actions should be taken that will reduce long-term vulnerability to flood damages, and a desire to take the necessary actions. Guidance can be provided, but for most actions site-specific decisions cannot be made before the disaster.

130. LESSONS FROM OTHER STATES AND COMMUNITIES

While Rhode Island has had little experience with major storms in recent years, and as a result post-disaster recovery and mitigation planning in the state's coastal communities has been limited, other states and communities with more recent disaster experience have undertaken successful emergency preparedness and response programs as well as long term recovery and mitigation programs. It is useful to take a brief look at some of these programs in order to get an idea of the types of actions that may be appropriate in Rhode Island.

Although many state and local emergency management efforts have been stimulated and shaped by Federal requirements (many states, for example, would not have initiated mitigation activities were it not for the Section 406 requirements of the Disaster Relief Act), the states can also launch their own programs. Several states and communities have gone beyond the basic federal requirements to establish programs which follow state-directed courses of action.

130.1 Preparedness

Preparedness activities are carried out before a hazard event occurs, and typically include development of plans and procedures to be undertaken during and after a disaster. Preparedness activities may also include the design and installation of warning systems, purchase of emergency equipment and training of emergency personnel.

As an example of pre-disaster planning, the State of Florida has recently enacted legislation requiring coastal communities to address hazard mitigation and post-disaster redevelopment in their state-mandated Local Government Comprehensive Planning and Land Development plans. An Executive Order prohibits the use of state funds and federal grants for projects that subsidize growth or unwisely promote redevelopment in hazardous coastal areas.10

The North Carolina coastal area management program requires each of the coastal counties and municipalities to prepare a comprehensive coastal plan which must address post-disaster reconstruction as well as other areas of concern. The state has given high priority to the development of post-hurricane mitigation plans and has directed each locality to address this concern.11

130.2 Emergency Response

Typical emergency response actions undertaken during and immediately after a disaster include warnings, evacuations, rescue operations, fire fighting, medical care, and food and shelter programs. Some jurisdictions have also addressed mitigation objectives during this emergency response period.

The State of Maryland developed guidelines for use by the Town of Ocean City for emergency post-disaster removal and disposal of overwash sand. Included were guidelines for emergency filling of breaches and overwash channels,

restoring dunes, removing sand from public roadways, and placement of sand on beaches.12

The State of North Carolina recommends that communities develop special damage assessment teams that can act immediately after the disaster to determine assistance needs, evaluate changes in vulnerability, and identify mitigation opportunities. North Carolina also recommends that emergency procedures for reconstruction permitting, including a temporary moratorium, be instituted to effect an orderly recovery while allowing for implementation of mitigation opportunities.13

130.3 Long-Term Recovery and Mitigation

Recovery actions undertaken after the hazard event has passed may include repairing damaged roads and buildings and reconstructing a community's physical, social and economic infrastructure. Long-term recovery and mitigation programs can be directed toward breaking the cycle of repeated destruction in which development is damaged or destroyed by a hazard event such as a hurricane, rebuilt much as it was before, and then damaged or destroyed again by the next hurricane or storm. Long-term recovery and mitigation actions have been successfully undertaken in several states.14

After experiencing several federally-declared disasters, a state official in one highly floodprone state decided that he was missing out on mitigation opportunities by waiting 180 days to submit the 406 Hazard Mitigation Plan in accordance with federal requirements for disaster relief. Following a recent flood disaster, he decided to write a brief mitigation report within two weeks in order that state recommendations could be included in the initial report prepared by the federal Interagency Hazard Mitigation Team. (See Chapter 2 for a description of Section 406 and Interagency Hazard Mitigation Team requirements.)

The State of Louisiana formed a state interagency mitigation team to function only in specific disaster situations. After a declared disaster in October 1984, the state team and the federal interagency team operated together. As a result, the state had a great deal of input to both damage assessment and the identification of mitigation opportunities in the 15-day report.

Florida has added mitigation to the list of state criteria used in evaluating applications for acquisition of lands for recreational purposes. The State Hazard Mitigation Plan recommends that the Division of State Lands, which purchases land for open space, should consider the purchase of coastal high hazard areas whenever possible. Also, when applications by local governments for acquisition of recreational lands are reviewed by the Division of Recreation and Parks, a new mitigation-related criterion is recommended for consideration: a parcel can receive higher priority for acquisition if it is a coastal hazard area near an urban area.

In Wisconsin, the state-authorized "Tax Increment Financing Districts" program which allows a municipality to set aside tax money for specific purposes was used by the Town of Soldiers Grove to implement a floodplain acquisition and relocation project.

Galveston, Texas enacted a 30-day moratorium on rebuilding following Hurricane Alicia in 1983. Following this moratorium, the City did not issue permits for the rebuilding of structures damaged greater than 50%.

Other coastal states have recommended a variety of regulatory changes for local communities, including: incorporation of public facilities siting requirements in local comprehensive plans to prevent location in hurricane hazard-prone areas; revisions to building codes to address design standards appropriate to withstand hurricane forces; development of housing codes to address hurricane impacts; and revision of subdivision regulations to designate hurricane hazard areas.

140. THE GOALS OF THE PLAN

The basic goals of the Post-Hurricane Recovery and Mitigation Plan are directed toward reducing the potential adverse effects of future storms while at the same time accomplishing efficient and effective restoration of normal community functions in the aftermath of a major storm. These goals are based on recognition that it is possible to break the historical, long-term cycle of repeated destruction in which coastal development is damaged or destroyed by a hurricane, rebuilt much as it was before, and then damaged or destroyed again by the next major storm.

Goals

- **To provide guidelines for resolving conflicts between recovery and mitigation actions and for achieving a balance between these actions.**
- **To coordinate state and municipal plans and actions for post-hurricane recovery and mitigation.**
- **To identify mitigation actions which represent special opportunities for reducing future hurricane-caused damages, and which can and should be undertaken in concert with recovery actions.**

In the aftermath of a major disaster, conflicts will arise between two important needs: rapid restoration of community health, safety and economic well-being, and initiation of mitigation actions which can reduce vulnerability in the future. Historically, government post-disaster actions in most coastal communities have been devoted primarily to providing financial and other assistance used for the restoration of pre-disaster conditions -- an approach typically resulting in perpetuation of community vulnerability.

The time period immediately following a major disaster, however, presents unique opportunities for mitigation actions which may be difficult or impossible to accomplish at any other time. As a result of major damage to, or destruction of, existing structures and natural features, the community is afforded an unusual opportunity to guide reconstruction through, for example, the application

of special land use controls and construction standards. In addition, there are often special sources of state and federal financial assistance available to help carry out mitigation actions. Perhaps most importantly, public attitudes are usually more receptive to mitigation following a major disaster as individuals and community leaders develop first hand experience with the dangers associated with improper development in high hazard areas.

Nevertheless, most coastal communities are not fully prepared to take advantage of this unique post-disaster period of opportunity for accomplishing mitigation along with recovery. Communities which have not recently experienced a major hurricane have given a relatively low priority to preparing for recovery from such an event and to identifying the specific kinds of post-disaster mitigation actions that might be taken. This lack of preparation can needlessly complicate and prolong the recovery process and result in a loss of mitigation opportunities.

By establishing a framework for action -- assigning mitigation responsibilities, developing procedures for carrying out those responsibilities, instituting necessary legal authority, making sure resources are available, and developing priorities for recovery and mitigation -- state and local officials can effect rapid recovery from future disasters while simultaneously taking advantage of mitigation opportunities. Without such a framework, existing disaster recovery procedures, combined with public compassion for disaster victims, can create strong pressures for restoration to pre-disaster conditions.

Chapter Two.

The Management Framework for Recovery and Mitigation

Many regulations, standards, programs and procedures exist at the federal, state and local levels that largely determine how a community will respond to a major flood disaster. In order to understand what special post-flood mitigation and recovery actions might be appropriate to help reduce future flood vulnerability, it is first necessary to review this existing framework for recovery and mitigation.

210. LAND USE REGULATIONS AND FLOOD ZONE CONSTRUCTION STANDARDS

In the absence of special flood mitigation and recovery initiatives, the land use regulations and flood zone construction standards in effect at the time a disaster occurs will determine whether a community emerges from the disaster more or less vulnerable to damages from a future recurrence of an event of the same magnitude. If regulations and standards are weak or not enforced, a community may actually find itself more vulnerable to damages after recovery from a disaster than it was before. On the other hand, good standards strictly enforced can prepare a community to sustain significantly less damage during a similar future event. If existing regulations, standards and enforcement procedures are inadequate to effect a significant reduction in vulnerability, a community may need to take special post-disaster mitigation measures.

The following sections describe the major regulations and standards which govern flood disaster recovery.

210.1 Federal

Many federal regulations and standards have an impact on land use decisions and construction standards. Generally, federal authorities apply when federal facilities are involved or federal funds are used by a state or local government. Among the most prominent federal programs that may affect a coastal community's vulnerability to flood hazards are the National Flood Insurance Program, Executive Order 11988 and the Coastal Barrier Resources Act.

A. National Flood Insurance Program. The National Flood Insurance Program (NFIP) was created by the National Flood Insurance Act of 1968. The program is intended to promote flood hazard mitigation by reducing the amount of property exposed to damage from flooding. For each floodprone community, the Federal Insurance Administration (FIA) of the Federal Emergency Management Agency (FEMA) prepares Flood Insurance Rate Maps (FIRMs) of the special flood hazard areas and makes available flood insurance at affordable rates to cover both structures and their contents. Special food hazard areas include all land inundated by the flood that has a one percent chance of being equalled or exceeded in any given year. This event is known as the "base flood" or "100 year flood" and is used by practically all federal agencies in the administration of programs related to floodplains. In coastal areas, the floodplain is divided into A-zones which are subject to floodwaters and to waves less than three feet, and V-zones which are subject to waves greater than three feet and capable of causing structural damage to buildings.

In exchange for making flood insurance available, the NFIP requires participating communities to regulate new construction and development in designated flood hazard areas. FIA has developed a set of minimum floodplain regulations with which participating communities must comply.1 2

B. Executive Order 11988, Floodplain Management. In 1977, the President issued Executive Order 11988 which requires all federal agencies "to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative". Each federal agency has established regulations to avoid, where possible, use of federal funds within the 100-year floodplain, and within the 500-year floodplain for critical facilities such as hospitals and storage of hazardous wastes.3

C. Coastal Barrier Resources Act. The Coastal Barrier Resources Act (CBRA) of 1982 established a 186-unit Coastal Barrier Resources System (CBRS) along the Atlantic and Gulf coasts in which federal funding for roads bridges, sewers, water lines, housing and insurance is prohibited. The purpose of CBRA is to discourage the development of coastal barriers in order to:

- o minimize the loss of human lives and property;
- o reduce wasteful federal expenditure for emergency relief and flood insurance; and
- o prevent the destruction of fragile coastal ecosystems and the abundant wildlife they support.4 5

Twenty-one areas in Rhode Island were designated as part of the CBRS6.

210.2 State

A. Building Code. The Rhode Island State Building Code incorporates provisions of the BOCA (Building Officials and Code Administrators International, Inc.) Basic National Building Code, with changes and additions adopted by the State of Rhode Island Building Code Standards Committee. The state building code relies upon the FIRMS developed by FEMA and adopted by communities to identify areas subject to the flood control provision of the code. Within these floodplain areas, the code requires that new construction, major repairs, or substantial improvements to existing buildings conform to the Corps of Engineers minimum standards for construction in flood hazard areas as referenced in Appendix B of the Code and regulation SBC-8 Construction in Flood Hazard Area, developed in accordance with FEMA requirements. It also requires compliance with pertinent rules and regulations of the Rhode Island Department of Environmental Management, CRMC, and Division of Statewide Planning.

Although generally conforming in its requirements to the minimum standards for floodplain management established by FEMA, the Rhode Island State Building Code departs from the FEMA provisions with regard to its treatment of "substantial improvements". FEMA defines "substantial improvements" as "any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure

either (a) before the improvement or repair is started, or (b) if the structure has been damaged, and is being restored, before the damage occurred". The Rhode Island Building Code defines substantial improvement as "any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds 50 percent of the physical value of the structure". Physical value is defined as the current replacement value. The Rhode Island Building Code also excludes from alteration and repair costs 1) all non-permit items such as painting, decorating, landscaping, fees and the like; and 2) all electrical, mechanical, plumbing and equipment systems. 2

This interpretation of substantial improvements means that fewer structures will fall under its provision, that fewer structures damaged by flooding will be required to elevate to the base flood elevation or otherwise meet floodplain management standards, and that more structures will be rebuilt following a disaster to their pre-disaster condition, i.e. they will be just as vulnerable to flood damage as before the disaster.

A Building Official is appointed by the chief executive of each town to administer the code. The Building Official is responsible for reviewing all permits for construction in flood hazard areas to make sure that required federal, state and local permits have been obtained.

B. Roads and Bridges. The Rhode Island Department of Transportation (DOT) is responsible for design and construction of all state roads and bridges. Wherever appropriate, the DOT policy is to build bridges to the 100-year flood standard[7]. State roads and bridges on the federal aid system are subject to design regulations of the Federal Highway Administration, which uses a least cost analysis to determine the design that is most cost effective over the life of the facility.[8]

C. Coastal Resources Management Program. The Coastal Resources Management Program, including the Special Area Management Plan for the Salt Pond Region, adopted by the Coastal Resources Management Council (CRMC) establishes many regulations and standards governing land use and construction in coastal floodplains. Among the prohibited activities are construction on undeveloped barriers, construction of new buildings on developed barriers on which only roads, utility lines, and other forms of public infrastructure were present as of 1975, and reconstruction of all residential and non-water-dependant recreational, commercial, and industrial structures on dunes destroyed 50 percent or more by storm-induced flooding, wave or wind damage.[9]

Specific standards for construction in coastal floodplains have been adopted by the CRMC. These standards guide construction in coastal high hazard areas (V-zones) and special hazard areas (A-zones)

1. Construction standards in coastal high hazard flood zones (V zones).

   a. All new construction and substantial improvements shall be elevated on adequately anchored pilings or columns, and securely anchored to such piles or columns so that the lowest portion of the structural members of the lowest floor (excluding the pilings or

columns) are elevated above the base flood level.

b. If timber pilings are used, they shall meet the American Society for Testing and Materials (ASTM) standards for Class B piles and shall have a minimum tip diameter of 8 inches. Wooden pilings shall be treated with a wood preservative. It is recommended that creosote not be used, however. Bracing between piles is required.

c. Pilings in oceanfronting areas and on barrier beaches shall penetrate no less than 10 feet below mean sea level. Pilings in pond shore areas shall penetrate no less than 5 feet below mean sea level.

d. The primary floor beams spanning between pilings shall span in the direction parallel to the flow of potential flood water and wave action. floor joists shall be secured with hurricane clips where each joist encounters a floor beam. These metal fasteners or straps shall be nailed on the joist as well as on the beam. Cross bridging of floor joists is required.

e. To secure the exterior wall to the floor joists, galvanized metal strap connections shall be used connecting the exterior wall studs to the joists.

f. Roof trusses or rafters shall be placed 16 to 24 inches on center and, as required by the Rhode Island Building Code, shall be connected to the exterior wall with galvanized metal straps.

g. As required by the Rhode Island Building Code, all windows shall meet manufacturers' standards for wind loads of 110 mph.

h. The space below the lowest floor and between pilings shall be kept free of obstruction. Breakaway walls are prohibited in V Zones. The space below the lowest floor shall not be used for human habitation, utility items or permanent storage.

i. All residential and commercial structures shall be set back not less than fifty (50) feet from the inland boundary of the coastal feature as set forth in the CRMP Section 140. In critical erosion areas, the setback shall be not less than 30 times the calculated annual erosion rate (Table 2 CRMP Section 140).

j. All plans submitted to the CRMC for buildings proposed for V zones shall be stamped by a registered professional engineer or architect.

2. Construction Standards in Areas of Special Flood Hazard (A Zones).

a. In all other A zones, the following regulations as listed in Section 300.3 D (4) of the R.I Coastal Resources Management Program, as amended, apply.

(1) Lowest floor elevation including basements of new or substan-

tially improved residential buildings in A zones shall be elevated to or above the 100-year level as established on flood insurance rate maps and the Rhode Island Building Code.

(2) Parallel concrete walls or pilings rather than fill shall be used to elevate habitable residential structures when the difference between the original ground elevation and the flood elevation is more than 50 percent of the flood elevation.

(3) Standards (5), (6) and (7) for residential buildings in v zones also apply to A zones.

(4) New construction or substantial improvement of any non-residential structure shall either have the lowest floor, including basement, elevated to the level of the base flood elevation or, together with attendant utility and sanitary facilities, be floodproofed so that below the base flood level the structure is watertight, with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.

(5) A registered professional engineer or architect shall certify that these standards will be met.

210.3 Municipal

A. Comprehensive Plans. The comprehensive plan of each community describes the overall plan of development within the community. These plans can serve to guide development in a manner that will protect the health and safety of residents, including reducing vulnerability to flooding. These plans are particularly important in determining the location of public facilities and infrastructure.

B. Subdivision and Zoning Regulations. Municipal zoning and subdivision regulations are the major determinant of where and how construction within the floodplain occurs. Each community within the coastal area has adopted floodplain zone regulations that meet the minimum regulations required by FEMA for participation in the NFIP.

220. FEDERAL ASSISTANCE FOR DISASTER RECOVERY

Federal disaster assistance to individuals is available from a host of individual programs operated by many federal agencies. Disaster assistance to public agencies is provided primarily through the President's Disaster Fund, authorized under the Disaster Relief Act of 1974. A well-defined legal framework and set of procedures for administering this disaster assistance has been established.

To a very large degree, both recovery and hazard mitigation actions following a major disaster are determined by these existing federal laws,

regulations and policies. In order to receive federal financial and technical assistance for disaster recovery, state and local governments must comply with these existing programs. Although this legal framework is geared toward recovery to pre-disaster conditions and imposes considerable constraints on flood hazard mitigation, states and communities may still expedite the recovery process and find opportunities to reduce future vulnerability to hurricane damages.

220.1 FEMA Procedures for Federal Disaster Assistance

The Federal Emergency Management Agency (FEMA) has the primary responsibility for coordinating all federal disaster assistance to individuals and most forms of federal assistance to state and local governments. FEMA coordinates federal disaster assistance programs from the initial request by the Governor for a disaster declaration, until all recovery activities involving federal assistance have been completed. The entire process generally requires a year or more and involves federal, state and local officials in a complex program of damage assessments, applications for assistance, repair and reconstruction of approved projects, and auditing of all records and projects relating to disaster assistance.10 Figure 2.1 illustrates the approximate sequence and time frame for the major federal disaster assistance activities, and Table 2.1 lists the major federal disaster assistance programs that can be used for repair and reconstruction of public and private facilities. A more complete description of the disaster assistance procedures is provided in Appendix B.

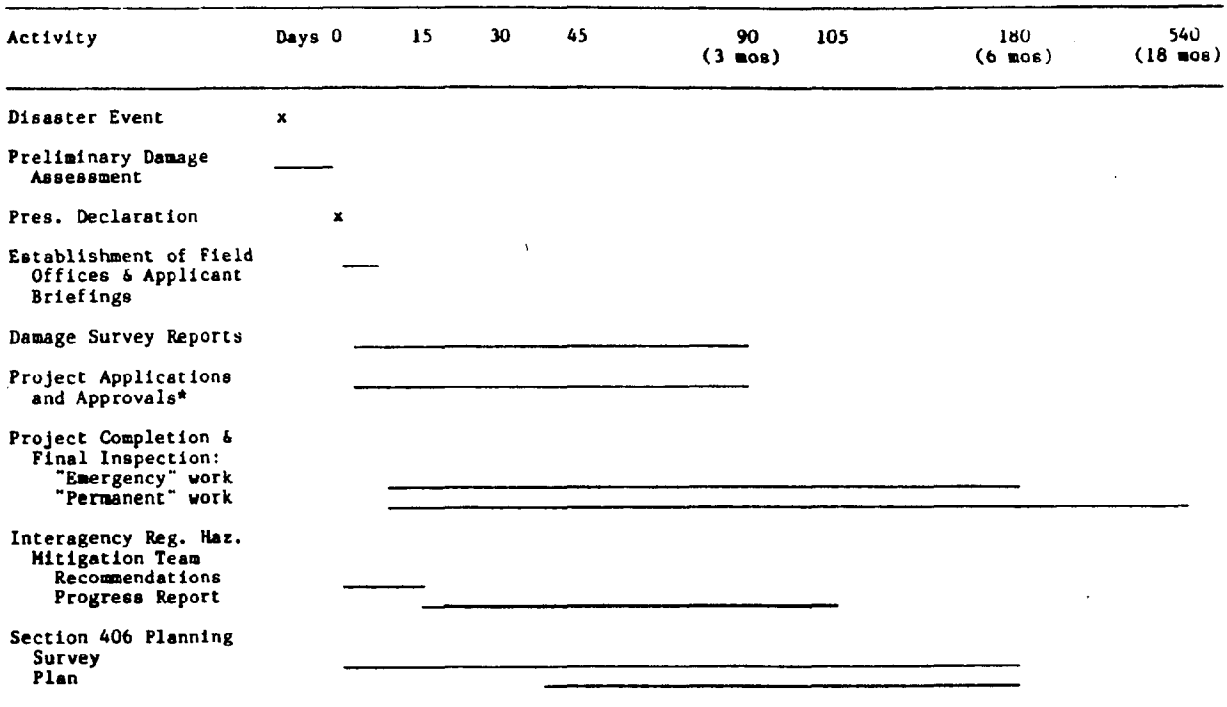
In most instances, the federal disaster assistance programs provide reimbursement of 75 percent of the cost of repairing or rebuilding a public facility to its pre-disaster condition, including the costs of complying with applicable health and safety standards in effect at the time of the disaster. State and local governments must provide the remaining 25 percent of eligible costs as well as all costs ineligible for federal aid.

220.2 Disaster Assistance from Other Federal Agencies

Although most federal disaster assistance for public facilities is coordinated through FEMA, the Small Business Administration (SBA), the Federal Highway Administration (FHWA) and the Soil Conservation Service (SCS) operate their own disaster assistance programs. Assistance under these programs is provided concurrently with those coordinated by FEMA, and involve their own procedures for application, qualification, amount and percentage of federal funding, and other program requirements.11 These programs also are described further in Appendix B.

220.3 Hazard Mitigation under Federal Disaster Assistance Programs

Federal disaster assistance provides opportunities for post-disaster hazard mitigation through funding options and technical assistance. Although most disaster assistance for public facilities is funded 75 percent by the federal government for a restoration to pre-disaster conditions, some flexibility in funding is available that permits facilities to be rebuilt or relocated so that future vulnerability to flood hazards



*Thirty-day deadline if only an "emergency" is declared, not a "major disaster."

Adapted from: FEMA, 1981, Flood Hazard Mitigation: Handbook of Common Procedures, p. I-5.

Source: McElyea, William D., David J. Brower and David R. Godschalk. 1982. Before the Storm: Managing Development to Reduce Hurricane Damages. Office of Coastal Management, North Carolina Department of Natural Resources and Community Development.

Figure 2.1 Timing of Federal Disaster Assistance Activities.

Program	OMB Catalog No.*	Funding Agency	Available to . . .			Presidential Declaration Required
			Individual	Business	Government	
Flood Insurance	83.100	FEMA	X	X		
Individual & Family Grants	83.300	FEMA	X			X
Home/Personal Property Disaster Loans	59.008	SBA	X			X
Temporary Housing	83.300	FEMA	X			X
Mobile Home Loans Insurance	14.110	HUD	X			X
Mortgage Insurance--Homes for Disaster Victims	14.119	HUD	X			X
Adjustments to Federal Loans	83.300	Vet. Adm.	X			X
Physical Disaster Loans to Businesses	59.008	SBA		X		X
Aid to Major Sources of Employment	83.300	SBA/FmHA		X		X
Economic Injury Disaster Loans	59.002	SBA		X		X
Repair and Restoration of Private Non-profit Facilities	83.300	FEMA		X		X
Rural Electrification Loans and Loan Guarantees	10.805	REA(USDA)		X	X	X
Rural Telephone Loans and Loan Guarantees	10.851	REA(USDA)		X		X
Repair and Restoration of Public Facilities	83.300	FEMA			X	X
CDBG Secretary's Fund for Disaster Assistance	14.218	HUD			X	X
Federal-aid Highway Repair	?	FHWA(DOT)			X	
Debris Removal	83.300	FEMA**	X	X	X	X

*Refer to the Office of Management and Budget's Catalog of Federal Domestic Assistance.

**FEMA makes requests for debris removal to the appropriate federal agencies.

Source: McElyea, William D., David J. Brower and David R. Godschalk. 1982. Before the Storm: Managing Development to Reduce Hurricane Damages. Office of Coastal Management, North Carolina Department of Natural Resources and Community Development.

Table 2.1. Federal Disaster Assistance Programs Aiding Directly in Repairs and Reconstruction.

is reduced. In addition, some programs, such as FEMA's Flooded Property Acquisition Program, are specifically designed for hazard mitigation.12

The federal government also provides technical assistance to communities that receive a Presidential disaster declaration. Within fifteen days after a disaster declaration, a federal Interagency Flood Hazard Mitigation Team prepares a hazard mitigation report that recommends specific actions that federal agencies, the state and the community should take to reduce future vulnerability to flood losses.10

These funding options and technical assistance for hazard mitigation are further described in Appendix B. For the past several years, bills have been introduced in the U.S. Congress that would increase the amount of funds available for hazard mitigation following a disaster. Anyone involved in post-disaster mitigation must determine the current status of federal post-disaster hazard mitigation funding.

230. STATE OF RHODE ISLAND EMERGENCY MANAGEMENT

The federal programs for post-disaster recovery and mitigation establish the framework within which states and municipalities must operate, if they wish to avail themselves of federal financial and technical assistance. The Rhode Island framework for emergency management is similar to and based on the federal programs. The basic authority for Rhode Island emergency management activities is the Rhode Island Defense Civil Preparedness Act of 1973 (General Laws of Rhode Island, Title 30, Chapter 15, as amended).

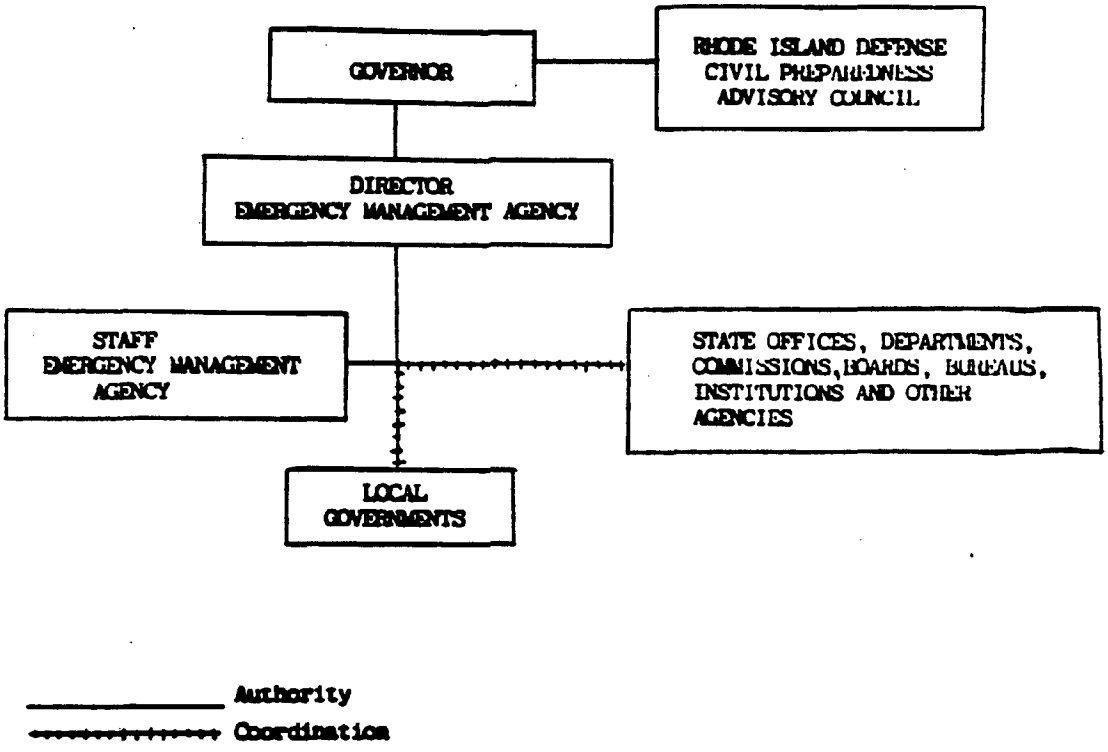
Following a presidentially declared disaster, Rhode Island state agencies and municipalities will function in accordance with prescribed procedures and their assigned responsibilities. The state organization for emergency management is shown graphically in Figure 2.2, and the roles of selected organizations are described in the following sections.

230.1 Governor of the State of Rhode Island

The Governor has ultimate responsibility for direction and control over state activities related to emergencies and disasters. A disaster emergency is declared by executive order or proclamation of the Governor if he finds a disaster has occurred or that their is an imminent threat of a disaster. The Governor's declaration of a disaster emergency activates the response and recovery aspects of the state and local emergency operations plans.13

230.2 Rhode Island Emergency Management Agency

The Rhode Island Emergency Management Agency (RIEMA) is responsible to the Governor for carrying out the emergency management programs in the state and for coordinating the disaster response and recovery activities of state agencies and municipalities with FEMA and other federal agencies. The principal RIEMA responsibilities are briefly described below.



Source: Rhode Island Emergency Management Agency. 1985. Emergency Operations Plan.

Figure 2.2. State Organization for Emergency Management.

A. Pre-Disaster Responsibilities. During non-emergency times, RIEMA is responsible for organization, planning, coordination, education and training for emergency preparedness and management. A critical element of these responsibilities is preparation of the Rhode Island Emergency Operations Plan (EOP), which was most recently revised in October 1985. The EOP describes the state's program for emergency management and the basic responsibilities of each state agency. Each agency is responsible for developing its own preparedness plan for emergency management.

B. Post-Disaster Responsibilities. Following the occurrence of a disaster, RIEMA is responsible for coordinating the disaster response and recovery activities of state agencies and municipalities with FEMA and other federal agencies. RIEMA responsibilities and activities largely parallel those of FEMA described in Section 220.1 and Appendix B. Selected RIEMA activities are described in more detail below.

1. Initial Damage Assessments. RIEMA is responsible for assembling initial information on damages sustained throughout the state.

a. Initial damage report. The first damage estimates are collected within hours of the event and are obtained by telephoning (or using other communications networks) municipalities and state agencies for estimates of damages within their jurisdiction. This initial information is used to identify emergency assistance needs and to determine the approximate magnitude of damages. RIEMA then coordinates emergency response activities within the state.

b. Support for disaster declaration. A second, more complete compilation of damages is obtained within a few days of the event. Again, RIEMA collects the information from state agencies and municipalities. This more detailed report on damages is used to support the Governor's Request for a Major Disaster Declaration. Therefore, damage estimates provided by state and local units of government need to be in the format required by FEMA.

2. Applications for State and Federal Disaster Assistance. In addition to coordinating emergency response to the disaster, RIEMA is also responsible for coordinating state agency and municipal requests for federal and state disaster assistance. Under current state policies, the state will provide 12.5 percent of eligible disaster expenses.

a. Disaster Assistance Center. RIEMA provides limited staff support to the Federal Disaster Field Office and Disaster Assistance Center.

b. Damage Survey Teams. RIEMA coordinates the assignment of staff from appropriate state agencies to work with federal personnel on damage survey teams in the preparation of damage survey reports.

c. Applications for Disaster Assistance. RIEMA is the state coordinator that reviews and approves applications by state

agencies and municipalities for federal and state disaster assistance.12

230.3 Rhode Island Defense Civil Preparedness Advisory Council

The Rhode Island Defense Civil Preparedness Act of 1973 created the Rhode Island Defense Civil Preparedness Advisory Council to advise the Governor and the Director of the RIEMA on all matters pertaining to disaster preparedness. The Advisory Council consists of 22 members; 11 members appointed by the Governor and 11 ex officio members from state agencies.10

230.4 State Agencies and Departments

The state organization for emergency management is based on the concept of maintaining the traditional departmental structure of state government. Emergency functions are assigned to the appropriate departments in a manner consistent with the day-to-day role of state departments and agencies. For example, the Department of Transportation has primary responsibility for debris and garbage removal, water and sewer service, and road and bridge maintenance; and the Office of State Planning has primary responsibility for hazard mitigation planning. Several agencies have responsibility for damage assessment and may be requested to participate on the federal/state damage survey team, as well as conducting damage assessments of their own facilities.12

230.5 Coastal Resources Management Council

CRMC has the major responsibility for managing Rhode Island's coastal area, including the granting of assents for a wide range of activities as detailed in the Coastal Resources Management Program. CRMC also has authority to issue Emergency Assents following a disaster.6 However, at the present time, CRMC is not assigned any specific emergency management responsibilities in the Rhode Island Emergency Operations Plan,13 and CRMC does not have an emergency operations plan.

230.6 Section 406 Hazard Mitigation Planning

One of the federal requirements for providing disaster assistance (Section 406 of the Disaster Relief Act of 1974) is that the state must develop a hazard mitigation plan for the state and the affected areas within 180 days of the disaster.10 Following the Presidential disaster declaration for Hurricane Gloria in September 1985, the Rhode Island Office of State Planning prepared a state hazard mitigation plan which was completed in June 1986. This plan contains over 90 recommended actions to mitigate hurricane, winter storm, and flooding damage in Rhode Island.7

240. MUNICIPAL RESPONSIBILITIES FOR DISASTER RECOVERY

Municipalities have the primary responsibility for emergency management and disaster recovery within their jurisdiction. When the resources of the community are insufficient to deal with an emergency or disaster, state aid is made available and, if needed, federal aid. Following a Presidentially

declared disaster, the community, as well as the state, will be required to follow the federal procedures for disaster assistance if it is to receive federal disaster aid. In Rhode Island each community is responsible for 12.5 percent of costs eligible for federal disaster aid and for all costs ineligible for state or federal disaster aid.

The extent to which a community is prepared to deal with this complex program of disaster recovery and the manner in which community responsibilities are carried out will greatly influence the speed with which recovery takes place. Community preparedness will also affect the extent to which mitigation actions are implemented and the whether the community is more or less vulnerable to the next damaging storm.

A. Pre-Disaster Responsibilities. Each municipality is required by the state to appoint a local Civil Preparedness Director, who is generally employed in this capacity only part-time. Each town is also required to prepare a local Emergency Operations Plan. These plans vary in content and quality, and focus principally on emergency actions such as warnings and evacuation. Very limited information is provided on post-disaster recovery, and none of the plans reviewed provides a comprehensive plan for recovery from a major hurricane. In particular the plans do not provide specific and current information on the procedures a community must follow to receive federal and state disaster assistance, including procedures and forms for damage assessment and information on applying for disaster assistance. Neither do the plans address how the community will deal with repair and reconstruction of private and public facilities, and what, if any, mitigation actions might be appropriate.[14]

B. Post-Disaster Responsibilities. Following a major disaster, each community will be faced with a number of essential responsibilities, some of which must be performed within a matter of hours and days, while others will extend over many months.

1. Immediate Post-Disaster Actions. Immediately after the disaster, the community will be responsible for search and rescue, providing shelter, restoring essential public facilities, and assessing damages. Local officials will be required to provide initial damage assessments to RIEMA within a few hours after the disaster, and more detailed and accurate damage assessments within a few days to support the Governor's request for a major disaster declaration.

2. Short- and Long-Term Recovery Actions. After the immediate emergency response has been completed, the community must deal with the longer term process of recovery from the disaster. This will involve detailed damage surveys, permanent repair or reconstruction of public facilities, decisions on appropriate mitigation actions, and assisting community residents and businesses with recovery, including issuing permits for repair and reconstruction of damaged structures.

Figure 2.3 lists many of the post-disaster actions a community will need to undertake and indicates an approximate time frame for each[15].

Events	Weeks 0	1	2	3	4	5	6	7	8	.	.	.	.
Disaster and Declaration	x												
Damage Assessment --													
Deploy Assessment Teams	x												
Assess, Classify, and Map Damages	———												
Submit Damage Survey Reports to State and Federal Agencies	———												
Notify Property Owners of Damage Classifications and Repair Requirements		———											
Attend Applicant's Briefing and Submit Requests for State and Federal Assistance		———											
Reconstruction Permitting --													
Deploy Recovery Task Force	x												
Declare Moratorium on Repairs and New Development	x												
Set Calendar of Milestones for Other Tasks		x											
Begin Repairs to Critical Utilities and Facilities	----------	- ? - >											
Lift Moratorium for "Minor" Repairs		---------->											
Lift Moratorium for "Major" Repairs to Conforming Structures		- - - - ? - - -	---------->										
Evaluate Hazards and the Effectiveness of Mitigation Policies		----------	- - ? - ->										
Amend Policies			- - ? - -	------->									
Initiate Negotiations for Relocations and Acquisitions		----------	---------->										
Lift Moratorium on "Major" Repairs (with changes to conform)			- - - ? - - -	---------->									
Participate in Federal Hazard Mitigation Planning		----------	---------->										
Lift Moratorium on New Development				- - - ? - - -	------>								

Source: McElyea, William D., David J. Brower and David R. Godschalk. 1982. Before the Storm: Managing Development to Reduce Hurricane Damages. Office of Coastal Management, North Carolina Department of Natural Resources and Community Development.

Figure 2.3. Sequence of Local Activities in Assessing Damages and Permitting Reconstruction

Chapter Three.

Post-Hurricane Recovery and Mitigation in Rhode Island's Coastal Region

310. COORDINATION OF EMERGENCY RESPONSE ACTIONS

The time period immediately after a hurricane has passed is largely devoted to emergency response actions needed to ensure the health and safety of area residents and to protect property from further damage. This is the primary mission of emergency response personnel and other activities should not interfere with the effective and timely execution of these essential actions.

Nevertheless, emergency response actions should not be conducted without regard for potential adverse impacts. Some emergency actions, if improperly carried out, can hinder subsequent recovery, cause environmental damage, increase vulnerability to future storms, or reduce the potential for taking appropriate mitigation actions. Awareness by emergency response officials and field crews of how to deal with selected emergency response actions can minimize or avoid inappropriate actions following a disaster.

310.1 Debris Removal and Disposal

Rapid removal and disposal of debris from public roadways and other critical locations is essential to permit police, public utility crews and other emergency personnel to enter affected areas and undertake required cleanup and restoration activities. Storm debris will likely contain a mixture of sand, wood, brick, metal, concrete, asphalt, furniture, and other materials. Debris removal is also necessary as a public health measure, such as removal of food and other perishables which are spoiled or contaminated with floodwaters and could cause the spread of disease. Existing landfills in coastal communities are unlikely to be capable of accommodating all of the bulky debris. Therefore, special arrangements need to be made for both temporary and permanent disposal of this material.

A. Temporary Storage Areas. Areas suitable for temporary storage of debris need to be identified. The use of temporary storage areas will permit the rapid removal of debris from roadways, other public areas and private lots while arrangements for permanent disposal of the debris are made.

At least one area for temporary storage of debris should be designated in each area where large amounts of debris may accumulate. Where possible, publically owned land should be selected for temporary storage of debris. Public parks and recreation areas, open fields, and public works grounds are the types of areas that should be considered. In some areas, the median strip of divided highways and highway right-of-ways may be suitable for temporary storage of debris removed from the highways. Schools, hospitals and other areas where debris or truck traffic would pose problems should be avoided. If possible, areas selected should not be located in the floodplain to avoid the possibility of stored material being washed away during another storm.

Privately owned areas may need to be used if there is no suitable public land in the area of debris accumulation. For privately owned properties, communities and state agencies should develop agreements with owners

regarding use of the sites for temporary storage of storm debris. Such agreements should include a provision to hold the private property owner harmless from any liability associated with use of the site for temporary debris disposal, specify the particular portion of the property that may be used for storage of debris, identify points of access and egress to the property, specify a time limit on use of the site for temporary storage of debris, provide for restoration of the area following use, and provide a reasonable compensation to the owner.

B. Permanent Disposal of Debris. Since there is likely to be far more debris than can be adequately disposed of in existing landfill sites of coastal communities, special arrangements for permanent disposal must be made. The following approach to permanent disposal is suggested.

1. Bulky wastes that can be burned, such as wood, furniture, etc. should be moved to selected sites for incineration. DEM, in coordination with local officials, should make the final choice of sites for burning debris, issue special permits for open-air burning, and supervise the burning.

2. Material unsuitable for burning should be separated from the burnable material and disposed of in existing town landfill sites, if available at the time. Residue from the burned material should also be disposed of in the landfill sites.

3. In cases where suitable sites are not available within a community, DEM should work with local communities to identify acceptable cites in other communities.

4. Explosive and potentially hazardous materials should be separated from other debris and disposed of in an appropriate manner and location under DEM supervision.

310.2 Removal of Overwash Sand and Restoration of Temporary Inlets

In low-lying coastal areas large amounts of sand from eroded sand dunes, beaches and offshore sand deposits may be washed inland. Where feasible, this overwash sand should be left in place to build up dunes and other coastal areas. Where sand must be removed from roadways, parking lots, building sites and other areas, it should be returned to the adjacent beaches and placed on the beaches in the manner described in Section 420.1 of the SAMP (Figure 4-4).

In the barrier beach areas, overwash may create new inlets into the ponds or marshes behind the barrier. Procedures for restoring overwash channels and temporary inlets are discussed in more detail in Chapter Four.

310.3 Coordination of Emergency Response Actions

DOT, DEM, CRMC, the National Guard and coastal municipalities should enter into a memorandum of agreement on emergency procedures for debris and sand removal and disposal and restoration of temporary inlets and channels. This memorandum should be reviewed, and updated as necessary, each year.

A draft agreement between CRMC and RIEMA is provided in Appendix C.

Each agency and each community should incorporate these policies and procedures into their Emergency Operations Plan. In addition, a statement of policies and procedures should be prepared for distribution to DOT crews, private waste haulers, National Guard personnel, town public works crews and others who may be involved in debris removal following a disaster. Immediately following the disaster, these policies and procedures should also be published in local newspapers and posted in the town hall of each affected community.

320. DAMAGE ASSESSMENTS

Chapter Two described the damage assessments that federal, state and local governments must conduct in order to document eligibility for federal disaster assistance. There are actions which state and local government can take to make sure that these required damage assessments are completed as quickly and as accurately as possible, ensuring that federal disaster assistance becomes available in the shortest possible time and that state and local governments receive all of the federal financial and other assistance for which they are eligible.

In addition to these required damage assessments, additional, more specialized assessments should be performed to identify changes in vulnerability to flood damages and to identify mitigation opportunities.

320.1 Initial Damage Assessments.

A. Initial Damage Report. Initial damage reports are the responsibility of communities (and of state agencies for their facilities) and must be made within hours of the disaster event in order for the community to determine how severe the disaster is and what types of emergency response are needed. This initial information must also be provided to RIEMA so that RIEMA can quickly assess damages throughout the state and determine how and where state emergency assistance should be provided. This initial assessment also provides the Governor with a preliminary indication of whether federal assistance is needed.

This initial damage assessment is generally known as a "windshield survey", indicating that it is made by driving or walking through affected areas and making rough estimates of the type and extent of damage. It is not intended to produce detailed or precise information on damages to individual facilities. However, the information gathered must be as accurate as possible to ensure that the community is able to provide the proper emergency assistance and to allow RIEMA to properly assign state resources.

Because RIEMA must rely upon these initial damage assessments to assign state resources, RIEMA should ensure that each community is provided with damage assessment forms suitable for this initial damage assessment. RIEMA should also provide training to each community in how to perform the initial damage assessments, complete the forms, and communicate the information to RIEMA.

Each community should identify in its Emergency Operations Plan those areas that are considered most susceptible to severe damages from a hurricane or other major storm, including public facilities and private development. Prior identification of these areas and facilities will speed the initial damage assessments.

In addition, each community should designate the individuals responsible for making these initial damage assessments. Appropriate individuals to assist with initial damage assessments include: town manager, public works engineer, building official, police and firemen. The damage assessment forms, guidance for performing the assessment, and responsible individuals should all be incorporated in the community's Emergency Operations Plan.

B. Support for Disaster Declaration. Within a few days after the disaster, a more detailed assessment of damages must be made by the communities and provided to RIEMA. This assessment is primarily to provide information in support of the Governor's request to the President for a major disaster declaration. Because FEMA requires the Governor's request to provide information regarding how much and what types of federal disaster assistance are required, this second damage assessment must be more detailed and provided in a different format. The accuracy of this information may affect FEMA's recommendation to the President regarding a major disaster declaration, and it certainly affects the speed with which the Governor can make the request and FEMA and the President can make a decision.

As with the initial damage reports, RIEMA should make available to each community the proper forms for conducting these more detailed damage assessments for inclusion in their Emergency Operations Plan, and provide training to community personnel in how to perform damage assessments, complete the forms, and provide the information to RIEMA. Each community should designate one or more damage assessment teams to make these damage assessments. Three separate teams should be considered:

1. Public Property Survey Team. This team would be responsible for assessing damages to all public property, including buildings, roads and bridges, public utilities, and parks and recreation areas. Appropriate team members might include the Public Works Engineer, Building Code Official, Town Manager, Civil Preparedness Director and member of the recreation or conservation commission.

2. Business and Industry Survey Team. This team would be responsible for determining damages to businesses and industries in the area, and would work with any personnel from state agencies assigned to conduct damage assessments for business and industry. Team members might include a Building Inspector, Tax Official, Firemen, and local Realtor.

3. Private Dwellings Survey Team. This team should work with the Red Cross representatives and any state personnel assigned to conduct damage estimates of private residences. A primary function of this team would be to identify those dwellings that may have suffered damages of 50% or greater and would thereby be subject to upgrading to new codes and standards, CRMC Category B Assents, and other

requirements. Team members might include a Building Code Official, Building Contractor, Fireman, Realtor and member of the zoning commission.

Damage assessment information gathered by these teams should be provided to the CRMC Hazard Mitigation Advisory Committee (Section 320.2) and to appropriate town officials and commissions, in addition to RIEMA.

320.2 Hazard Mitigation Advisory Committee(s)

During the period following a disaster, and continuing for a period of several weeks or months, one or more Hazard Mitigation Advisory Committees should be established by the CRMC. This committee(s) should be composed of CRMC members and community representatives of affected areas of the coastal region. The committee(s) will be charged with examining the damage that has occurred within the affected coastal areas, identifying and evaluating opportunities for hazard mitigation and making recommendations regarding mitigation actions to the individual communities and to state agencies.

Potential mitigation opportunities the committee should examine include:

- acquisition of particularly vulnerable areas that could legally be built on but should not be because of the significant hazard involved.
- prohibition of rebuilding in areas that are particularly hazardous as a result of erosion or other changes in natural features.
- changes needed in the building code
- zoning changes needed
- need for remapping of flood hazard zones
- modification of setbacks as a result of erosion and other changes in natural features

To carry out this work, the committee should have available staff to perform the necessary inventory and technical evaluations and to assist committee members in developing recommendations. Interagency agreements should be developed to provide this staff. Staff should be drawn from the University of Rhode Island (URI), DEM, the Office of State Planning, from building inspectors in areas of the state not severely affected by the disaster, and possibly private consultants. The Hazard Mitigation Advisory Committee should be responsible for the assessments described in section 320.3.

320.3 Hazard Mitigation Assessments

While the damage assessments described above are required to meet state and local needs for providing emergency assistance and federal program requirements to document requests for federal disaster assistance, they are not necessarily adequate to identify all disaster information that the state and local governments might need. In particular, they do not provide all of the information needed to identify potential mitigation actions. The following sections describe additional damage assessment activities that should be undertaken as a supplement to the required assessments.

A. Examination of Debris and Damaged Facilities.

An examination of the nature and location of some debris can be vital to obtaining a clear understanding of the nature of the hurricane and the precise cause of damages. For example, the location of debris may help determine the inland extent of flooding, the direction at which waves struck the shore, the maximum height of flood waters and waves, and other flood characteristics. Examination of debris may also help in determining whether damages to a structure were caused by floodwaters or by high winds (including storm generated tornados); by hydrostatic pressure (still water inundation) or by hydrodynamic pressure (wave action); by scour and undermining of foundations; by flood or wind forces exceeding current design standards; whether a building was constructed to code specifications; or whether flood elevations or wind speeds exceeded design standards.

State and local officials need this type of information to determine if floodplain mapping is accurate; if zoning needs to be modified; if existing building codes are sufficient; and if buildings were actually constructed in accordance with approved plans. Unfortunately, this information is seldom obtained because no one is specifically assigned and requested to do so, other post-disaster tasks seem more critical at the time, and its value is not widely recognized until long after the disaster. The following mitigation assessment activities are needed.

1. Aerial photographs of damages. Immediately after the hurricane or other coastal storm has passed and weather conditions permit, oblique aerial photographs of the affected coastal areas should be taken and used as an aid in determining the extent of the flooding, the severity and location of damages, the amount and location of erosion, and location of temporary overwash channels and inlets. These photographs can serve two purposes. First, they can be used by RIEMA to estimate the type and extent of damages. Second, they can be used by the Hazard Mitigation Advisory Committee as an aid in the evaluation of mitigation opportunities.

RIEMA has assigned the Civil Air Patrol (CAP) responsibility for aerial photographs following a disaster. CAP should make arrangements for the photographs before the storm to ensure availability and quick action after the event. Preparation should include agreement with CRMC on areas to be photographed, type of film, altitude, etc. Aerial photograph requirements may vary for different regions of the coastal area. Specific recommendations for post-disaster aerial photography of the salt pond region are included in Appendix C.

2. Inspection of Selected Structures and Features. Using information from the aerial photographs and reports from each town concerning the location, type and severity of damages, the Hazard Mitigation Committee staff should examine selected structures and features to determine the cause of damage. These evaluations should attempt to classify damages as primarily caused by wind, water, erosion or combinations of these forces.

WIND DAMAGE
- High velocity
- Wind tossed debris
- Localized tornados

WATER DAMAGE
- Hydrostatic pressure (low velocity high water)
- Hydrodynamic pressure (high velocity water, including waves)

EROSION DAMAGE
- Undermining due to complete removal of supporting ground
- Undermining of foundation due to scour

3. Extent of Flooding. Hazard Mitigation Advisory Committee staff need to determine the extent of the flooding and estimate the height of waves. The Corps of Engineers, U.S. Geological Survey, Soil Conservation Service and FEMA should be requested to assist in determining the magnitude of the flood event (e.g. 100-year) and the accuracy of flood insurance maps for the area.

C. Participation on Federal Interagency Hazard Mitigation Team.

1. CRMC should assign one or two persons to work with the federal Interagency Hazard Mitigation Team. The role of these individuals would be to:
- assist the team members in identifying areas of major damage
- provide information on precise causes of damages in different areas
- provide additional information the team members need regarding state and local regulations, resources, etc.
- explain mitigation opportunities that have already been identified
- work with team members in implementing mitigation recommendations

2. Each affected municipality should also assign one person to work with the federal Interagency Hazard Mitigation Team within their community.

330. RECONSTRUCTION AFTER STORMS

Storm damages due to wind and flooding may occur at practically any location within CRMC jurisdiction. The most severe damages, including complete destruction of some buildings, are likely to occur within areas subject to high waves (V zones), particularly where structures were built prior to current building codes and floodplain zoning. Although newer construction in V zones should better withstand the forces of wind, storm surge and waves, natural variations in storm intensity, offshore bathmetry, topography and design and construction techniques will combine to make it impossible to predict just which structures will be destroyed or suffer severe damage. Within the salt pond region alone there are more than 900 structures located within V zones and more than 2,000 in other portions of the coastal floodplain. It is unlikely that major storm damage will be restricted to the salt pond region. Damages are also likely throughout Narraganasett Bay and the eastern coastal areas of the state.

With present staff levels and procedures for processing permit applications, CRMC is currently unable to keep up-to-date with applications for construction and other activities within CRMC jurisdiction. Following a severe hurricane or other major coastal storm that produces a significant storm surge and wave action, there are likely to be hundreds or even thousands of damaged or destroyed homes and other structures within CRMC jurisdiction that will require either a type A or type B Assent from CRMC. Without special procedures to deal with this massive increase in its workload, CRMC will be unable to process these applications in a reasonable time frame.

So that building codes and other standards are not ignored in the period immediately after a disaster, a set of emergency procedures is needed. These emergency procedures can be used by CRMC to provide expeditious processing of applications while ensuring that CRMC policies and standards are met and also ensuring that mitigation opportunities are considered and implemented where feasible.

330.1 Reconstruction Standards

A. Reconstruction in Accordance with Applicable Standards. Storm damaged structures shall be repaired or rebuilt according to the standards required for the flood zone in which the structure is located. All local zoning regulations, building codes, CRMC policies and standards, DEM ISDS permits, and other applicable state and local standards shall be complied with.

B. Variances. Variances shall be granted only in accordance with Section 120 of the CRMP. A variance shall not be granted if such a variance would permit repair or reconstruction that would pose an unacceptable risk to health and safety.

330.2 Emergency Procedures for Issuance of CRMC Assents

A. Imposition of Emergency Procedures. These emergency procedures shall take effect only if each of the following conditions have been met.

1. A hurricane, severe storm or other disaster has caused severe and widespread damage in portions of CRMC jurisdiction; and

2. The Governor has submitted a formal request to the President to declare areas within CRMC jurisdiction a major disaster area; and

3. The Chairman of the CRMC determines that the number of applications for CRMC assents resulting directly from the disaster will cause significant delays in the orderly processing of assents and, thereby, impose an undue hardship on disaster victims and other applicants; and

4. The CRMC provides adequate notice of its decision to impose emergency procedures by causing a legal notice to be printed in local newspapers and by posting such a notice in CRMC offices and in the town hall of each town in which the emergency procedures shall apply.

B. Temporary Moratorium. A temporary moratorium shall be imposed and shall remain in effect for a maximum of 90 days. The purpose of the moratorium

is to provide CRMC, the Hazard Mitigation Advisory Committee(s) and affected coastal communities with adequate time to assess damages, determine changes in natural features that may change vulnerability to damage, and identify mitigation opportunities.

This temporary moratorium may be extended for one or more additional periods of up to 90 days each, provided that the CRMC holds a public hearing prior to each extension on its intent to extend the temporary moratorium and that CRMC demonstrates adequate justification of the need for the extension in relation to protection of public health and safety.

The temporary moratorium for the entire area or for selected areas may be lifted at any time by the Chairman of the CRMC upon a finding that the moratorium is no longer necessary. The temporary moratorium shall apply to the following:

1. New Alterations and Activities. A temporary moratorium shall be imposed on applications for new alterations and activities requiring Council Assent, which do not result from the disaster.

2. Reconstruction in V Zones. A temporary moratorium shall be imposed on reconstruction of all residential, commercial and public structures in V zones that were damaged more than 50% during the storm. Damage shall be determined by the local building inspector and shall be based on the estimated replacement cost of the structure.

3. Reconstruction in A Zones. A temporary moratorium shall be imposed on reconstruction of all residential and commercial structures in A zones that were damaged more than 50% during the storm. Damage shall be determined by the local building inspector and shall be based on the estimated replacement cost of the structure.

C. Disaster Related Applications for Category A and Category B Assents. Applications for alterations and activities that require a Council Assent shall be for a category "A" or "B" Assent, as listed in Tables 1 and 1a of the CRMP, with the following exceptions.

1. Repair or reconstruction of all structures, including residential structures, and facilities, that were destroyed 50% or more by wind, storm surge, waves or other natural coastal processes in the salt pond region shall require a Category "B" Council Assent.

2. Emergency Assents may be granted for all alterations and activities in A, B, or C flood zones that would normally require a Category A Assent. Provided, however, that the applicant must place an application on file with the CRMC and sign a statement that the alteration or activity is required as a result of damages suffered during the disaster and that it will conform with all applicable CRMC and other state and local standards and regulations. All alterations and activities granted an Emergency Assent are subject to inspection to ensure that work has been performed in accordance with all applicable CRMC and other state and local standards and regulations.

3. An emergency assent may be granted on a case-by-case basis by the Executive Director or the Council, in accordance with Section 180.1 of the CRMP, for any alteration or activity located in a V zone.

D. Priorities for Processing Applications. The following priorities are established:

1. Emergency Assents. First priority will be given to any application for a catastrophic storms assent, including essential public facilities.

2. Essential Public Facilities. Second priority will be given to other applications for alteration, reconstruction, or replacement of essential public facilities, such as roads, bridges, and public utilities.

3. Reconstruction in A-Zones. Third priority will be given to applications for reconstruction of structures in A-zones which were damaged more than 50%.

4. New Alterations and Activities. Fourth priority will be given to new applications for new alterations and activities unrelated to the disaster.

5. Reconstruction in V-Zones. Fifth priority will be given to applications for reconstruction of structures in V-zones which were damaged more than 50%.

E. Public Notification of Emergency Permitting Procedures. CRMC should publish in local newspapers and provide to each municipality information on the emergency procedures that will be followed.

330.3 Coordinated Procedures for Emergency Permitting.

To speed reconstruction and minimize adverse economic and other impacts on those directly affected by the disaster and the community at large, other state agencies and each affected coastal community are encouraged to adopt emergency permitting procedures equivalent to those of CRMC, within its jurisdiction.

330.4. Rebuilding of Infrastructure

It can be expected that a major hurricane will severely damage or destroy some public infrastructure and utilities, such as roads, bridges, and water and sewer lines. These public facilities will be eligible for disaster assistance from FEMA or FHWA. In most cases, the state and community will need to reconstruct these public facilities to their pre-disaster condition. However, in some cases this may not be the best option. For example, bridges and roadways subject to repeated flooding because they are not currently designed to withstand a major hurricane may need to be rebuilt to a higher standard. However, specifying that destroyed roads and bridges should be reconstructed to a 100-year or other standard, may not provide the best overall solution. A 100-year design standard for a bridge and roadway approaches may cause considerable environmental damage

in some areas. In other instances, the most desireable option may be to not replace the road, bridge, sewer line or other type of infrastructure. The following guidance is suggested.

A. Do Not Encourage Development in High Hazard Areas. New or rebuilt infrastructure should not encourage additional development in V-zones.

B. Flexible Design Standards. Reconstruction design should be determined on a case-by-case basis. A least-cost type analysis as currently used by the Rhode Island Department of Transportation and the Federal Highway Administration is preferred for most roads and bridges. Each community should indicate in their Comprehensive Plan (or in other appropriate documents, such as their Emergency Operations Plan) that design standards for roads and bridges destroyed by storms will be based on RI DOT standards.

Where feasible, electrical, telephone and cable TV utilities should be rebuilt underground to reduce future wind damage. Use of underground utilities is not recommended on barrier beaches where breaching of the barriers may occur.

330.5 Acquisition and Relocation

As a result of destruction or severe damage to structures, erosion, and other effects of the disaster, it may be advisable for the state or a community to acquire some properties. The post-disaster period provides a unique opportunity for acquisition because owners may be willing to sell and funds may be available. The Hazard Mitigation Advisory Committee should evaluate all properties that may pose a hazard for redevelopment and make recommendations as to whether they should be acquired by the state or a municipality. This type of evaluation and recommendation is particularly important in cases where the structure may be legally rebuilt, but would still pose a hazard.

A. Priority Areas for Acquisition. Coastal areas that have already been identified by a state agency or a community as likely candidates for acquisition because of their vulnerability to flood damage and because they could serve other public purposes should be carefully evaluated following the storm to determine if reconstruction should be prohibited or if owners may be willing to sell their properties.

B. Areas with Damage Greater than 50%. All areas with structures that sustained damage greater than 50% should be carefully evaluated to determine if reconstruction should be prohibited or if properties owners are willing to sell and relocate.

C. Funds for Acquisition. Following a disaster, various types of federal assistance may be available that can be used for acquisition and/or relocation of severely damaged or destroyed properties. Usually, however, federal funds are insufficient or require state and local matching funds. The State of Rhode Island should institute a fund to be used for acquiring property in high hazard flood zones that can serve some other public purpose once acquired, such as open space or recreation. Coastal communities are also encouraged to establish funds specifically for acquisition of areas

vulnerable to flood damages, particularly structures in V-zones.

330.6 Construction Standards

A. Rhode Island Building Code. The Rhode Island Building Code definition of substantial improvements should be changed to conform with the FEMA definition for all flood hazard areas. This is especially critical for V zones.

B. CRMP Standards. The current CRMP constructions standards for flood zones should be modified or updated to reflect the most recent technical guidance available regarding construction in coastal areas as contained in the FEMA publication "Coastal Construction Manual" (FEMA-55/February 1986). It is suggested that this document and any successors be included in the CRMP standards by reference.

Chapter Four.

Post-Hurricane Recovery and Mitigation in the Salt Pond Region

410 RISK AND VULNERABILITY OF THE SALT POND REGION

The salt pond region consists of portions of the towns of Westerly, Charlestown, South Kingston and Narragansett, generally extending from Watch Hill to Point Judith along the coast and inland to approximately U.S. 1, as show in Figure 4.1. For a number of reasons, the salt pond region is particularly vulnerable to flooding, erosion and related damages from hurricanes and other coastal storms:

410.1 Hurricane Risk

The east-west shoreline of the salt-pond region is unprotected by large, off-shore islands, and is exposed to the full force of coastal storms. During the 1938 hurricane, the southern shore of Rhode Island experienced the highest winds and greatest waves recorded anywhere in New England.1 Recent maps of the salt pond region indicate that the combined height of storm surge and waves along the coast may exceed 20 feet in some locations.1

The dunes and unconsolidated glacial sediments of the south shore are highly susceptible to erosion from storm-generated waves. The south shore barrier beaches are sand starved and have an exceptionally narrow and low profile which renders them susceptible to erosion and overwash. During the 1938 hurricane, the cliffs at Watch Hill receded some 35 feet and the dune scarp at Weekapaug receded 50 feet. The dunes of the south shore have not recovered from the hurricanes of 1938 and 1954, and the beach profile is now lower than the storm surge height of those hurricanes.[1] Average annual erosion rates of up to five feet have been determined for areas along the south shore.[2]

During major hurricanes, new breachways may be created through the low coastal barriers, existing breachways closed by sediment, and large amounts of sediment transported into the salt ponds. These occurrences may cause major changes to the salt ponds by altering water circulation and fish and shellfish habitats as well as creating shoals that impede boating. The manner in which cleanup, restoration and repairs proceed after a hurricane will have a major impact on the subsequent ecology and condition of the ponds.1

The salt ponds, which lie inland of the coastal barriers, are also subject to storm surge and damaging wind-generated waves. Prior to 1984, flood maps of the salt pond region indicated that areas inland from the coastal barriers were subject to flooding, but not to damaging wave action.[3] Beginning in 1984, revisions to these maps showed that waves may continue across some of the coastal barriers into the salt ponds, or be regenerated in other salt ponds after having been dissipated by the barriers. Storm surge and wave heights up to 15 feet in the ponds and along the shore areas adjacent to the ponds are now indicated.[6] In other words, shoreline areas of the salt ponds, more than a mile from the open coast, are subject to damaging waves. (See Figure 4.2).

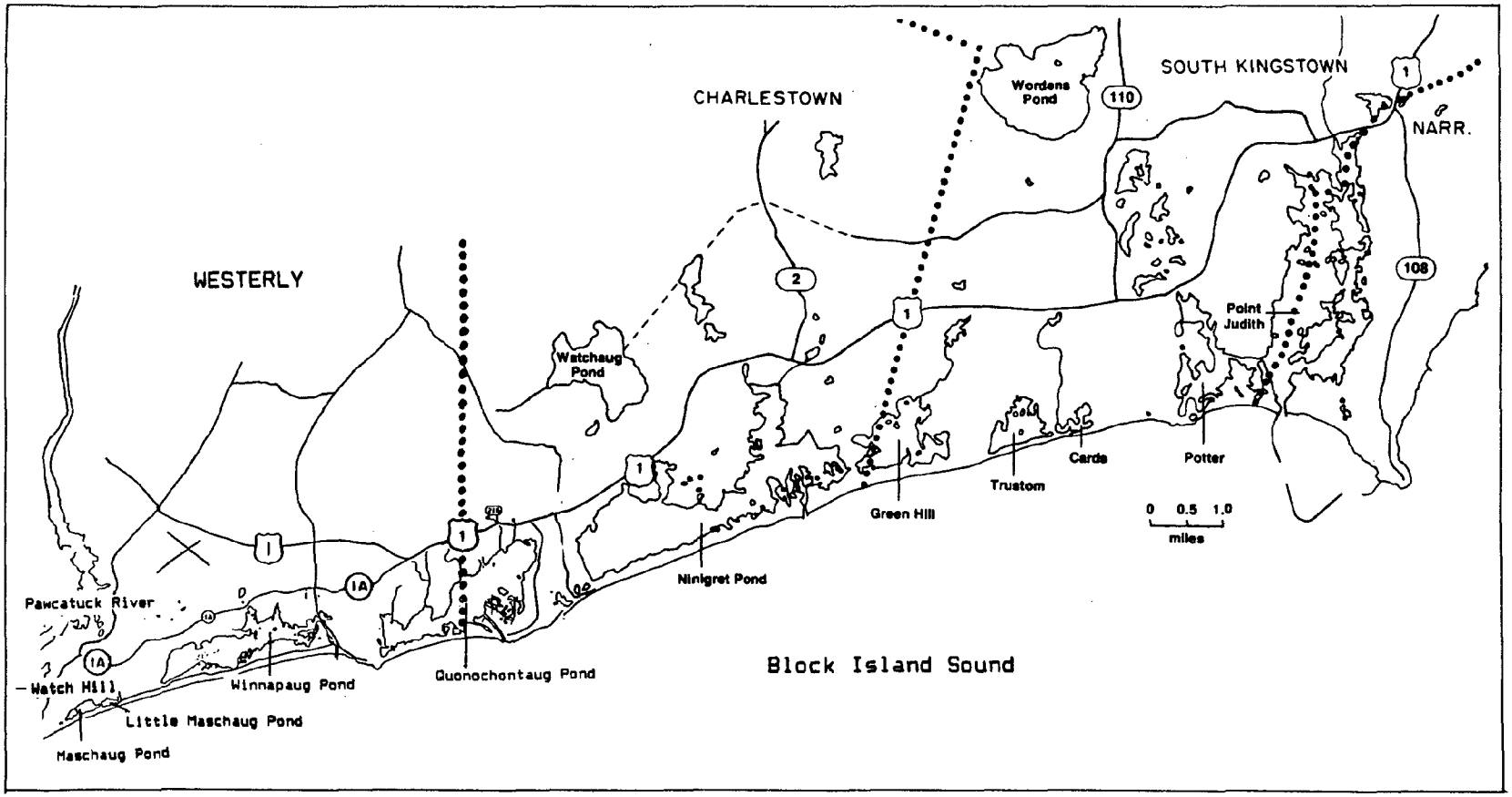


Figure 4.1. The Salt Pond Region. For administrative purposes, the boundaries of the Salt Pond Region follow the roadways that most closely correspond to the watershed boundaries of the salt ponds. The region is bounded on the on the east by Route 108 in Narragansett, on the west by Browning Road in Westerly and on the south by Block Island Sound. The northern boundary runs from Route 1 in Narragansett, along Tuckertown Road and Narragansett Trail in South Kingston to the town hall in Charlestown; thence following a straight line across the northernmost shore of Schoolhouse Pond to Kings Factory Road; thence following the Burlingame State Park boundary to Watchaug Pond; thence following Healy Brook to Cookestown Road in Charlestown; thence following Rout 1 and Route 1A in Westerly.

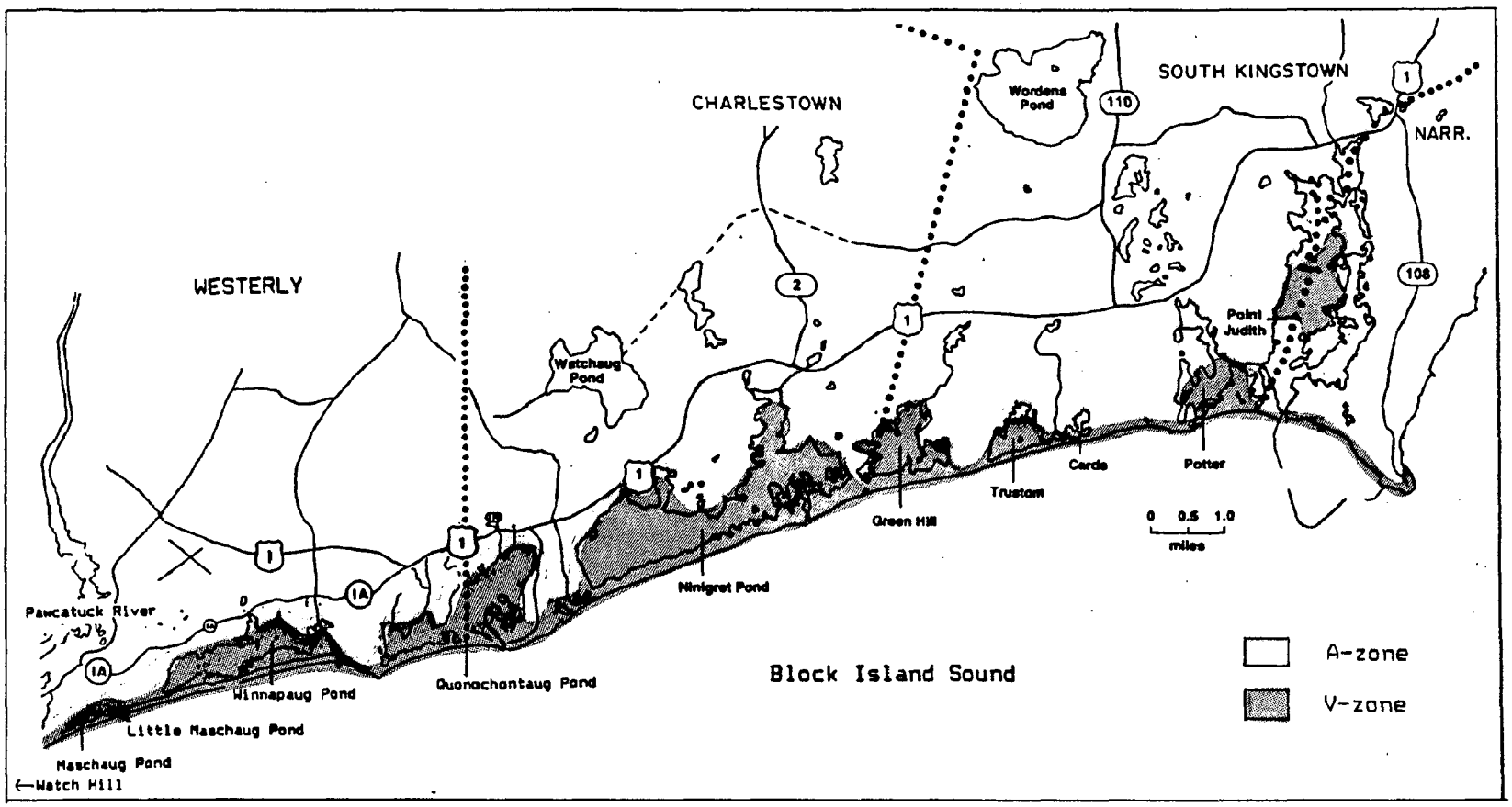


Figure 4.2. High Hazard Flood Zone Areas Within the Salt Pond Region of the Towns of Westerly, Charlestown, South Kingston and Narragansett. (Adapted from the 1984-1985 FEMA Flood Insurance Rate Maps.)

410.2 Vulnerability to Damages

Because zoning regulations and building standards are keyed to the floodplain maps, most structures built along the shores of the salt ponds -- prior to recent changes in the maps -- were not constructed to withstand hydrodynamic forces of wave action.

Several of the coastal barriers and much of the low lying coastal plain around the salt ponds are densely developed. There are now three times more houses than were present at the time of the last major hurricane in 1954 (see Figure 4.3). According to 1981 aerial photographs, there were more than 3,200 houses and 9,600 residents in the 100-year floodplain (see Table 4.1). Estimates of property damage during a major hurricane are well in excess of $100 million (see Table 4.2).

Because of this rapid growth during the past 30-40 years, most people now living in the region have never experienced the force of a major hurricane, and many consider themselves safely removed from the destructive power of an ocean that may be a mile away beyond a placid salt pond and coastal barrier. The relatively mild damage inflicted on the region in September 1985 by Hurricane Gloria may have further contributed to this false sense of security. Since Hurricane Gloria highest winds occurred at low tide, there was little damage to coastal areas from storm surge and waves. In addition to year-round residents, thousands of summer tourists visit the region during the hurricane season, and thousands of recreational boats and commercial fishing vessels are located at local marinas and ports.

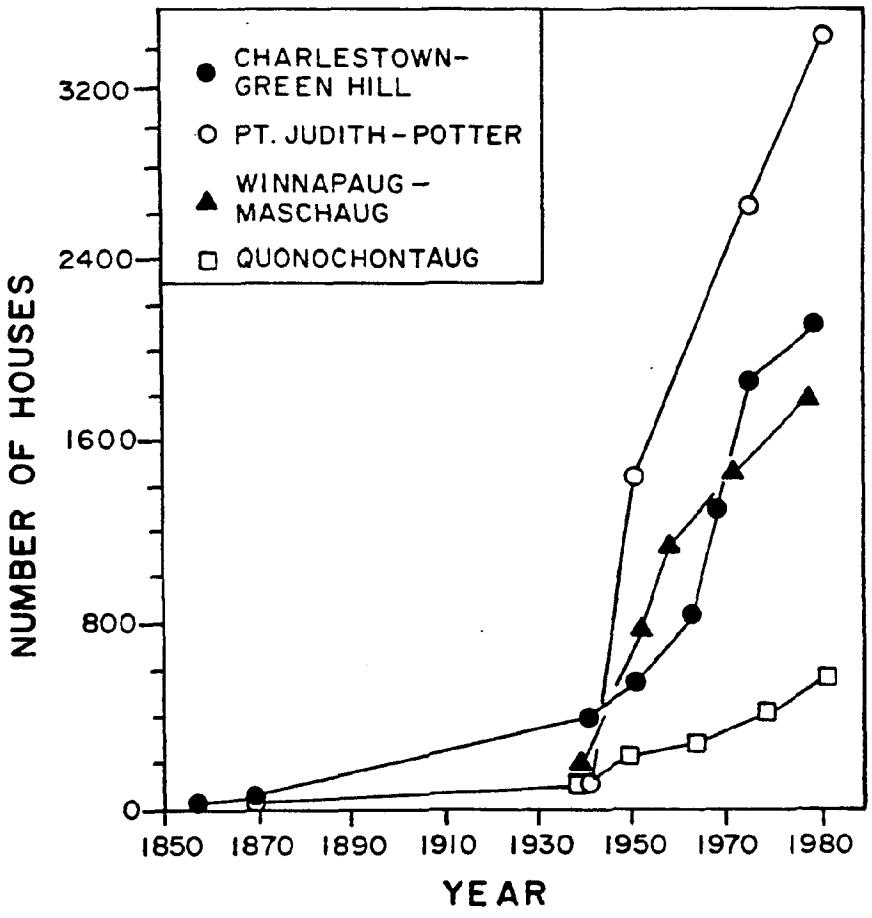
420. EMERGENCY RESPONSE AND RECOVERY ACTIONS

420.1 Areas for Temporary Storage of Debris

As described in Section 310.1, at least one area should be identified and designated for temporary storage of debris in each area where large amounts of debris may accumulate. Additional areas may need to be designated depending upon the extent of storm destruction and debris accumulation. Community officials will have to make final decisions on appropriate areas to be used for temporary storage of storm debris after the disaster has occurred. The following areas should be considered for designation:

1. Point Judith Pond, Narragansett.
   Galilee -- Fishermen's Memorial State Park
   Upper Pond area -- Marina Park

2. Point Judith and Potter Ponds area, South Kingston.
   Snug Harbor -- Water Tower Park
   Matunuck -- DEM field north of Succotash Road
   Jerusalem -- land west of the State Pier



Source: Coastal Resources Management Council. 1984. Rhode Island's Salt Pond Region: A Special Area Management Plan.

Figure 4.3. The Trend in Development Around the Salt Ponds South of Route 1. (Note the dramatic increase in development since Hurrican Carol in 1954, the last major hurricane to strike the region.)

Location	Number of Structures A Zones	V Zones
MASCHAUG POND		
Headlands	305	107
Barrier Spit	0	5
Pond Shoreline	1	14
WINNAPAUG POND		
Headlands	24	0
Barrier Spit	46	132
Pond Shoreline	53	57
QUONOCHONTAUG POND		
Headlands	139	89
Barrier Spit	0	5
Pond Shoreline	50	73
NINIGRET POND		
Headlands	-	-
Barrier Spit	0	59
Pond Shoreline	171	98
GREEN HILL POND		
Headlands	23	6
Barrier Spit	0	38
Pond Shoreline	200	60
TRUSTOM POND		
Headlands	6	0
Barrier Spit	0	0
Pond Shoreline	0	0
CARDS POND		
Headlands	420	16
Barrier Spit	2	8
Pond Shoreline	13	0
POTTER POND		
Headlands	41	0
Barrier Spit	38	27
Pond Shoreline	120	80
PT. JUDITH POND - SOUTH KINGSTOWN		
Headlands	0	2
Pond Shoreline	109	4
PT. JUDITH POND - NARRAGANSETT		
Headlands	470	27
Pond Shoreline	215	9
TOTALS	2286	892

Source: Coastal Resources Management Council.

Table 4.1. Number of Structures in Coastal Wave Velocity (V) Zones and in 100-Year Flood (A) Zones Within Rhode Island's Salt Pond Region According to 1981 Aerial Photos and 1984 and 1985 FEMA Flood Insurance Rate Maps (FIRMs).

1. Private Structures - Zone V
In the event of a major hurricane, structures located within this high flood hazard zone are expected to be more than 50 percent destroyed and as such will need full review by the Coastal Resources Management Council (CRMC). There are at this time, close to 900 residential and commercial structures located within the V zone at an estimated value in excess of $50 million.[1] Assuming severe damage or destruction, FEMA and HUD estimates are more than $80 million for this area.[2]

2. Private Structures - Zone A
Structures located within this flood hazard zone are expected to sustain severe damage during the next major hurricane and may or may not require full CRMC review. More than 2,000 residential and commercial structures are located within the A zone of the salt pond region with an estimated value of more than $85 million.[1] Assuming major damage after a hurricane, FEMA and HUD[2] estimates for this area would be about $45 million.

3. Public Structures - Zone V and Zone A
In addition to review of private applications, CRMC will need to consider reconstruction of public structures and utilities, including roads, bridges, public facilities, water and sewer pipes, power lines, etc. Plans for reconstruction according to FEMA standards need to be in place before damage occurs in order to obtain full value disaster relief monies for replacement or improvement of flood damaged structures.

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[1]Estimates are based on 1985 tax assessment records for the Maschaug, Little Maschaug, and Winnapaug Pond areas of Westerly and prorated for the remainder of the ponds.

[2]FEMA and the Federal Department of Housing and Urban Development (HUD) have advised the use of three categories for making rapid estimates of residential damage incurred during a disaster.
Destroyed--$90,000 (structure completely demolished or moved from foundation)
Major Damage--$20,000 (water above the first floor)
Minor Damage--$5,000 (water in the basement)

Source: Coastal Resources Management Council.

Table 4.2. Estimates of Property Damage Within the High Hazard Flood Zones of the Salt Pond Region Based on Structures Existing in 1981.

3. Ninigret and Green Hill Ponds area.
   Green Hill and Limber Point Area -- Green Hill Beach Association parking lot
   North Green Hill Pond and Sea Lea Colony areas -- Baptist Church lot
   Tocwotton Cove, Cross Mills, and East Beach Road -- Naval Air Base

4. Quonochontaug Pond area.
   Drive-In Theatre North of Route 1

5. Winnapaug Pond area.
   Misquamicut State Beach Parking Lot
   Pond View Country Club
   Aircraft landing field south of Shore Road

420.2 Removal and Disposal of Overwash Sand

Following a major coastal storm, large amounts of sand may be washed onto upland areas and into the salt ponds. Roads may be buried by several feet of sand. Typically, such overwash sand is removed from public roads and property by public works crews and returned to the beach. Private property owners may transfer the sand from their properties to public rights-of-way, onto vacant lots, onto the beach, or into wetlands and salt ponds depending upon what is most convenient and least expensive. This redistribution of overwash sand, however, may have a negative effect on the long-term stability of the barrier beach system.

To ensure that thick deposits of sand washed onto upland areas are disposed of in a manner consistent with maintenance of natural coastal area features and long-term stability of the barrier beach system, the following guidance is provided.

1. Overwash sand deposited on sand dunes and other undeveloped areas should be left in place.

2. Homeowners are encouraged to remove only that amount of overwash sand in the immediate vicinity of houses, garages and other structures as necessary to provide reasonable and safe entrance and use. Sand removed from private property should be returned to the adjacent beach. Where this is not practicable, sand should be placed in a public right-of-way for later removal and disposal by public works crews.

3. When overwash accumulates on unpaved roads, driveways and parking lots on the barriers, the preferred practice shall be to leave the overwash in place and thus build up the profile of the barrier. If necessary, gravel surfacing may be placed on top of the overwash to accommodate automobiles. Priority sites that need additional elevation because they are particularly susceptible to overwash or temporary breaching include the parking lots at East Matunuck Beach, Charlestown Beach, and Green Hill Beach.

4. Overwash sand on paved roads, driveways and parking lots should be plowed or otherwise moved back onto the beaches and not into adjacent wetlands, undeveloped lots or coastal ponds. Sand should be placed on the beaches in the manner described in Section 420.1 (Figure 4-4) of the SAMP.

In addition to the information provided to state, local and private work crews regarding proper practices for handling of overwash sand (Appendix C), property owners also need to be advised of the desirability of allowing overwash sand to remain in place wherever possible and of the proper disposal practices when it must be removed. CRMC and the coastal towns should provide information to residents of coastal barriers detailing preferred practices and requirements for disposal.

420.3 Restoration of Overwash Channels and Temporary Inlets

Based on experience from previous hurricanes, the next major hurricane can be expected to cause significant changes to the coastal environment, including severe erosion, destruction of sand dunes, creation of new inlets, and clogging of existing breachways. Changes are expected to be particularly severe in the salt pond region. Previous hurricane waves and storm surge swept the sand dunes into the ponds, creating the extensive back barrier shoals that are now heavily used as shellfishing flats. Many temporary inlets were cut through the barrier beaches. Future hurricane surges will bring large volumes of sand further inside the ponds, accelerating shoaling of the flood tide deltas. Active overwash sites may become temporary inlets in the next major hurricane. Other inlets may be blocked off and protective structures damaged.

Within the salt pond region, the following actions should be taken regarding new and existing inlets and overwash channels.

1. New inlet channels breached to Potter Pond through East Matunuck Beach may be filled in with sand or gravel only after an evaluation of the impacts of a direct connection between Potter Pond and the ocean has been made by CRMC, DEM and researchers from the University of Rhode Island.

2. New inlet channels cut across the beach to Green Hill Pond, Ninigret Pond or to Point Judith Pond through Sand Hill Cove may be immediately filled in with sand or gravel.

3. Dredging of overwash shall be permitted for navigation in the Green Hill Pond Inlet, the Bluff Hill Cove Inlet and in the main breachway channels. Any dredging of overwash sand elsewhere within the ponds shall be limited to habitat restoration and enhancement in conformance with Section 450.1 of the SAMP. All dredged sand shall be placed on the adjoining ocean beach.

430. DAMAGE ASSESSMENTS AND SHORT-TERM RECOVERY

430.1 Initial Damage Assessments

Each of the four salt pond communities should establish and appoint the damage assessment teams described in Chapter Three. One team is needed to make the initial windshield survey. Other teams are needed for the follow-on surveys in support of the Governor's application for disaster assistance (public property, business and industry, and private dwellings survey teams). Each team should use the damage survey forms and instructions provided for the purpose by RIEMA. The public property survey team should continue to work with federal and state representatives over a period of months in the development of detailed Damage Survey Reports.

Information from each of these damage survey teams should be provided to the Hazard Mitigation Advisory Committee in addition to local officials and RIEMA.

430.2 Hazard Mitigation Advisory Committee.

Within the salt pond region the Salt Pond Action Committee should function as the Hazard Mitigation Advisory Committee. If at the time of the next disaster, the Salt Pond Action Committee is no longer active, a Hazard Mitigation Advisory Committee should be developed by CRMC. This Committee should be composed of members of CRMC from the salt pond communities and selected area residents and officials.

This committee will be responsible for focusing on long-term mitigation opportunities and making recommendations to CRMC, other state agencies and local officials concerning appropriate reconstruction activities.

430.3 Permitting for Reconstruction

Each town should establish emergency permitting procedures that parallel those of the CRMC. A temporary moratorium should be established on areas that receive major damage or that are isolated as a result of infrastructure destruction.

440. LONG-TERM RECONSTRUCTION FOR HAZARD MITIGATION

The Hazard Mitigation Advisory Committee and local officials must determine whether and under what conditions severely damaged buildings and infrastructure should be permitted to be reconstructed. Long-term public needs may best be served if some destroyed or severely damaged roads and bridges are not reconstructed at all. In other cases, they should perhaps be reconstructed to a different design standard.

Similarly, destroyed or severely damaged residences and commercial buildings should not be rebuilt if they would again be exposed to the same or greater flood and erosion hazard. Regulations of municipalities, CRMC or other state agencies may provide an adequate basis for prohibiting reconstruction at some locations. In other instances,

regulations may permit reconstruction even though such action would clearly pose a hazard to lives and property. In those cases, state and local officials should actively pursue acquisition of the properties. Areas that have already been identified as likely candidates for acquisition because of their vulnerability to flood damage and because they could serve other public purposes include: Charlestown Beach, Green Hill Beach, Matunuck Beach and the eastern end of East Matunuck Beach4. Each of these areas should be carefully evaluated following a hurricane or other disaster to determine if reconstruction should be prohibited or if owners may be willing to sell their properties.

Most recommendations and decisions regarding reconstruction must be made on a case-by-case basis following a careful review of the actual damages incurred to structures, infrastructure and the natural environment. Based on their vulnerability to damage, areas of priority concern are identified below that will likely require major and difficult decisions regarding permitting of reconstruction following a disaster.

440.1 Point Judith Pond

A. Galilee. The fishing industry is a vital part of the economy of Narragansett. Due to the presence of the breakwater, the commercial port area is not subject to major wave action. Even so, high water levels and winds may cause significant damage to the commercial fishing fleet, fish processing plants and related commercial enterprises. Following a storm, commercial structures that suffer major damage should be rebuilt. Wherever feasible, these structures should be elevated to the base flood level. Where this is not feasible due to requirements related to access and loading and unloading catches from fishing vessels, floodproofing measures should be explored such as use of removable flood shields at all doorways, windows and other openings. The Hazard Mitigation Advisory Committee should assist local businesses in working with federal and state agencies to obtain grants, loans or other funding to assist with floodproofing.

B. Jerusalem/East Matunuck. Succotash Road provides the only access to the commercial fishing industry and recreational boating facilities at Jerusalem, the residences located at the western end of the Point Judith Pond Breachway and the East Matunuck State Beach. Most of Succotash Road is below flood levels of the 100-year storm and access to and from the area may be cut off during the early stages of a hurricane. In addition, the bridge over the inlet connecting Point Judith Pond to Potter Pond could be damaged or destroyed as flood waters are pushed through the inlet. For these reasons, Succotash Road and the bridge over the inlet should be identified for reconstruction to a 100-year standard. A least-cost approach to this road does not seem appropriate because of the vital role it has as an evacuation route for this area. However, it should not be expanded to provide greater capacity (depending upon results of any hurricane evacuation study that may be performed).

The residential homes adjacent to Point Judith Pond Breachway are built on the large sand dunes in this area and are outside of the V zone. They may still be subject to major damage as a result of erosion of the sand

dunes. If destroyed, existing CRMP regulations regarding rebuilding should be strictly enforced. Acquisition of both non-buildable land and remaining homes should be considered by the State and the area added to the existing state beach at East Matunuck.

440.2 Potter Pond

Most of the homes around Potter Pond are subject to flooding but few are located within V zones. In this area strict enforcement of existing regulations should be applied, but moratoriums or consideration for acquisition will probably not be needed unless unanticipated damages occur.

The commercial area south of Matunuck Beach Road at Matunuck is partially located within the V zone. It this area is seriously damaged, efforts should be made to relocate most commercial activities to the north side of the road and limit the area south of the road to commercial recreational facilities.

440.3 Cards Pond

Cards Pond is located within a designated Coastal Barrier System. Existing regulations regarding rebuilding should be applied to the few homes that occupy the eastern edge of this area.

440.4 Trustom Pond

Trustom Pond is entirely within the Trustom Pond National Wildlife Refuge, and no special consideration for this area is needed by local or state officials.

440.5 Green Hill Pond

Homes built on the barrier beach at Green Hill Pond are highly vulnerable to damage by wave action, erosion of sand dunes on which they are built and collapse into temporary inlets that may be created by overwash channels. Existing regulations regarding rebuilding should be strictly enforced. The Town of South Kingstown should consider acquiring properties along the barrier.

440.6 Ninigret Pond

Homes on the barrier beach between the Charlestown border and the Charlestown Breachway are also highly vulnerable to destruction by storm surge and erosion. In the event of major damage to these homes, the Town of Charlestown should consider not rebuilding Charlestown Beach Road for vehicular access to the barrier. Regulations should be strictly enforced and the Town of Charlestown should consider acquisition of properties.

440.7 Quonochontaug Pond

The barrier beach south of Quonochontaug Pond is a designated undeveloped coastal barrier. Only a few structures are present on the barrier at the western end of the pond.

440.8 Winnapaug Pond

The barrier beach south of Winnapaug Pond is lined with homes, many of which are built on high sand dunes and are outside of the V zone. Others are built behind the sand dunes and lie within the V zone on the pond side of the barrier. All of these homes are subject to damage from flooding and erosion. In the event of major damage to this area (as occurred during the hurricanes earlier this century), CRMP regulations regarding setbacks and reconstruction on sand dunes should be strictly enforced. The Town of Westerly should consider whether Atlantic Avenue along the barrier should be reconstructed as a public roadway.

Appendix A.

References

CHAPTER ONE. THE OBJECTIVES OF THE POST-HURRICANE RECOVERY AND MITIGATION PLAN

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7. Hoffman, John S, Dale Keyes and James G. Titus. 1983. Projecting Future Sea Level Rise: Methodology, Estimates to the Year 2100, and Research Needs. A report of the U.S. Environmental Protection Agency, EPA 230-09-007.

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CHAPTER TWO. THE MANAGEMENT FRAMEWORK FOR RECOVERY AND MITIGATION

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CHAPTER FOUR. POST-HURRICANE RECOVERY AND MITIGATION IN THE SALT POND REGION

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Appendix B.

Federal Disaster Assistance Programs

FEMA PROCEDURES FOR FEDERAL DISASTER ASSISTANCE

To receive federal disaster assistance, a state must follow specific procedures established by the Federal Emergency Management Agency, beginning with a request from the Governor for a Presidential Disaster Declaration.

A. Request for Disaster Declaration. An area affected by a disaster that causes damages of such severity and magnitude that it is beyond the capabilities of state and local governments alone to deal with is eligible to receive a declaration by the President as a "major disaster" area. A request for a major disaster declaration must be made to the President by the Governor, through the FEMA regional office in Boston. Prior to a formal request, the Governor, with information provided by the Rhode Island Emergency Management Agency (RIEMA), and perhaps with the assistance of FEMA personnel from the regional office, generally will make a preliminary assessment of the extent of damage and alert FEMA and the President through a letter or telegram that he intends to request a declaration. As soon as reasonably accurate estimates of the types and extent of damage can be assembled by RIEMA, a formal request is prepared and submitted by the Governor to the President, through the FEMA regional office. The Governor's request must include a certification of reasonable state and local expenditures for disaster relief and an estimate of what type and how much federal assistance is required for the entire state and each affected county or other specified area.

B. Review and Recommendation by FEMA. When the Governor's formal request for a disaster declaration is received by the regional office, the FEMA regional director and staff evaluate the estimates of damage and assistance required and make a recommendation to the Director of FEMA. The FEMA headquarters staff performs a further review and the Director of FEMA makes the final recommendation to the President. The President issues the declaration, which identifies specific geographic areas to which the declaration applies and the types of federal assistance to be made available.

C. Types of Federal Disaster Assistance. A disaster declaration may authorize two general types of federal disaster assistance: Individual Assistance and Public Assistance. Any given area may be declared eligible for either or both types of assistance depending upon the type and extent of damages. Individual Assistance makes available a number of programs to aid individuals, families and businesses. Public Assistance provides a separate set of programs to assist local and state governments in restoration of public facilities and resumption of essential public services.

D. Federal-State Disaster Assistance Agreement. Once the President makes the disaster declaration, the Governor and the FEMA Regional Director sign a Federal-State Disaster Assistance Agreement which specifies where and how federal disaster assistance will be made available.

E. Disaster Field Office. FEMA establishes a Disaster Field Office in the disaster area as a base for federal disaster assistance functions. Usually, this office is located in conjunction with a similar office operated by the RIEMA. The Disaster Field Office is staffed by representatives of FEMA and all other federal agencies with disaster assistance responsibilities

in the area. These field representatives are responsible for providing prompt assistance to disaster victims and advising local and state agencies on eligibility requirements, surveying and reporting damages, and applying for federal assistance.

F. Disaster Assistance Centers. FEMA also establishes one or more Disaster Assistance Centers in the area to help individual disaster victims get information and guidance from the various federal agencies and apply for assistance from the available federal programs. Mobile disaster assistance teams may also be sent out to help persons who have difficulty getting to the Disaster Assistance Center.

G. Applicant's Briefing for State and Local Governments. FEMA, in conjunction with RIEMA, holds a briefing to inform state and local officials of public assistance that may be available and the procedures and eligibility requirements involved. Items covered at the briefing include: 1) filing a Notice of Interest for receiving different types of federal disaster assistance (see Figure B.1); 2) preparing Damage Survey Reports to document damages and repair costs; 3) filing a Project Application; and 4) addressing special considerations, such as environmental assessments and opportunities for hazard mitigation.

H. Damage Survey Report. Damage Survey Reports (DSRs) document the extent of damages to public facilities, identify needed and eligible repairs, and assess in detail the costs of repairing or rebuilding these facilities. The DSRs are prepared by a Damage Assessment Team consisting of federal, state and local personnel, and are submitted to FEMA and the RIEMA. The DSR is the basis for FEMA's approval of applications for public assistance. (See Figure B.2).

FEMA classifies damages that are eligible for public assistance into seven categories of "permanent" work and two categories of "emergency" work. (See Table 2.2). A separate DSR is prepared for each category of work and for each damage site. Separate DSRs are required for different categories of work at the same site.

A DSR does not constitute an approval of repair work or a commitment of federal funds. It simply provides the most accurate information available on the extent of damages and estimated repair costs, which FEMA uses to approve or deny specific line items requested in the Project Application.

I. Project Application. The Project Application (see Figure B.3) is the formal request for aid that a local government or state agency's authorized agent (see Figure B.4) submits to FEMA's Regional Director through the RIEMA. The Project Application summarizes and combines the Damage Survey Reports for various projects to repair public facilities damaged in the community, and provides a formal record of FEMA's and RIEMA's review and approval of the different projects for which federal funds are committed.

A Project Application must be submitted to FEMA's Regional Director within 90 days of the Presidential declaration of a major disaster. Under current FEMA policy, the federal government will only fund up to 75 percent of the eligible cost of repairs to public facilities. Once a

Form Approved
OMB No. 026-R0036

FEDERAL EMERGENCY MANAGEMENT AGENCY DISASTER RESPONSE AND RECOVERY **. NOTICE OF INTEREST** *IN APPLYING FOR FEDERAL DISASTER ASSISTANCE*	FEMA DECLARATION NUMBER DATE FIPS NUMBER

The purpose of this form is to list the damages to property and facilities so that inspectors may be appropriately assigned for a formal survey.

REQUIREMENTS FOR FEDERAL DAMAGE SURVEYS

A. DEBRIS CLEARANCE

- ☐ On Public Roads & Streets including ROW
- ☐ Other Public Property
- ☐ Private Property *(When undertaken by local Government forces)*
- ☐ Structure Demolition

B. PROTECTIVE MEASURES

- ☐ Life and Safety ☐ Health
- ☐ Property ☐ Stream/Drainage Channels

C. ROAD SYSTEMS

- ☐ Roads ☐ Streets
- ☐ Bridges ☐ Culverts
- ☐ Traffic Control ☐ Other*

D. WATER CONTROL FACILITIES

- ☐ Dikes ☐ Levees ☐ Dams
- ☐ Drainage Channels ☐ Irrigation Works

E. PUBLIC BUILDINGS AND EQUIPMENT

- ☐ Public Buildings
- ☐ Supplies or inventory
- ☐ Vehicles or other equipment
- ☐ Transportation Systems
- ☐ Higher Education Facilities

F. PUBLIC UTILITY SYSTEMS

- ☐ Water ☐ Storm Drainage
- ☐ Sanitary Sewerage ☐ Light/Power
- ☐ Other*

G. FACILITIES UNDER CONSTRUCTION

- ☐ Public Facilities*
- ☐ Private Non-Profit Facilities**

H. PRIVATE NON-PROFIT FACILITIES**

- ☐ Educational ☐ Medical
- ☐ Emergency ☐ Custodial Care
- ☐ Utility

I. OTHER *(Not in above categories)*

- ☐ Park Facilities
- ☐ Recreational Facilities

** Indicate type of facility;*
*** Provide name of the facility and of private non-profit owner.*

NAME AND TITLE OF REPRESENTATIVE WHO WILL ACCOMPANY THE SURVEY TEAM

NAME OF POLITICAL SUBDIVISION OR ELIGIBLE APPLICANT 1	COUNTY 2
BUSINESS ADDRESS	ZIP CODE
BUSINESS TELEPHONE *(Area Code/Number)* 3	HOME TELEPHONE *(Area Code/Number)*
APPLICANT'S AUTHORIZED REPRESENTATIVE 4	BUSINESS TELEPHONE *(Area Code/Number)*

FEMA FORM 90-49 (3/80)

Source: FEMA, 1981, Handbook for Applicants, p. E-1.

Figure B.1. FEMA Notice of Interest Form

Form Approved
OMB No. 3067-0027

FEDERAL EMERGENCY MANAGEMENT AGENCY
- DAMAGE SURVEY REPORT
DISASTER RESPONSE AND RECOVERY
(See instructions on reverse)

3. DECLARATION NO. FEMA

4. INSPECTION DATE

1. TO ➡ REGION _____ FEDERAL EMERGENCY MANAGEMENT AGENCY

5. WORK ACCOMPLISHED BY
☐ CONTRACT
☐ FORCE ACCOUNT

2. APPLICANT *(State Agency, County, City, etc.)* | PA NO.

7. WORK CATEGORY *("X" Applicable Box)*
☐ EMERGENCY ☐ A ☐ B
☐ PERMANENT ☐ C ☐ D ☐ E ☐ F ☐ G ☐ H ☐ I

DSR NO. 100001

6. PERCENTAGE OF WORK COMPLETED TO DATE
%

8. DAMAGED FACILITIES *(Location, identification and description)*

8A. FACILITY IN OR AFFECTS FLOOD PLAIN OR WET LANDS
☐ YES ☐ NO

9. DESCRIPTION OF DAMAGE

10. SCOPE OF PROPOSED WORK

11. ESTIMATED COST OF PROPOSED WORK

QUANTITY (a)	UNIT (b)	MATERIAL AND/OR DESCRIPTION (c)	UNIT PRICE (d)	COST *(dollars)* (e)

12. EXISTING INSURANCE *(Type)* | AMOUNT $ | TOTAL ➡ $

13. RECOMMENDATION BY FEDERAL INSPECTOR *(Signature, Agency, date)* | ELIGIBLE ☐ YES ☐ NO | ATTACHMENTS

14. CONCURRENCE IN REPORT BY STATE INSPECTOR *(Signature, Agency, date)* | CONCUR ☐ YES ☐ NO | ATTACHMENTS

15. CONCURRENCE IN REPORT BY LOCAL REPRESENTATIVE *(Signature, Agency, date)* | CONCUR ☐ YES ☐ NO | ATTACHMENTS

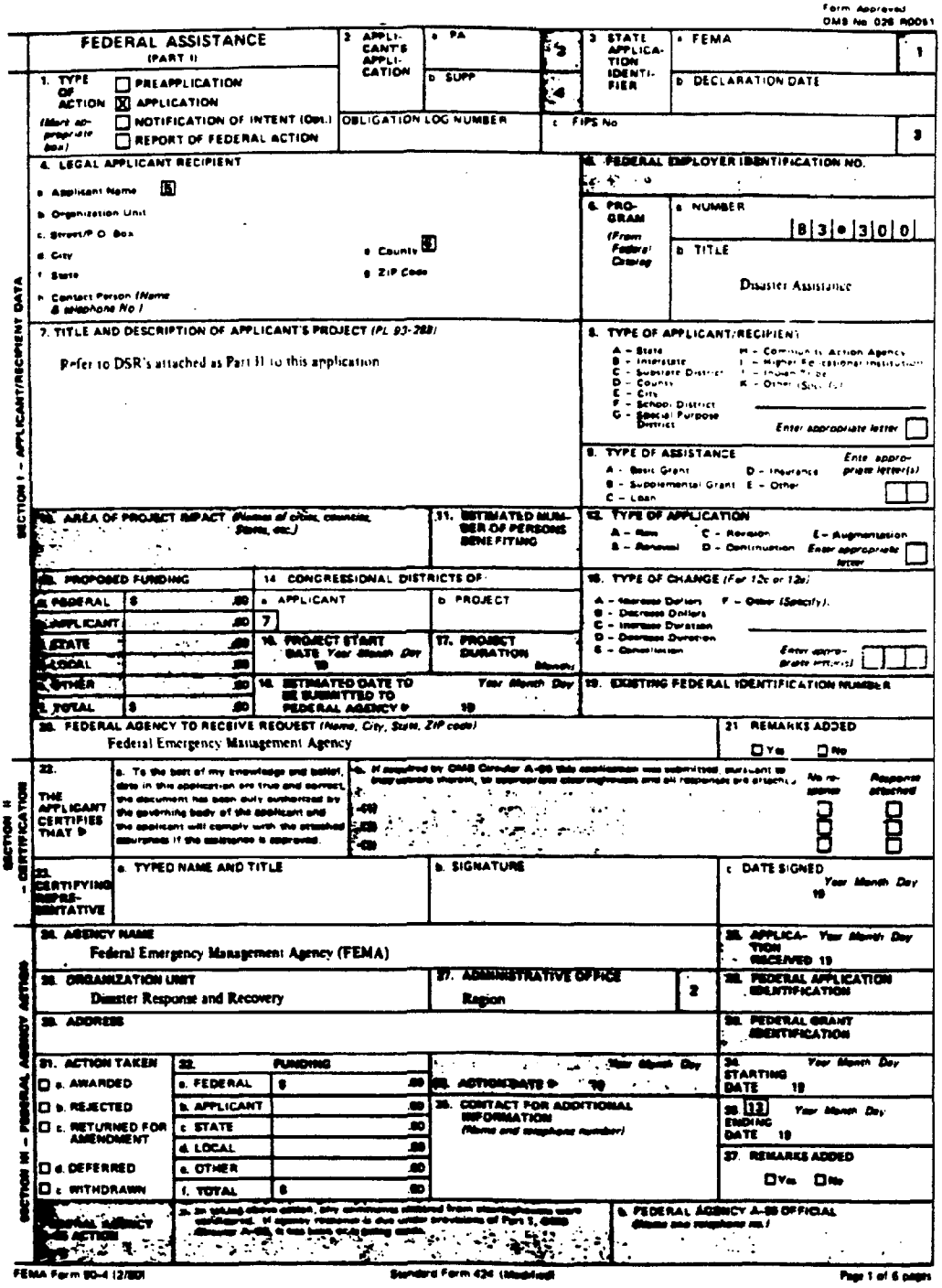
16. FEDERAL REVIEW *(Signature, Agency, date)* | FEMA REVIEW *(Initials and date)*

FEMA Form 90-52, JAN 81 (Formerly HUD Form 484)

COPY 1 - FEMA REGION

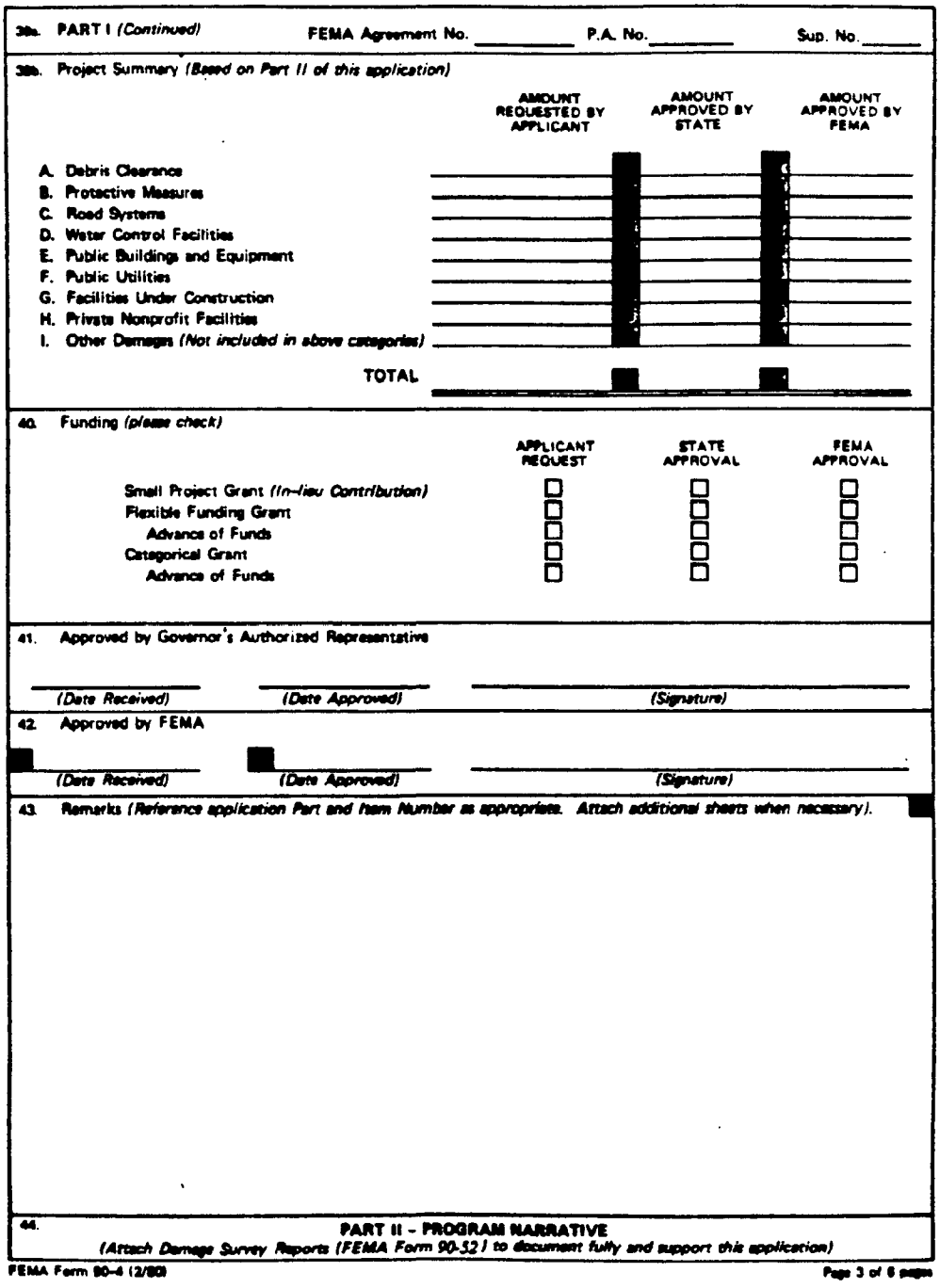
Source: FEMA, 1981, Handbook for Applicants, p. F-1.

Figure B.2. FEMA Damage Survey Report Form



Source: FEMA, 1981, Handbook for Applicants, p. G-1.

Figure B.3. FEMA Project Application Form



39a. PART I *(Continued)* FEMA Agreement No. _____ P.A. No. _____ Sup. No. _____

39b. Project Summary *(Based on Part II of this application)*

	AMOUNT REQUESTED BY APPLICANT	AMOUNT APPROVED BY STATE	AMOUNT APPROVED BY FEMA
A. Debris Clearance			
B. Protective Measures			
C. Road Systems			
D. Water Control Facilities			
E. Public Buildings and Equipment			
F. Public Utilities			
G. Facilities Under Construction			
H. Private Nonprofit Facilities			
I. Other Damages *(Not included in above categories)*			
TOTAL			

40. Funding *(please check)*

	APPLICANT REQUEST	STATE APPROVAL	FEMA APPROVAL
Small Project Grant *(In-lieu Contribution)*	☐	☐	☐
Flexible Funding Grant	☐	☐	☐
Advance of Funds	☐	☐	☐
Categorical Grant	☐	☐	☐
Advance of Funds	☐	☐	☐

41. Approved by Governor's Authorized Representative

_____ _____ _____

(Date Received) *(Date Approved)* *(Signature)*

42. Approved by FEMA

_____ _____ _____

(Date Received) *(Date Approved)* *(Signature)*

43. Remarks *(Reference application Part and Item Number as appropriate. Attach additional sheets when necessary).*

44. **PART II - PROGRAM NARRATIVE**

(Attach Damage Survey Reports (FEMA Form 90-52) to document fully and support this application)

FEMA Form 90-4 (2/80) Page 3 of 6 pages

Figure B.3. FEMA Project Application Form (continued)

DESIGNATION OF APPLICANT'S AGENT

RESOLUTION

BE IT RESOLVED BY _____ OF _____,
(Governing Body) *(Public Entity)*

THAT _____ , _____
* *(Name of Incumbent)* *(Official Position)*

OR

_____ , Governor's Authorized Representative,
* *(Name of Incumbent)*

is hereby authorized to execute for and in behalf of _____

_____ , a public entity established under the laws of the State of _____ , this application and to file it in the appropriate State office for the purpose of obtaining certain Federal financial assistance under the Disaster Relief Act (Public Law 288, 93rd Congress) or otherwise available from the President's Disaster Relief Fund.

THAT _____ , a public entity established under the laws of the State of _____ , hereby authorizes its agent to provide to the State and to the Federal Emergency Management Agency (FEMA) for all matters pertaining to such Federal disaster assistance the assurances and agreements printed on the reverse side hereof.

Passed and approved this _____ day of _____ , 19____.

_____
(Name and Title)

_____
(Name and Title)

_____
(Name and Title)

CERTIFICATION

I, _____ , duly appointed and _____ of
(Title)

_____ , do hereby certify that the above is a true and correct copy of a resolution passed and approved by the _____ of _____
(Governing Body) *(Public Entity)*

on the _____ day of _____ , 19____.

Date: _____

_____ _____
(Official Position) *(Signature)*

**Name of incumbent need not be provided in those cases where the governing body of the public entity desires to authorize any incumbent of the designated official position to represent it.*

FEMA Form 90-63, MAR 81

Source: FEMA, 1981, Handbook for Applicants, p. H-1.

Figure B.4. FEMA Applicant's Agent Designation Form

Project Application is approved and FEMA makes different forms of public assistance available to the local government or state agency, FEMA maintains standards for project administration, including project completion deadlines, progress reports, and cost overruns. For a major disaster, federal assistance for "emergency" work typically ends six months after the declaration and federal assistance for "permanent" work ends after 18 months. Recipients can receive time extensions for a number of extenuating circumstances.

J. Final Inspection Report. As work on a project ends, the recipient notifies the Governor's Authorized Representative, who arranges for federal or state personnel to make a final inspection of the work. The Final Inspection Report (see Figure B.5) documents the completion of work and is essential to the recipient's being reimbursed for the cost of repairs. A project that does not exceed $10,000 usually does not require a final inspection.

K. Request for Advance or Reimbursement. Once the Final Inspection Report is completed and approved, the recipient files a Request for Reimbursement (see Figure B.6), attaching a listing of completed line items and their costs. This same form can be used to request advance payments as well as reimbursements. It is the final formal claim for the reimbursement of costs for all repair and reconstruction projects eligible and approved under FEMA's disaster assistance program.

L. Direct Federal Assistance. In addition to funding local repair and reconstruction projects, the federal government may deploy its own personnel and equipment to perform emergency work if local and state personnel and equipment are inadequate to do so. To obtain this direct federal assistance, the local government or state agency must submit a request to FEMA's Regional Director within ten days after the Presidential declaration. The request takes the form of a resolution by the local governing body (or body governing a state agency) accompanied by a statement of why the work cannot be conducted with local or state resources. Local government budget constraints are not considered a sufficient cause for receiving direct federal assistance.

DISASTER ASSISTANCE FROM OTHER FEDERAL AGENCIES

Although most federal disaster assistance is coordinated through FEMA, a few other federal agencies have disaster assistance programs that are provided separately from FEMA. These agencies include the Small Business Administration, the Federal Highway Administration and the Soil Conservation Service.

A. Small Business Administration. The Small Business Administration (SBA) issues its own disaster declaration, separate from FEMA. SBA makes available low interest Physical Disaster Loans directly to eligible individuals and businesses. These loans can be used to replace or repair damaged real estate, inventory or other business property. Businesses are required to document their flood damages and have the damages verified by an SBA representative. SBA low interest loans are generally available only to businesses and individuals that cannot obtain credit through commercial sources. Those that can obtain credit elsewhere may also be eligible for SBA loans,

Form Approved
OMB No.
0246-R0088

FEDERAL EMERGENCY MANAGEMENT AGENCY
DISASTER RESPONSE AND RECOVERY
· FINAL INSPECTION REPORT

DECLARATION NUMBER AND DATE

APPLICATION NO. | SUPPLEMENT NO.

TO: FEDERAL EMERGENCY MANAGEMENT AGENCY REGION

FROM: *(Agency and/or Bureau and Location)*

1. APPLICANT

2. TYPE OF FUNDING: ☐ CATEGORICAL ☐ FLEXIBLE ☐ SMALL PROJECT GRANT

3. INSPECTED WORK

CAT.	ITEM	DATE COMPLETED	DATE INSPECTED	INSURANCE SETTLEMENT	APPROVED PA COST ESTIMATE	REPORTED COST	CONTRACT/ FORCE ACCT.	SCOPE OF WORK *(Report Changes)*

4. INSPECTOR

	STATE		FEDERAL	
	YES	NO	YES	NO
a. Did you personally inspect each item of completed work?				
b. Did you review and utilize applicable Damage Survey Reports?				
c. Did you review and utilize applicable FEMA Engineering Analyses?				
d. Did you review and utilize applicable Applicant's Documentation?				
e. Did you ever make any prior inspections of any of these work items?				

CERTIFICATION

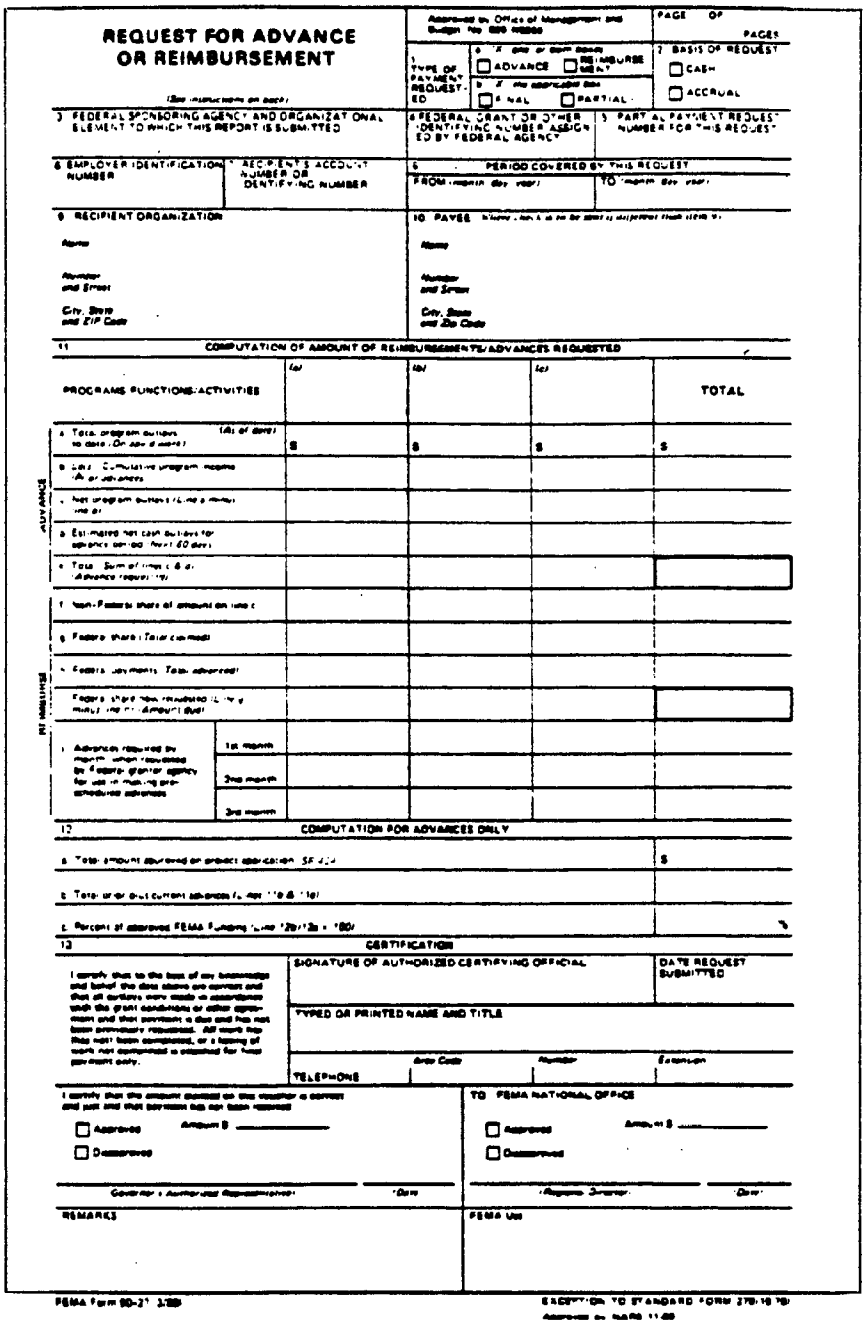
The above item(s) in the project application for the category of work shown has been inspected and certification is hereby made that the work has been completed as approved therein, except as noted above.

FEDERAL INSPECTOR *(Signature and Title) (Federal Agency)*	*(Date)*	FEMA REVIEW
STATE INSPECTOR *(Signature and Title) (State Agency)*	*(Date)*	INITIALS
LOCAL REPRESENTATIVE *(Signature and Title)*	*(Date)*	DATE

FEMA FORM 90-48 (3/80) Sheet _____ of _____

Source: FEMA, 1981, Handbook for Applicants, p. K-1.

Figure B.5. FEMA Final Inspection Report Form



REQUEST FOR ADVANCE OR REIMBURSEMENT

(See instructions on back)

Approved by Office of Management and Budget No. [illegible]

PAGE OF PAGES

1. TYPE OF PAYMENT REQUESTED: a. [illegible] ☐ ADVANCE ☐ REIMBURSEMENT; b. [illegible] ☐ FINAL ☐ PARTIAL

2. BASIS OF REQUEST: ☐ CASH ☐ ACCRUAL

3. FEDERAL SPONSORING AGENCY AND ORGANIZATIONAL ELEMENT TO WHICH THIS REPORT IS SUBMITTED

4. FEDERAL GRANT OR OTHER IDENTIFYING NUMBER ASSIGNED BY FEDERAL AGENCY

5. PARTIAL PAYMENT REQUEST NUMBER FOR THIS REQUEST

6. EMPLOYER IDENTIFICATION NUMBER

7. RECIPIENT'S ACCOUNT NUMBER OR IDENTIFYING NUMBER

8. PERIOD COVERED BY THIS REQUEST: FROM (month, day, year) TO (month, day, year)

9. RECIPIENT ORGANIZATION: Name; Number and Street; City, State and ZIP Code

10. PAYEE (Where check is to be sent is different than item 9): Name; Number and Street; City, State and Zip Code

11. COMPUTATION OF AMOUNT OF REIMBURSEMENTS/ADVANCES REQUESTED

PROGRAMS FUNCTIONS/ACTIVITIES		(a)	(b)	(c)	TOTAL
ADVANCE	a. Total program outlays to date (On-aid work) (As of date)	$	$	$	$
	b. Less: Cumulative program income (Ai or advances)				
	c. Net program outlays (Line a minus line b)				
	d. Estimated net cash outlays for advance period (Next 60 days)				
	e. Total (Sum of lines c & d) (Advance requested)				
REIMBURSE	f. Non-Federal share of amount on line c				
	g. Federal share (Total claimed)				
	h. Federal payments (Total advanced)				
	i. Federal share now requested (Line g minus line h) (Amount due)				
	j. Advances required by month, when requested by Federal grantor agency for use in making pre-scheduled advances	1st month			
		2nd month			
		3rd month			

12. COMPUTATION FOR ADVANCES ONLY

a. Total amount approved on project application (SF 424)	$
b. Total prior plus current advances (Lines 11e & 11e)	
c. Percent of approved FEMA Funding (Line 12b/12a x 100)	%

13. CERTIFICATION

I certify that to the best of my knowledge and belief the data above are correct and that all outlays were made in accordance with the grant conditions or other agreement and that payment is due and has not been previously requested. All work has not been completed, or a listing of work not completed is attached for final payment only.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL

DATE REQUEST SUBMITTED

TYPED OR PRINTED NAME AND TITLE

TELEPHONE: Area Code; Number; Extension

I certify that the amount claimed on this voucher is correct and just and that payment has not been received

☐ Approved Amount $ _____

☐ Disapproved

Governor's Authorized Representative (Date)

TO FEMA NATIONAL OFFICE

☐ Approved Amount $ _____

☐ Disapproved

(Regional Director) (Date)

REMARKS

FEMA Use

FEMA Form 90-21 3/80

EXCEPTION TO STANDARD FORM 270 (10-79)

Approved by NARS 11-80

Source: FEMA, 1981, Handbook for Applicants, p. I-1.

Figure B.6. FEMA Request for Reimbursement Form

though at a higher interest rate and shorter loan period. In all cases SBA loan recipients must demonstrate an ability to repay the loan. SBA has another loan program called Economic Injury Disaster Loans. These loans may be available to businesses who suffer economic injury as a direct result of the disaster (with or without physical damage) and cannot obtain commercial credit. Application for SBA loans must be made within 180 days of the SBA disaster declaration. Loans may be made for up to 85 percent of the verified losses.

B. Federal Highway Administration. The Federal Highway Administration (FHWA) provides funding assistance for damaged roads and bridges that were constructed or maintained under the Federal Aid System. Applications for assistance are made by the State Department of Transportation directly to FHWA. Reimbursement of repair or replacement costs are funded 100 percent by FHWA. FHWA will also provide 100 percent of funding to reconstruct a road or bridge to a higher hydrological standard, if an evaluation of the structure indicates that such a redesign is needed.

C. Soil Conservation Service. The U.S. Department of Agriculture's Soil Conservation Service (SCS) under its Emergency Watershed Protection Program may directly undertake emergency work for debris clearance from channels and streambank stabilization. Typically, SCS personnel will prepare all plans and designs and supervise the work that is performed by contractors. SCS work may be divided into two phases, the Exigency Phase, and the Non-Exigency Phase. Stream improvement work which must be undertaken immediately in order to reduce the likelihood of further damage is authorized under the Exigency Phase. Exigency Phase work is funded 100 percent by SCS. Needed stream improvement work that is not required immediately due to the threat of further damage is authorized under the Non-Exigency Phase. Non-Exigency Phase work is funded 80 percent by SCS and 20 percent by a local sponsor. A municipality or a state agency may serve as the local sponsor, and applications for the Emergency Watershed Protection Program are made by the local sponsor directly to the SCS office in Rhode Island.

HAZARD MITIGATION UNDER FEDERAL DISASTER ASSISTANCE PROGRAMS

Historically, the federal programs for disaster assistance have been oriented to financial and direct assistance for emergency response actions and for short- and long-term recovery. The federal programs were designed to speed the return of the community to its pre-disaster condition. There were few provisions in these programs to encourage mitigation actions, and in many cases a state or community desiring to undertake a mitigation action would be discouraged from doing so due to the unavailability of federal disaster assistance funds. For example, disaster assistance is available to restore damaged facilities to their pre-disaster condition in conformance with codes, specifications, and standards which were in use and enforced locally at the time of the disaster. Other improvements were not eligible for federal assistance, even if restoration to a more stringent standard was indicated.

In recent years, particularly since about 1979, some changes have been

made to the federal programs in an attempt to increase post-disaster mitigation measures and reduce a community's vulnerability to future damages from a similar event. The incorporation of hazard mitigation opportunities and incentives into the federal framework for disaster assistance is proceeding slowly, but some progress has been made. The most important of these mitigation activities are briefly described below.

A. Funding Options for Disaster Assistance. In most instances, the federal disaster assistance programs provide reimbursement of 75% of the cost of repairing or rebuilding a public facility to its pre-disaster condition, including the costs of complying with applicable health and safety standards in effect at the time of the disaster. Any improvements to the facility, beyond those required to comply with applicable standards, are not permitted. However, current FEMA policies do provide some funding options which can permit state agencies and local governments to undertake mitigation actions during disaster recovery.

1. Additional 15 Percent for Mitigation. In addition to repair or reconstruction costs, FEMA can authorize an additional 15% of the eligible grant amount for individual projects to cover the costs of measures which will make a damaged public facility more disaster-resistant. This 15% increase in the grant amount is in addition to those measures required by applicable state and local codes and standards.

2. Grant-In-Lieu. An applicant wishing to construct a better or larger facility than the facility damaged or destroyed may request a "grant-in-lieu" instead of the standard categorical grant. For any grant-in-lieu, the applicant receives federal financial assistance of 75% of the approved federal estimate of restoring the facility. The applicant must pay for all other project costs, including increased size, design changes, and other improvements.

3. Flexible Funding. An alternative option to a categorical grant is known as "flexible funding." Under flexible funding, a state agency or local government may, instead of restoring the damaged facilities, use the federal grant to perform approved work projects or to construct new facilities, if such facilities are determined necessary by the community. The flexible funding grant is based on 90% of the total estimated eligible costs of permanent work (i.e. federal grant payment of 90% of the usual 75% of total disaster-related costs for permanent work). Emergency work is not eligible for flexible funding.

A state agency or local government cannot choose flexible funding for some projects and categorical funding for others. Flexible funding may be appropriate in cases where a public facility is eligible for federal disaster assistance, but the applicant prefers to use disaster assistance funds for some other needed community facility instead of repairing or rebuilding the damaged facility.

4. Section 1362 Property Acquisition. Section 1362 of the National Flood Insurance Act of 1968 provides FEMA's Federal Insurance Administra-

tion (FIA) with authority to purchase certain flood damaged properties. In order to qualify for purchase under this program, the properties must be covered by federal flood insurance and must have been damaged "substantially beyond repair".1 Participation in this program is entirely voluntary: only owners of qualifying properties who wish to sell their damaged properties are involved. Property owners who do sell must relocate to an area outside the floodplain. Property acquired under this program is turned over to a unit of local government or a state agency for use as open space or other public use that will not be subject to flood damages. FIA uses several community selection factors (see Figure B.7) in determining which properties will be acquired with the limited 1362 funds. Funding for this program has been in the amount of approximately $5 million for each of the last several years, and the number of applications for purchase of eligible properties far exceed the funds available each year. Although 1362 funds have been used to purchase eligible properties in coastal areas, the high cost of coastal land is a factor that has apparently limited the use of this program in coastal areas.

B. Planning and Technical Assistance for Hazard Mitigation. Planning and technical assistance for hazard mitigation is provided by the federal Interagency Flood Hazard Mitigation Team. Hazard mitigation planning is a requirement for federal disaster assistance under Section 404 of the federal Disaster Relief Act.

1. Interagency Flood Hazard Mitigation Team. In 1980 the federal Office of Management and Budget directed FEMA to coordinate the activities of several federal agencies in providing pre- and post-disaster assistance to states and communities for flood hazard mitigation2. Within 15 days following a Presidential disaster declaration, an Interagency Flood Hazard Mitigation Team composed of representatives of these federal agencies must prepare a report that recommends actions which can be taken to reduce future flood damages in the affected areas.

The intent of this effort is to break the cycle of flood damages, followed by recovery and expenditure of federal disaster assistance funds, followed by yet another flood causing severe damages. The primary focus of the interagency team's recommendations is on federal actions and expenditures: actions that can be taken by federal agencies to limit use of federal funds for purposes that will result in a continuation of exposure to flood damages or contribute to

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1 Properties may also qualify in two other ways: 1) damaged by flooding no less than three times in the past five years, where the average cost of repairs was no less that 25 percent of the value of the structure; and 2) damaged to an extent where an existing statute, ordinance, or regulation prevents its restoration or allows its restoration only at a significantly higher cost.

2 The pre-disaster assistance role has not yet been implemented on a regular basis.

Community Selection Factors for the Section 1362 Program

1. The permanent removal of flood-prone structures will contribute to existing, on-going programs for permanent evacuation of flood plains.

2. In addition to hazard mitigation, acquisition will contribute to the achievement of multiple community development goals (such as environmental protection, open space/recreation, urban renewal, or some other public purpose).

3. The acquisition and relocation of flood-prone structures will have an economic benefit in terms of eliminating future flood insurance claims, avoiding future damage, reducing future disaster relief costs, avoiding business interruption, and reducing loss of life.

4. The distribution of properties to be acquired under Section 1362 (or the distribution of these properties combined with properties that can be acquired through other programs) will result in a logical, usable, and desirable land use pattern.

5. Alternatives to acquisition under Section 1362 have been investigated and found to be less effective than Section 1362 in meeting the community's floodplain management and hazard mitigation goals. These alternatives could include, but are not limited to, floodproofing, structural flood protection, or acquisition and relocation programs of local, state, or other federal agencies.

6. The community has undergone a planning process and found acquisition/relocation to be the most desirable alternative in terms of cost, degree of flood protection achieved, environmental enhancement, and other factors.

7. The community has demonstrated, or agreed to pursue, an active program of sound floodplain management which exceeds the minimum requirements of the National Flood Insurance Program.

8. The community can actively participate in the planning and implementation of the Section 1362 program through the provision of either financial or staff resources.

Source: McElyea, William D., David J. Brower and David R. Godschalk. 1982. Before the Storm: Managing Development to Reduce Hurricane Damages. Office of Coastal Management, North Carolina Department of Natural Resources and Community Development.

Figure B.7. Community Selection Factors for the Section 1362 Program

additional development exposed to flood hazards. The interagency team also makes recommendations for actions that can be taken by state and local governments independent of any federal involvement. In preparing their initial report, the interagency team works with and invites state and local representatives to participate on the team.

The initial 15-day report is submitted to state and local officials as well as to the appropriate offices of the involved federal agencies. FEMA, as the lead agency, monitors federal, state and local progress in implementing the report's recommendations. Recommendations included in the report are optional, not binding. A followup report is prepared after 90 days which reports on progress that has been made and any obstacles to implementation that have been encountered. Another progress report may be submitted 180 days after the disaster declaration.

2. Section 406 State Hazard Mitigation Plan. Section 406 of the Federal Disaster Relief Act of 1974 (Public Law 93-288) requires that any jurisdiction which receives federal disaster assistance must prepare a hazard mitigation plan within 180 days of the disaster declaration. The requirement for this state hazard mitigation plan is included in the State/Federal agreement which authorizes federal disaster assistance.

Because the plan is not required until six months after the disaster, it usually contains few recommendations that affect the immediate post-disaster period. Instead, recommendations relate more to hazard mitigation actions that can be taken by the state or local municipalities at any time. It may also include recommendations for immediate post-disaster mitigation actions to take following the next major disaster. Following Hurricane Gloria in September 1985, a Section 406 hazard mitigation plan for the State of Rhode Island was prepared by the Rhode Island Office of State Planning.

Appendix C.

DRAFT

INTERAGENCY AGREEMENT

BETWEEN

THE COASTAL RESOURCES MANAGEMENT COUNCIL

AND

THE RHODE ISLAND EMERGENCY MANAGEMENT AGENCY

REGARDING

POST-DISASTER EMERGENCY ACTIVITIES

TO PROTECT COASTAL RESOURCES AND PROMOTE HAZARD MITIGATION

Whereas, the Rhode Island Emergency Management Agency (RIEMA) and the Coastal Resources Management Council (CRMC) agree that following a major flooding disaster caused by a hurricane or winter storm:

- it is essential to restore the health, safety and well-being of flood damaged areas as quickly as possible; and
- it is also important to the long-term well-being of these areas to reduce flood hazard vulnerability: and
- these two needs may sometimes conflict; and
- there is a need to provide an acceptable balance between immediate recovery and long-term hazard mitigation;

Now therefore be it resolved that CRMC and RIEMA agree to the following:

- Emergency measures such as debris removal and disposal, removal and disposal of overwash sand, and restoration of overwash channels and temporary inlets, will be carried out in accordance with the policies, regulations and procedures established in the Coastal Resources Management Program, as amended, and in any Special Area Management Plans (such as that for the Salt Pond Region) now existing or that may be adopted by CRMC.
- Such emergency measures will also be undertaken in accordance with any more specific procedures and plans that may from time to time be adopted by the CRMC, provided, however, that RIEMA and CRMC agree to the specific provisions of these supplemental procedures.
- RIEMA will instruct all state agencies involved in emergency response, including the National Guard, of the requirements and procedures for proper handling of debris disposal, removal of overwash sand and restoration of overwash channels and temporary inlets.

- RIEMA will revise its Emergency Operations Plan (EOP) to include provisions for carrying out emergency response measures with due regard for protection of coastal resources and in accordance with plans and procedures adopted by the CRMC.

- RIEMA will require each agency with responsibilities for emergency response to revise their Standard Operating Procedures to include provisions for carrying out emergency response measures with due regard for protection of coastal resources and in accordance with plans and procedures adopted by the CRMC.

Similar agreements may be established by CRMC directly with the National Guard, Department of Transportation and individual communities.

RECOMMENDATIONS FOR AERIAL PHOTOGRAPHY

Aerial photographs of the coastal area of Rhode Island can be used for general planning purposes as well as for post-disaster assessments. Comprehensive aerial photography of the Rhode Island coast was last taken by the state in 1981 and is available at the Office of State Planning.

Air Photos for Coastal Planning

Up-to-date aerial photography can serve a number of general planning purposes, including the monitoring of changes in natural conditions (e.g., shoreline change) and the extent of coastal area development (e.g., number of structures in the V-zone and A-zone) as well as the identification of unauthorized activities and other work (dredging and filling, dune destruction) affecting the coastal area.

The CRMC should join with the Office of State Planning and the Department of Environmental Management in contracting for vertical aerial photography to be taken on a regular basis. This photography should be taken at least every ten years, and preferably every five years.

Standard black and white photography that will generate originals at a scale of 1:6,000 (1 inch = 500 feet) should be obtained, although color infra-red film will maximize the usefulness of the photography for other purposes and should be obtained if possible.

Air Photos for Post-Disaster Assessment

In addition to standard vertical aerial photography, post-disaster photographs of affected coastal areas should be taken as soon as possible following a hurricane or other major coastal storm. These photographs are essential for assessing the extent of structural damage, identifying areas of overwash and debris accumulation, estimating erosion and dune destruction and generally recording the impacts of the storm for public information and other purposes. For the salt pond region, these photographs should focus on the barrier island coast line and on the more inland shoreline of the salt ponds.

Low-level (500 to 750 feet) oblique photographs of affected areas using 35 millimeter lenses and color slide film should be taken. Standard black and white vertical photography as described above would also be desirable following a major storm, but in the absence of this photography damage assessment purposes can be served by the oblique photos alone.

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